Academic Earmarks and the Returns to Lobbying

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ABSTRACT

In this paper, we statistically estimate the returns to lobbying by universities. We develop a simple theoretical model of university lobbying for academic earmarks to motivate our empirical work. We first show that universities that are represented by a House Appropriations Committee (HAC) or Senate Appropriations Committee (SAC) member spend more on lobbying. Next, in a later instrumental variables estimation, we find that a 10% increase in lobbying expenditures by a university without HAC or SAC representation results in a 1.5% increase in earmark funding, although this relationship is not statistically significant in many specifications. For a university with HAC or SAC representation, a 10% increase in lobbying yields an additional 2.8% or 3.5% increase in earmarks, respectively. Moreover, we cannot reject that universities are setting marginal benefit of lobbying equal to its marginal cost of lobbying on average, although those with SAC representation do appear to underinvest in lobbying. We show that these results are consistent with predictions of the Grossman-Helpman (2001) and Helpman-Persson (2001) models of lobbying.

JEL Classification: K0, H1

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There are two primary ways in which special interests attempt to influence policy: campaign finance contributions and informational lobbying. Political action committee (PAC) contributions receive the overwhelming majority of attention from scholars (i.e. Randall Kroszner and Thomas Strattman 1999, James Snyder 1990). Yet, lobbying expenditures in the United States, nearing $2 billion per year, total more than three times the campaign contributions given by PACs (Timothy Groseclose *et al* 2000). Many voters view lobbying with suspicion, and the popular press frequently cites it as *prima facie* evidence of the power of "pressure groups, each promoting its own special interests, [to] prevent elected politicians from adopting policies that are in the interest of the electorate as a whole" (*Economist* 1999). Yet remarkably little is known about the economic returns obtained by organizations that lobby. Despite 65 years of theoretical and empirical investigation, and a steadily increasing interest by the press and electorate, there are no large-scale statistical studies of the returns to lobbying (Frank Baumgartner and Beth Leech 1998, Richard Smith 1995).

The dearth of statistical studies of lobbying is largely due to four challenges in data collection and measurement. First, it is difficult to measure lobbying expenditures. Second, many government policies lack identifiable pecuniary returns, thus making it difficult to measure the monetary value of policy outcomes that have been influenced by lobbying. Third, organizations typically employ multiple instruments to exert political influence, including lobbying, PAC contributions, and grassroots organization, creating statistical challenges to estimating the returns to lobbying. Finally, it is difficult to control for the intrinsic quality differences among competing lobbying interests.

In this paper, we overcome these challenges by studying the returns to lobbying in a particularly conducive context: efforts by universities to obtain "earmark" grants. Earmarks, which are non-competitive grants written into appropriations bills by legislators, allocate money directly to projects at specific universities and colleges, thus bypassing the competitive peer-review process (Amy Finkelstein, 1995). This context enables us to overcome the empirical challenges described above. First, the Lobbying Disclosure Act of 1995 allows us to measure

university lobbying expenditures, and techniques described below allow us to ascribe lobbying expenditures to the pursuit of earmark grants with reasonable certainty. Second, earmarks are specified in dollar terms and targeted to particular, identifiable educational institutions, overcoming problems of measurement of the dependent variable. Third, universities seeking to influence legislators have few options besides lobbying, because most universities, as non-profit institutions, are legally prohibited from using PAC contributions or grassroots political organization to convey their preferences to legislators. Finally, we are able to control for quality differences in interest groups with different systems of departmental rankings of universities.

In our statistical analysis, we estimate the elasticities of lobbying to earmarks. We find that a 1% increase in lobbying expenditures by a university without representation on the House Appropriations Committee (HAC) or Senate Appropriations Committee (SAC) results in a 0.15% increase in earmarks, but in many specifications the point estimates are not statistically different from zero. However, if the university is represented by a member of the HAC or SAC, then this 1% increase in lobbying yields an additional 0.28% or 0.35% increase in earmarks, respectively. These latter elasticities are statistically different from zero. We then use these elasticities to calculate the marginal benefit of lobbying for an average lobbying university. We cannot reject the hypothesis that, on the margin, a $1.00 increase in lobbying results in a $1.00 increase in earmarks for those universities unrepresented on either Appropriations Committee, or those universities with HAC representation. However, we find that those universities with SAC representation invest in lobbying below the efficient levels.

These findings are of interest not only because they provide insight into the private returns to lobbying, but also because they shed empirical light on predictions from recent theories of informational lobbying and campaign contributions (also known as "resource transfers").[1] The informational lobbying literature has traditionally focused on solving the problem of making a lobbyist's private information credible to a policymaker (e.g., Randall Calvert 1985, Suzanne Lohmann 1993). These models do not emphasize the returns obtained by interest groups. Nevertheless, one clear prediction from this literature, and the endogenous cost lobbying literature in particular, is that in a world with costly lobbying effort, groups whose

[1] Morten Bennedsen & Sven E. Feldman (2002) categorize economic models of interest group influence into two sets: those in which an interest group attempts to influence a policymaker by providing her with resources, in the form of campaign contributions (Grossman & Helpman 1994) or bribes (Timothy Besley & Stephen Coate 2001);

interests are closely aligned with those of policymakers will earn higher returns than those whose interests are more divergent (Austen-Smith 1995; Grossman & Helpman 2001: 161-170). This occurs because, when interest groups must incur costly lobbying to signal the credibility of their information, a group will need to incur greater lobbying costs the more divergent its interests are from those of the policymaker. In the U.S. Congress, members of the House and Senate Appropriations Committee control the earmarking process (James D. Savage 1999); consequently, universities in these members' districts are more likely have interests aligned with the relevant legislators, and therefore should receive a higher return to their lobbying efforts than should universities in other districts.

Similarly, the resource transfer literature predicts that interest groups aligned with key agenda-setters in the legislature will earn higher returns on their campaign contributions than will interest groups aligned with less central legislators (Helpman & Persson 2001).[2] This occurs because competition among legislators to be part of the winning coalition – and thus gain some benefits for their constituents – will drive policy to the agenda-setter's ideal point, while the absence of competition among interest groups within the agenda-setter's district leads the agenda-setter to adopt the group's ideal point as her own for a small amount of contributions.[3] This implies that interest groups that are represented by members of committees relevant to their interests (agenda-setters) will obtain greater rents to their lobbying efforts than those that are not. Thus, whether we interpret lobbying as informational (as in Grossman & Helpman 2001), or as a resource transfer (as in Helpman & Persson 2001), universities from the districts of House or Senate Appropriations Committee members are predicted to have a higher return to their lobbying efforts than those universities from elsewhere.

Our main result, that universities that are represented by HAC or SAC members earn higher returns on their lobbying efforts than unrepresented universities, is consistent with

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and those in which an interest group attempts to influence a policymaker by providing her with relevant information (Lohmann 1995; Grossman & Helpman 2001).

[2] Although the lobbying in our empirical work is informational, one may interpret this as a form of resource transfer. In the menu-auction literature on resource transfers from interest groups to politicians, a legislator values financial resources provided by special interests because these resources enable the legislator to enhance her re-election chances (Grossman and Helpman 1994). To the extent that the information provided by an interest group helps a legislator to know what policy will enhance her re-election chances, the legislator may value this information in much the same way she values financial resources.

[3] Helpman & Persson (2001) propose a multiple legislator, majoritarian decision-making model where there is a one-to-one mapping between interest groups and legislators (e.g. there is a single interest group in each legislator's

Grossman & Helpman's (2001) prediction about the rents that accrue to groups whose interests are aligned with key policymakers, and with Helpman & Persson's (2001) predictions about the rents that accrue to interest groups affiliated with agenda-setters. This paper thus contributes to the empirical research testing recent theoretical predictions of political activity (Pinelopi Goldberg and Giovanni Maggi 1999; Kishore Gawande and Usree Bandyopadhyay 2000).[4]

We also find that, after controlling for lobbying, House and Senate Appropriations Committee members send a disproportionate share of academic earmarks to their constituent universities. Contrary to those who claim there is no relationship between federal spending and committee membership (Kenneth R. Mayer 1991, Bruce A. Ray 1980), our study provides evidence to support the claim that committee members direct federal spending toward their districts. However, as we show in Section V, the amount of money these legislators send to their districts is less than would otherwise be predicted in the absence of lobbying.

We structure the paper as follows. In the next section we offer some background on educational earmarks and lobbying. In Section II we discuss the empirical challenges in measuring the returns to lobbying. Section III provides a simple theoretical model. In Section IV we explain the data and provide descriptive statistics. In Section V, we provide results and robustness checks. Section VI offers extensions, examining the efficiency of lobbying. We conclude in Section VII.

I. BACKGROUND ON EDUCATIONAL EARMARKS AND LOBBYING

As Claudia Goldin and Lawrence F. Katz (1999) note, American institutions of higher education emphasized learning rather than research until late in the 19th century. However, as the scientific needs of industry increased, so did the demand for academic research in the applied sciences. Thus the modern research-oriented university became widely established by World War I, with research funded primarily by states and secondarily by local industry (Nathan Rosenberg and Richard R. Nelson 1994). Although the federal government funded roughly 25

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district.) As we note below, university lobbying patterns generally conform to a world in which a single interest group lobbies a given legislator.

[4] Goldberg & Maggi (1999) and Gawande & Bandyopadhyay (2000) find empirical support for other predictions from the Grossman & Helpman (1994) menu-auction theory. However, they do not study the question of returns. Goldberg & Maggi (1999) find that legislators care far more about social welfare than about contributions, which suggests that informational lobbying about welfare-enhancing policy may be a more fruitful area for research than PAC contributions.

percent of academic research by the 1920s, this was largely in the form of agricultural research grants that correlated grant size to the state's agricultural output (Savage 1999).

The exigencies of war led to a sea change in the mechanisms for federal funding of academic research. Largely due to the advocacy of Vanevar Bush, the practice of awarding federal research funds to individual scientists via competitive project-based grants became institutionalized by 1950. Under this system, the awarding of funds was managed by the newly-created National Science Foundation and several other federal agencies, and awards were made primarily on the basis of peer review of project proposals. By 2001, federal funding of academic research through competitive grants exceeded $15 billion. Numerous scholars of technology policy have argued that this system has ensured that money is allocated toward the most promising research projects, and thus underpins the enduring success of academic research in the United States (e.g., Nelson and Rosenberg 1993).

Yet the competitive grant process has had its share of critics as well. A number of prominent academicians and legislators have argued that peer review serves to concentrate research funding in a few elite schools whose scientists populate the peer review boards (William H. Gray 1994, John Silber 1987). These critics have further argued that peer review tends to reward "safe" research projects, thus starving truly breakthrough research (Silber 1987). According to this view, the earmarking of federal funds through the legislative process offers a potential counterbalance to the perceived defects of the competitive grant process.

The birth of academic earmarks can be traced to the late 1970s, when Jean Meyer, President of Tufts University, engaged two lobbyists – Kenneth Schlossberg and Gerald Cassidy – to help secure funding for a nutrition and aging center. Over the next two decades Schlossberg and Cassidy, as well as several imitators, pursued educational institutions as clients, holding out the promise of obtaining academic earmarks such as that won by Tufts (Savage 1999). The amount of money allocated through academic earmarks rose from less than $17 million in 1980 ($32 million in constant 2001 dollars) to nearly $1.7 billion in 2001, a 100-fold increase in nominal terms (52-fold increase in real terms). By 2001 academic earmarks represented nearly 10 percent of total federal funding of academic research (see Figures 1a and 1b).

**********INSERT FIGURE 1a and 1b ABOUT HERE **********

The rise of specialist lobbying firms to secure earmarks also routinized the earmark "production schedule." The "life cycle" of lobbying and obtaining an earmark is as follows.[5] In January, a university's administrators meet with its lobbyist to formulate their lobbying strategy for the upcoming fiscal year. This entails prioritizing potential earmark requests by the likelihood of success, and identifying elected officials to lobby. In most cases, the lobbyist will approach the Representative and/or Senator from the university's district. Beginning in March and April, the university begins lobbying the targeted representatives to have its request included in the appropriations legislation. After the August recess, there is a large push to have the request included in one of the 13 appropriations bills. The cycle ends in November or December, as the appropriations bills are sent to the President, and in January the process begins again. According to our interviewees, requests from one year do not carry forward to the next year. This is mainly because the appropriations process, unlike the budget process, is not a multiyear process.

II. CHALLENGES IN MEASURING THE RETURNS TO LOBBYING

As noted in the introduction, estimating the returns to lobbying poses a number of challenges. First, it is difficult to measure the monetary value of lobbying expenditures. Until recently, systematic data on lobbying expenditures did not exist. Consequently, nearly every published statistical study has relied on proxy measures, survey data, or dummy variable measures for lobbying, rather than direct measures of lobbying expenditures.

Recent legislation passed by Congress has created lobbying expenditure disclosure requirements that help us to overcome this measurement problem. The Lobbying Disclosure Act of 1995 mandates that any individual who spends more than 20 percent of his or her time lobbying administrative agencies, Congress, or the Executive, must file a report disclosing the amount of money expended on this activity. Each organization that spends more than $20,000 on such lobbying in a given year also must file a report disclosing the name of the lobbyist, the clients of the lobbyist, and the amount of money spent on lobbying by the client (to the nearest $20,000).[6] One complication that arises, however, is that firms and interest groups typically

[5] According to interviews with staffers on the appropriations committees and lobbyists.
[6] This report encompasses all expenses related to lobbying, including the cost of cultivating lobbying contacts and background work that is intended for use in contacts and coordination with the lobbying activities of others (Office of the Clerk of the House, 2001). This includes salaries and benefits, overhead, expenses, and third-party billings.

lobby across a range of issues. Even when a firm's aggregate lobbying expenditure is known, it is difficult to identify how this expenditure is allocated across different issues.

We overcome this by examining academic earmark funding. Nearly all of university lobbying is directed at two objectives: earmark funding and science policy, and the vast majority is directed at the former objective.[7] The first legislative item for which top- and lower-tier universities lobby is earmark funding. A small number of top-tier universities and umbrella groups also lobby for a second item – increased budgets for competitive grant funding agencies such as the National Institutes of Health, rules governing human subjects, etc which we call science policy. These organizations include the top 50-100 research universities, and associations such as the American Association of Universities (AAU) and the Science Coalition. The remaining 6,400 post-secondary institutions generally do not.

Since the vast majority of universities' lobbying, and virtually 100 percent of lobbying by universities that are not among the top 50-100 research institutions, is devoted to the pursuit of earmarks, concerns about allocating lobbying expenditures across multiple policy objectives are ameliorated. In econometric specification tests, we exploit the single-mindedness of non-top-tier universities' lobbying to control for universities that lobby for science policy.

Second, it is difficult to measure the monetary value of policy outcomes that have been influenced by lobbying. Many policies that governments legislate – such as saving the forests, mitigating lawsuits, or eliminating a disclosure rule – lack identifiable pecuniary returns. Moreover, these benefits are often distributed among many groups. This makes the precise allocation of benefits to individual groups or companies difficult. These two problems together have made it nearly impossible to measure the economic returns to lobbying efforts.

We overcome this challenge by studying an easily measurable benefit. Earmark grants specify the university that is to receive funding, the amount of the funding, and the purpose of the funding.[8] The dollar value of these earmarks is identifiable, measurable, and easily allocated to a specific institution, consequently overcoming the measurement challenges noted above.

A third challenge is to disentangle lobbying's impact from that of other mechanisms of political influence, such as PAC contributions and grassroots organizing. It would be incorrect to attribute policy outcomes to lobbying alone when other mechanisms are available. Further,

[7] We have conducted interviews with lobbyists and they confirm this viewpoint.

because interest groups should be simultaneously optimizing across all tools at their disposal, one cannot simply include PAC contributions and grassroots organization as variables on the right-hand side of the equation, but rather must employ instruments that are correlated with these tools yet uncorrelated with lobbying. Instruments that satisfy this condition are often elusive.

However, as non-profit institutions, universities are not permitted to create and fund political action committees, and thus give no money in PAC contributions or "soft money" to political candidates or political parties.[9] In addition, universities are not allowed to engage in grassroots organization of its members for political purposes. Lobbying is clearly the dominant, and in most cases the only, avenue for universities pursuing earmarks.

A fourth and final challenge relates to variance in the quality of the groups that lobby. Suppose, for example, that IBM lobbies for legislation regarding disk drive construction. Seagate also lobbies, but for a different legislative outcome. IBM's preferred policy is passed by Congress. It is not clear to the researcher whether this results from IBM's lobbying effort, or from its superior technology in disk drives. If one is to measure the returns to lobbying, then one must control for the optimality of the policy, relative to the alternatives. Yet it is difficult to determine if IBM is the best disk-drive maker, and it is likely even more difficult to determine a ranking of all disk drive makers in the industry. This challenge, however, is easily surmounted in a study of universities. Using ranking data by independent sources, such as the National Academy of Science, we can control for quality of university by department.

III. A SIMPLE MODEL

The production function for earmarks is characterized by the following equation:

$$y_i = Z_i^{\gamma} L_i^{\beta} \qquad \text{(EQ. 1)}$$

where y_i is the value of the earmarks received by university i, Z_i is a set of observable and unobservable characteristics of university i and its representation, and L_i is the amount of money university i spends on lobbying. Taking logs, this simplifies to:

[8] For example, "$10,000,000 for the construction and equipping a new space dynamics lab, Utah State University…." (Savage 1999: 8)
[9] Universities could form non-affiliated PACs, but this is very costly, and its incidence is rare.

$$\ln y_i = \gamma \ln Z_i + \beta \ln L_i \qquad \text{(EQ. 2)}$$

Note that L_i is an endogenous choice variable by the university. If so, then estimation of Eq. 2 suffers from omitted variable bias because L_i is correlated with the omitted elements of Z_i.[10]

There are two non-exclusive ways in which one can deal with this problem, depending upon the nature of the omitted variable bias. First, simultaneity bias may be caused by a cross-university correlation between the amount of lobbying and the productivity of lobbying, e.g. universities that are more likely to get earmarks through lobbying are also more likely to lobby. Let us assume this correlation takes the form of a time-invariant university-specific source of productivity differences. In this special case, a fixed effects or random effects estimator can be used to generate consistent estimates (Yazir Mundlak 1963). The equation to be estimated is then:

$$\ln y_i = \gamma \ln Z_i + \beta \ln L_i + \vartheta_i + t + \varepsilon_i \qquad \text{(EQ. 3)}$$

where ϑ_i is the university fixed (or random) effect, t is a time fixed effect, and ε_i is the error term. Below, we estimate Eq 3.

Alternatively, assume that there is a time-variant aspect to a university's productivity or willingness to lobby. Moreover, assume that there may be measurement error in the lobbying expenditures. In this case, instrumental variables estimation provides a second method for identifying the effects of lobbying on earmarks.

To accomplish this, we must find an instrument that is correlated with L_i but uncorrelated with the omitted elements of Z_i that are found in the estimated error term. To derive such an instrument, we examine the utility function of university i. We assume that university i attempts to maximize its utility which is characterized by:

$$\max\{p_i y_i - L_i\} \qquad \text{(EQ. 4)}$$

[10] This is analogous to a production function that is made up of capital and labor, where the amount of labor chosen is endogenous.

where p_i represents the shadow value of the earmarks to university i. Substituting Eq 1 into Eq 4, and solving for the first order condition by setting marginal benefit equal to marginal cost, which is assumed to be 1, we obtain:

$$\beta p Z_i^{\gamma} L_i^{\beta-1} = \frac{\beta p y_i}{L_i} \qquad \text{(EQ. 5)}$$

which simplifies into:

$$L_i^* = (p_i \beta Z_i^{\gamma})^{\frac{1}{1-\beta}} \qquad \text{(EQ. 6)}$$

where L_i^* is the optimal level of lobbying for the university. This suggests that p_i is a valid instrument for L_i because it is correlated with L_i but unlikely to be correlated with the estimated error in Eq 3. However, because p_i is unobservable, we must use instruments that are correlated with p_i. We use the university's overhead rate.

All federal research grants to universities have indirect costs (commonly known as overhead) that are attached to the grant. Overhead rates, negotiated with government contracting authorities, are designed to pay for operating costs and infrastructure of the university for research, and act as discretionary income to university. Two characteristics of this variable make it an attractive instrument. First, because overhead is usually attached to earmarks, the higher the overhead rates, the higher the incentive of an organization to seek an earmark. Second, the higher the overhead rate, the more money the university has to engage in lobbying activities, and the more likely it is to engage in lobbying.[11] The instrument is likely to be positively correlated with lobbying, yet it is unlikely to be directly correlated with earmarks, because politicians are unlikely to know or care about the overhead rates for each post-secondary institution in the district. Thus, in the instrumental variables estimation, we estimate Eq 3 using overhead rates as the instrument for lobbying expenditures.

[11] Kevin B. Grier *et al.* (1994) show that companies tend to give more PAC contributions to politicians the higher are their profits and sales. We use a similar logic here with lobbying.

IV. DATA AND DESCRIPTIVE STATISTICS

A. DATA

The dependent variable is the amount of money Congress earmarks to a given academic institution (taken in logs).[12] We eliminate the value of the earmark attributable to the overhead in all estimated models.[13] A full description of all the variables can be found in the Appendix in Table A1.

The primary right-hand-side variable of interest is the amount of money an academic institution of higher learning spends on lobbying (taken in logs). We have obtained the 1997-1999 data from disclosures made by institutions in compliance with the Lobbying Disclosure Act of 1995, as described in Section II.

The third set of data employed is a set of characteristics for each university's Congressperson and Senator in each year from 1997 to 1999. We obtain this by mapping each institution into its congressional district based on nine-digit zip codes. Then, we include the Representative's ADA score, the two Senators' mean ADA score, dummy variables for appropriations committee assignments, and dummy variables for chairmen and ranking members. We also match the legislators with their alma maters, to test for any effect on the outcomes of earmarking (A. Abigail Payne and Aloysius Siow 2003).

A fourth set of data is a set of characteristics for each university's district. We include data on population density, age, education, employment, and income of individuals in the district. These data come from the Bureau of the Census, which maps the results of the Census into congressional districts. In employing these data, we study whether Congress targets earmark grants to universities in districts with specific characteristics.

We also include a set of characteristics for each university. To control for university quality, we employ the National Academy of Science (NAS) university rankings. Every 10 years, the NAS ranks 41 different departments at all research universities on their research quality. Each department is given an ordinal ranking relative to all other schools.[14] For all other

[12] Some earmarks are shared among more than one university. We allocate the earmark to the universities in an equal proportion. For the handful of shared earmarks for which we cannot identify all the institutions which share, we assume that there are 2.5 institutions sharing the earmark and allocate 2/5 of the earmark to the institution.
[13] If we are to use overhead rates as the instrument of interest in the two-stage model, we must not allow the overhead portion of the earmark to appear in the second-stage dependent variable.
[14] We use an ordinal ranking system for the university. The results are robust to a variety of different ranking systems, including the use a departmental ranking system.

university characteristics, we employ the Integrated Postsecondary Education Data System (IPEDS). Each year, the Department of Education certifies post-secondary institutions that are eligible for Title IV (subsidized federal financial aid) funds. We control for whether an institution is public, has a medical school, has a Ph.D. program, or has athletic aid scholarships. We also control for student enrollment. We use as the sample frame for our study all 2,382 domestic, non-profit, Carnegie Foundation recognized institutions for which there is complete IPEDS data.[15]

For our instrument, we obtained each university's overhead rate from the Division of Cost Allocation of the Office of Grants Management of the Department of Health of Human Services (HHS).[16] Universities usually sign global agreements to cover research funded by the federal government for a specified overhead rate for a given year. HHS collects all of these indirect cost contracts in the only comprehensive, centralized database of overhead rates of which we are aware. We obtained the contracts from HHS and have taken the relevant overhead rate in April of the year of interest. Table A2 in the Appendix shows that overhead rates range from 8 percent to 85 percent, with 22 percent as a mean.

Finally, we use state financial health variables for our first-stage regressions. It is possible that public universities seek assistance from the federal government when their state governments are financially constrained. If so, then as the financial health of the state becomes worse, these schools will increase federal lobbying. We use as a summary statistic of a state's financial health Moody's Bond ratings for general obligation debt in the state.

Table A2 presents descriptive statistics of our university-year observations. We bifurcate the table into all universities (n=7,146), and only those that lobby (n=423). The average annual earmark amount for all institutions is $230,290 with a maximum of $44.5 million for Loma Linda University. Annual lobbying expenditures for this group average $7,442, ranging from no lobbying to $760,000 by Boston University. For the sub-sample that lobby, the average earmark is $1.92 million and the average lobbying expenditure $125,726. These unconditional means lead many commentators to note that interest groups receive a lot for little lobbying effort.

[15] IPEDS includes more than 6,400 post-secondary institutions that qualify under Title IV. Many of these are vocational schools, such as Bjorn's Hairstyling Academy in Vallejo, CA, that are unlikely to be "at risk" for receiving earmarks. We eliminate such institutions by excluding those not covered by the Carnegie Foundation.

[16] Special thanks to Charles Seed and Otto Kent for assistance with the data. In most cases, we use the on-campus research rate for the main campus. For universities without such a rate, we used the closest category available.

B. LOBBYING AND EARMARKS

We begin by exploring the relationship between committee structure, lobbying and earmarks. Figure 2 presents a graph of earmarks on lobbying for all years, all institutions, with the representation of the institution indicated. If the institution is represented by a House Appropriations Committee member, the point receives an H; a Senate Appropriations Committee member, an S; both a House and Senate Appropriations Committee member, an HS; and no appropriations committee members, an O. A review of the figure shows that both earmarks and lobbying are distributed across a range, with a large concentration at smaller amounts. Those institutions that are high on the earmark-scale tend to have Senate and/or House appropriations committee membership. Those institutions that are low on the earmark scale (even if high on the lobbying scale) tend to be represented by non-appropriations committees members. This is suggestive of the importance of appropriations committee representation.

**********INSERT FIGURE 2 HERE **********

Table 1 shows the average lobbying expenditure and average earmark per university in the 1997-1999 time period by appropriations committee membership. The table shows the statistics for all universities, and also for the "lobbier" (lobbying expenditures > 0) sub-sample. In the full sample, the results show that the average university with no representation on the SAC spent $9,430 lobbying, and received an earmark of $144,693. The unconditional average return was over $15 for every $1 spent on lobbying. However, universities with representation on the SAC lobbied about 40 percent less than their non-represented counterparts, yet received just over two times the earmark, for an unconditional return on investment of almost $56 for every $1 spent on lobbying. A similar pattern can be found in the House. The return for universities without representation on the HAC is just over $25 for every dollar spent in lobbying. Their counterparts who happen to be in districts where the representative is on the Appropriations Committee, lobby almost the same, on average, and receive an earmark of almost $320,000 more, for a return of $66 for each dollars in earmark for every dollar spent on lobbying.

**********INSERT TABLE 1 ABOUT HERE **********

When we limit our analysis to institutions that actually lobby, the relative results are roughly the same. A lobbying university with SAC representation receives, on average, three times the return of a university that is not represented by a SAC member. In the lower chamber, lobbiers with HAC representation also receive three times the amount of earmarks, on average, than that of lobbying universities without HAC representation. This evidence is consistent with the hypothesis that committee membership is crucial in determining who receives federal educational earmarks.[17]

We also find that less than 6% of House districts witness lobbying by multiple universities. Thus, the data we provide conform to a setting where, in equilibrium, we have a single interest group lobbying a legislator. While this section provides evidence that supports a committee power story, and that universities may change their lobbying in response to representation in Congress on the appropriations committees, it is difficult to determine a causal relationship from this data alone. In order to do this, we conduct a statistical analysis.

V. ESTIMATION

A. FIRST STAGE RESULTS

The question of which universities lobby is an interesting question in its own right. Therefore, we discuss the first stage estimates. We begin by estimating the first stage ordinary least squares (OLS) model where Ln(Lobby) is the dependent variable. The results are provided in Table 2. Model 1 presents the OLS model, while Model 2 presents the same estimation with random effects to control for unobserved institutional effects.[18] All clustered or robust standard errors are presented below the coefficient estimates, with the statistical significance noted for two-tailed t-tests. Except as otherwise noted, we discuss here the results of Model 2.

**********INSERT TABLE 2 ABOUT HERE **********

[17] While we would like to look at switchers on and off the HAC and SAC, there are too few to permit statistical analysis.

[18] We present here only the results of the first stage estimation on Ln(Lobby). There are similar first stage regressions for the interactive lobbying variables as well. We do not use fixed effects because there are only three years of data per university.

The key instrument that is predicted to be correlated with lobbying but uncorrelated with the error term in Eq 3, ε_i, is the overhead rate. Note that the coefficient on Ln(Overhead Rate) is positive as expected, and measured with statistical precision at the 99% level of confidence. A 10% increase in the overhead rate (which has a mean of 22%) results in a 3.4% increase in lobbying. Said differently, moving the overhead rate from 22% to 24.2% results in 3.4% more lobbying. The F-statistic and R-squared in Model 1 are 10.93 and .30, respectively, suggesting that there is a reasonable fit of the first stage model for second stage estimation. [NB: REVIEWERS: We have included the remaining first stage results for the interactive variables in the REVIEWER ONLY APPENDIX.]

Universities with representation on the HAC and SAC lobby at higher levels than those without representation on these committees. HAC representation increases university lobbying by 112%, while SAC representation increases university lobbying by about 48%. Other political factors also affect lobbying. Having alumni on the HAC, alumni on the SAC, or alumni in the Senate increases lobbying 137%, 100% and 69%, respectively.

Representation is not the only factor that drives universities to lobby. Large universities, top ranked schools, schools that offer Ph.D. programs, and universities with medical schools are all more likely to lobby.[19] Some of the variables have a large impact on lobbying. For example, universities with Ph.D. programs and with medical schools spend 248% and 1,330% more on lobbying, respectively, than universities without these programs. We use these first stage results in some of the specifications in the next section to understand the returns to lobbying.

B. SECOND STAGE RESULTS

We now turn our efforts to estimating the production function for earmarks as shown in Eq 3. We present our results in Table 3. Models 3-6 are the OLS estimations of the model, while Models 7-8 use the first-stage results from the previous section in an instrumental variables estimation of the model. Again, the clustered or robust standard errors appear below the coefficient estimates, and the statistical significance is noted at the 99%, 95% and 90% levels.

[19] One reason for this may be that these top ranked schools may lobby for items other than earmarks. We address this in our robustness checks later in the paper. We also find a somewhat weak relationship between the state bond rating and the lobbying behavior of public universities (in our interactive term).

**********INSERT TABLE 3 ABOUT HERE **********

We begin with Model 3. This replicates the standard models that consider only the supply side of earmarks—the committee memberships of the university's representative. We find that HAC representation increases the amount of earmarks by 41%, while SAC representation increases the amount of earmarks by 34%. This effect of committee representation is similar to what other researchers have found (Payne 2003, Savage 1999, Steven J. Balla *et al* 2002).

Model 4 considers that universities may influence what legislators do by adding the lobbying variable to the conventional approach. Our results indicate that a 10% increase in lobbying results in a 2.2% increase in earmarks. The direct effects for representation by HAC or SAC members retain their size and significance in this model.

In Model 5, we suggest a more complex view of lobbying, in which the amount of earmark a university obtains is determined by both the university's lobby effort and the alignment of an interest group with a representative who can easily write the earmark into legislation (as conveyed by her committee memberships). We interact lobbying expenditures with the HAC and SAC variables. In this model, the direct effect of lobbying drops by about 20% compared to Model 4, and the direct effects of HAC and SAC representation drop slightly. Meanwhile the coefficient Ln(Lobby)*HAC is positive although not statistically significant, and the coefficient on Ln(Lobby)*SAC is positive and statistically significant. This conforms broadly to the idea that lobbying is more effective if the representative can easily deliver on policy requests.

If lobbying is exogenously determined, this would be a reasonable model. However, as noted in the theoretical model, lobbying effort is an endogenous cost that the university chooses (Grossman & Helpman 2001). Section III notes two methods to solve this problem, depending on the assumptions about the nature of the omitted variable bias. If we assume that the source of greater lobbying productivity is time-invariant, then a consistent estimate of β and γ are generated from a fixed- or random- effects model of Eq. 3.

Model 6 provides results of an OLS model with random effects. We find that all lobbying and committee variables have positive and statistically significant coefficients. If a university has no representation on the HAC or SAC, a 10% increase in lobbying results in a 1.8% increase in earmarks. If a university does have representation on the HAC or SAC, that same 10% increase

in lobbying results in a further 0.5% or 0.3% increase in earmarks, respectively. In addition, there are direct effects to having HAC and SAC representation. HAC (SAC) representation results in a 31% (51%) increase in earmarks in the absence of lobbying. In this specification, universities that are public, have medical schools or Ph.D. programs, or athletic aid receive more earmark funding. Some of these effects are large. For example, public universities receive 43% more earmark funding and universities with medical schools receive 420% more earmark funding than institutions without these characteristics. In addition, consistent with Payne (2003), we find that universities with alumni on the SAC receive more earmark funding.

Although the previous model generates consistent estimates if there is a time-invariant form of institution-specific lobbying productivity, in Models 7 and 8 we relax that restriction and allow for measurement error or for time-variant forms of endogeneity. In Model 7, we estimate the production function for earmarks using the instruments from first stage results from the previous section. In Model 8, we use both instrumental variables and random effects estimation. Because the coefficient estimates for Model 7 and Model 8 are similar, we discuss the results for Model 8 here.

The coefficient on the direct effect of lobbying drops slightly compared to Model 6; a 10% increase in lobbying now results in a 1.5% increase in academic earmarks. Although the coefficient is roughly the same as other models, it is no longer statistically significant in either IV specification. However, the lobbying interactive variables are much larger in magnitude and statistically significant in the random effects IV model. A 10% increase in lobbying by a university with HAC (SAC) representation generates an additional 2.8% (3.5%) increase in earmarks. Thus, universities that lobby and have representation gain additional earmarks. However, universities that lobby but do not have representation may receive earmarks for their efforts, but the statistical significance of this effect is not different from zero. The direct effect of HAC is statistically significant at the 90% level, and the direct effect of SAC is statistically significant at the 99% level. HAC (SAC) representation increases the average earmark by 16% (19%), meaning that HAC and SAC representation result in money being sent to the university in the absence of lobbying. Moreover, these results suggest that without controlling for lobbying (e.g. Model 3), researchers may overestimate the direct effects of HAC and SAC membership.

Top schools show no systematic difference in their ability to obtain earmarks relative to lower-ranked schools. As in previous specifications, universities that are public, have medical

schools, have Ph.D. programs, or offer athletic aid receive larger academic earmarks. The estimates indicate that public universities receive earmarks that are on average 47% more than private universities, universities that offer athletic aid receive earmarks that are 27% larger than those that do not, universities with medical schools receive earmarks that are 227% larger on average than those without, and universities with doctoral programs receive earmarks that are 131% larger than those without these same programs.

Although the statistical analysis to this point has been framed in elasticities, we can put more concrete numbers on the analysis. We do this by examining asking how a change in lobbying expenditures from the average level of lobbying affects the average level of earmarks for these lobbying universities. Based on the coefficients in Model 8, the marginal return attributable to one dollar of lobbying is $1.56 without representation on the HAC or SAC. When there is representation on HAC, the marginal return attributable to one dollar of lobbying is $4.52; with representation on the SAC, the marginal return attributable to one dollar of lobbying is $5.24.[20] These point estimates suggest that universities are, on average, leaving money on the table. However, when we establish a 95% confidence interval around the point estimates, we cannot reject the hypothesis that universities without representation have a marginal return of $1.00. Likewise, we cannot reject the hypothesis that universities with HAC representation are receiving a marginal benefit equal to $1.00. However, we can reject the hypothesis that universities with SAC representation are receiving a marginal benefit of $1.00. In fact, the lower bound of the 95% confidence interval suggests they receive a marginal benefit of approximately $2.00, meaning that this subset of universities is lobbying less than is optimal. We revisit the optimality condition in the next section.

C. ROBUSTNESS

In order to examine the robustness of these results we conducted a number of specification checks. The first question is whether the overhead rate is a good instrument. Section III demonstrated the theoretical justification for this instrument, but we wish to test this empirically as well. We conduct a Hausman specification test for instrumental variables and find

[20] This is calculated by adding the effect of the lobbying with the HAC or SAC interactive lobbying effect. The magnitude of $1.00 spent on lobbying adds $2.96 and $3.68 through the HAC and SAC interactive variables, respectively, to the direct lobbying effect of $1.56.

that the instrumental variables provide significantly better coefficient estimates than the non-intrumented specification.

Our second concern centers on measurement error. As was noted earlier in the paper, top universities may create problems for the analysis in many ways. First, some do not lobby solely for earmarks, but instead devote some portion of the lobbying effort to influencing science budgets and policy. Relatedly, some of the top schools are engaged in regulatory policy-making, and the lobbying expenditures associated with these efforts will appear in the lobbying data. Finally, top schools may be fundamentally different in nature than other schools. To address these concerns, we exclude all institutions that have any department ranked in the top 20 in its respective field. This represents 83 top caliber research institutions. We re-estimate Model 8 without these institutions. The results are presented in Table 4, Model 9. Eliminating these top research institutions raises the magnitudes of the interactive variable coefficients slightly, and slightly lowers the direct effect of HAC and SAC. The coefficients on Ln(Lobby) and HAC are not statistically significant. Alternatively, if we drop all 72 universities that received more than $50 million in total government research funding each year, the results are similar.

**********INSERT TABLE 4 ABOUT HERE **********

Third, it may be that community colleges are fundamentally different from all other institutions. Thus, in Model 10 we eliminate the community colleges and examine only 4-year colleges and post-graduate institutions. There is little change in the coefficients from previous models.[21]

A fourth concern is that outliers in our sample drive our results. Figure 2 suggests that Northwestern, Boston University, and Loma Linda are outliers in the lobbying-earmark space. We remove these outliers in Model 11, and find similar results.

A fifth concern is that although universities maintain well-staffed internal government relations departments, such internal lobbying efforts may be focused on administrative regulation and general policy issues. In this view, academic-earmark lobbying is handled by external "guns for hire." A correlation analysis reveals that top schools are more likely than lower-ranked

[21] There are four institutions where the governing board of the college system lobbies. We have allocated this lobbying into the individual institutions. If we drop these schools from the sample, it does not change the results.

schools to have internal lobbying departments ($\rho = .61$). In order to address the larger critique of mismeasurement in lobbying, in Model 12 we re-run our earlier base econometric models using only expenditures made by universities on external lobbyists. The coefficients are largely the same as those generated by our earlier models.

A final critique of the model is that in conducting this analysis, we miss the value of alumni networks in conducting "off-the-books" lobbying. We have a number of replies to this critique. First, the random effects estimator presented in Model 8 should control for unobserved institution-specific effects, including alumni networks. Second, to the extent that alumni networks are effective, they are most likely to be effective with members of congress who are alumni of an institution. We control for congressional alumni effects in our models and show there is a HAC and SAC alumni effect in some first stage estimations. Finally, to the extent that enrollment is correlated with size of alumni network, and NAS Top Ranked School is correlated with "quality" of alumni, we control for the alumni effect. When we re-run Model 8 with an interactive term of the two variables, this new interactive variable has no statistically significant effect on the amount of earmarks schools receive.

In all cases, these robustness checks generate coefficient estimates close to the estimates in Model 8. The coefficient on Ln(Lobby) is never statistically significant, while the coefficients on the lobbying interactive variables are almost always statistically significant. The direct effect of SAC is always statistically significant, while the direct effect of HAC is sometimes statistically significant.

VI. EXTENSION: ARE UNIVERSITIES LOBBYING EFFICIENTLY?

In the previous section, we analyzed the parameter estimates to determine if universities were lobbying efficiently. In this section, we further pursue this question by deriving a theoretical test for efficient lobbying from our model. Economists typically assume that actors are optimizers. However, there are reasons to expect that universities may not lobby efficiently for earmarks. First, within the academic community, there is no consensus as to whether legislated earmarks are a "legitimate" form of funding academic research. Indeed, members of the AAU are split on whether universities should seek and obtain earmarks or not. Second, the practice of lobbying for earmarks during 1997 to 1999 may not have yet reached an equilibrium.

Figure 2 shows a marked increase in earmarking during the 1990s. It is possible that during our sample period, universities are still learning about how to most effectively lobby for earmarks.[22] Both of the above reasons suggest that universities might underinvest in lobbying.

To explore whether universities are setting the marginal benefit of lobbying equal to the marginal cost on average, we return to Eq 6. This represents the optimal level of lobbying. Taking logs, we obtain:

$$\ln L_i^* = \frac{1}{1-\beta}\ln p_i + \frac{1}{1-\beta}\ln \beta + \frac{\gamma}{1-\beta}\ln Z_i + \varepsilon_i \qquad \text{(EQ. 7)}$$

Unfortunately, p is unobservable. However, we know that overhead rates are a fixed and known proportion of p. Hence we assume:

$$p_i = O_i + \delta_i \qquad \text{(EQ. 8)}$$

The error term, δ_i, encompasses other factors, where the items in the error term are unlikely to be correlated with overhead rates, which are negotiated independently with HHS. Substituting Eq 8 into Eq 7, we obtain:

$$\ln L_i^* = \frac{1}{1-\beta}\ln O_i + \frac{1}{1-\beta}\ln \beta + \frac{\gamma}{1-\beta}\ln Z_i + \omega_i \qquad \text{(EQ. 9)}$$

where $\omega = \varepsilon_i + \frac{1}{1-\beta}\ln \delta_i$ and $E(\omega) = 0$. Taking the expectation of Eq 8 at the optimal levels of lobbying yields:

$$E\left(\ln L_i^* - \frac{1}{1-\beta}\ln O_i + \frac{1}{1-\beta}\ln \beta + \frac{\gamma}{1-\beta}\ln Z_i + \omega_i \right) = 0 \qquad \text{(EQ. 10)}$$

This can be tested empirically. We know the values of L, O, and Z, and from Table 2, we have estimated the values of β and γ. So for each observation, we can calculate the value of Eq 10, and then statistically test if Eq 10 holds.

[22] The fact that university lobbying expenditures during these years have increased far more rapidly than aggregate

We estimate Eq 10 for each of our 7,146 observations and find the mean of the variable is 0.0268 with a standard error of 0.0321. We then estimate a t-statistic to see if we can reject that is equal to zero. We find we cannot reject that this is equal to zero at the 95% level of confidence. The confidence interval is –0.0375 to 0.0911. Thus, we now have a second test that suggests we cannot reject the hypothesis that universities are, on average, lobbying efficiently under the assumptions of the theoretical model. Moreover, it suggests that Eq 6, which generates our instruments from the first order condition, is methodologically valid.

VII. CONCLUSIONS

Although scholars have made great progress during the last 65 years in analyzing the nature of interest group participation in government, measuring the returns to lobbying investments has been elusive. This paper has conducted a statistical analysis to measure the returns to lobbying by examining one aspect of interest group participation: lobbying by universities for educational earmarks.

Our results suggest an intriguing pattern in lobbying and earmarks. The amount of educational earmark funding an institution receives is determined by three factors: the lobbying efforts by the university, the political representation of the university, and the characteristics of the university. Universities that are fortunate enough to be located in districts with elected representatives on the HAC and SAC are likely to recoup significant returns on their lobbying efforts. The returns to lobbying for the average well-situated university, controlling for other factors is relatively high. On the other hand, without representation on these two committees, the return to lobbying is significantly less. Although the point estimate for the return to lobbying for an average university without representation on the HAC or SAC is consistently positive and of relatively of constant magnitude, it is not statistically different from zero or one in many specifications. These results are broadly consistent with the predictions of Grossman & Helpman (2001) from the informational lobbying literature with endogenous costs. They are also consistent with the predictions of Helpman & Persson (2001) from the campaign finance literature on agenda-setters. However, our results indicate that, contrary to the predictions of these models, universities with HAC or SAC representation lobby *more* than their unrepresented counterparts. Thus, although we find support for the overall Grossman-Helpman and Helpman-

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lobbying expenditures may indicate that university lobbying has not yet reached an equilibrium.

Persson prediction that returns to lobbying are increasing in the convergence of interests between group and legislator, the specific mechanism that these models propose – lower lobbying expenditures – does not appear to operate quite as predicted. This suggests that there is more work to be done on this subject, both theoretically and empirically.

This study also addresses the literature on committees. We find that HAC and SAC members send earmarks to their districts *in the absence of lobbying*, although the effects of the HAC members are less robust that those of their Senate counterparts. Lobbying serves to increment the amount HAC and SAC members send to their constituents. This is consistent with a distributive story of committees. Taken together with lobbying, the results suggest that theories that combine both the distributional and informational models may be useful routes for research.

This study also has implications for the funding of academic research. The U.S. higher education system is widely seen as key engine of U.S. economic growth, both through the training of students and through research discovery (David C. Mowery & Rosenberg 1993). Federal funding of academic research has been a central component of the United States university system for decades, providing roughly 60 percent of all university research funds since World War II (Nelson & Rosenberg 1994). This paper does not assess whether earmarked academic funding or peer-reviewed competitive funding is a preferable distribution system; however, with 10 percent of the federal budget for university research currently distributed through earmarking, it would seem that academic administrators and politicians alike should be concerned about how this mechanism might change the nature of research at U.S. universities (Payne & Siow 2003).

Finally, although this study focused on lobbying for academic earmarks, we believe it is generalizable to a whole class of interest group rent-seeking, especially when federal spending is involved. In these cases, politicians are likely to be exposed to re-election pressures, and sending targeted money to one's own district is likely to enhance the probability of re-election (Steven D. Levitt and Snyder 1997). In addition, unlike non-profit universities, most groups have multiple political instruments available to them: lobbying, PAC contributions, grassroots organizing, political advertisements, and the like. To the extent that groups can choose the most effective combination of instruments (where there may be complementarities between instruments) to achieve their goals, they may actually see higher returns to lobbying and political investment than do universities, which are largely constrained to only lobbying.

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Figure 1a: Total Federal Funding and Earmark Funding for Universities and Colleges

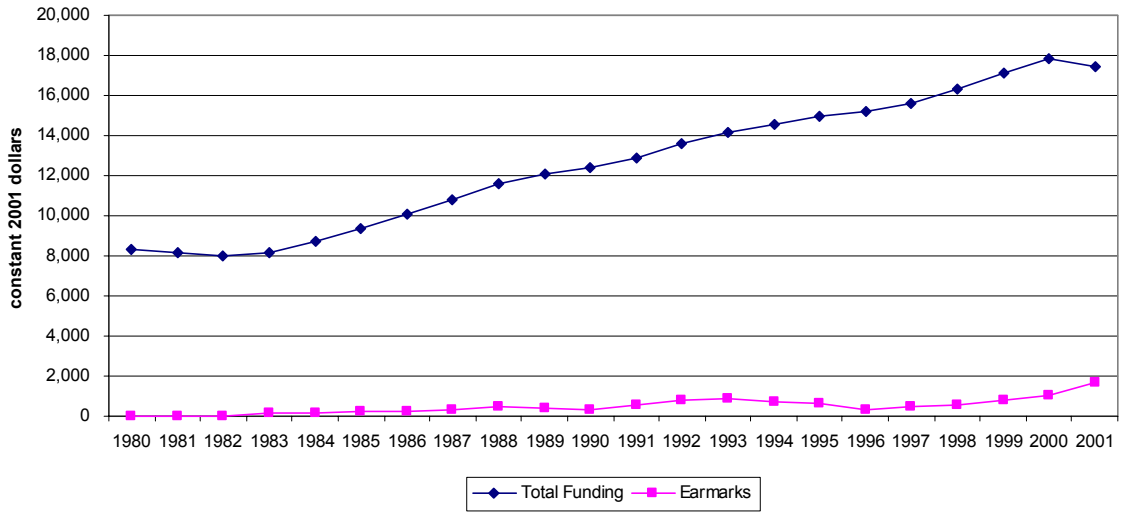
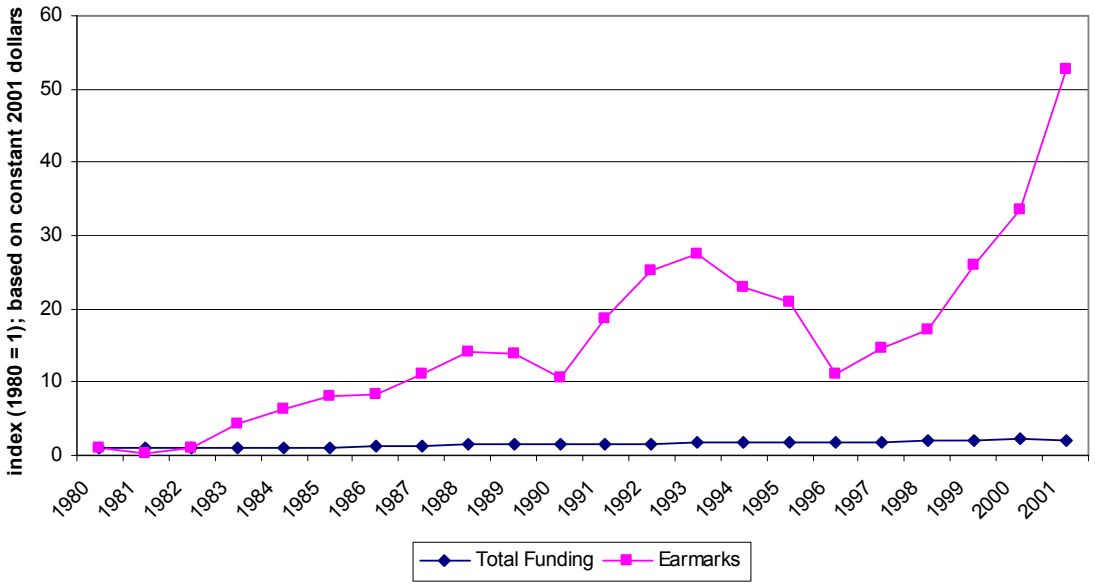
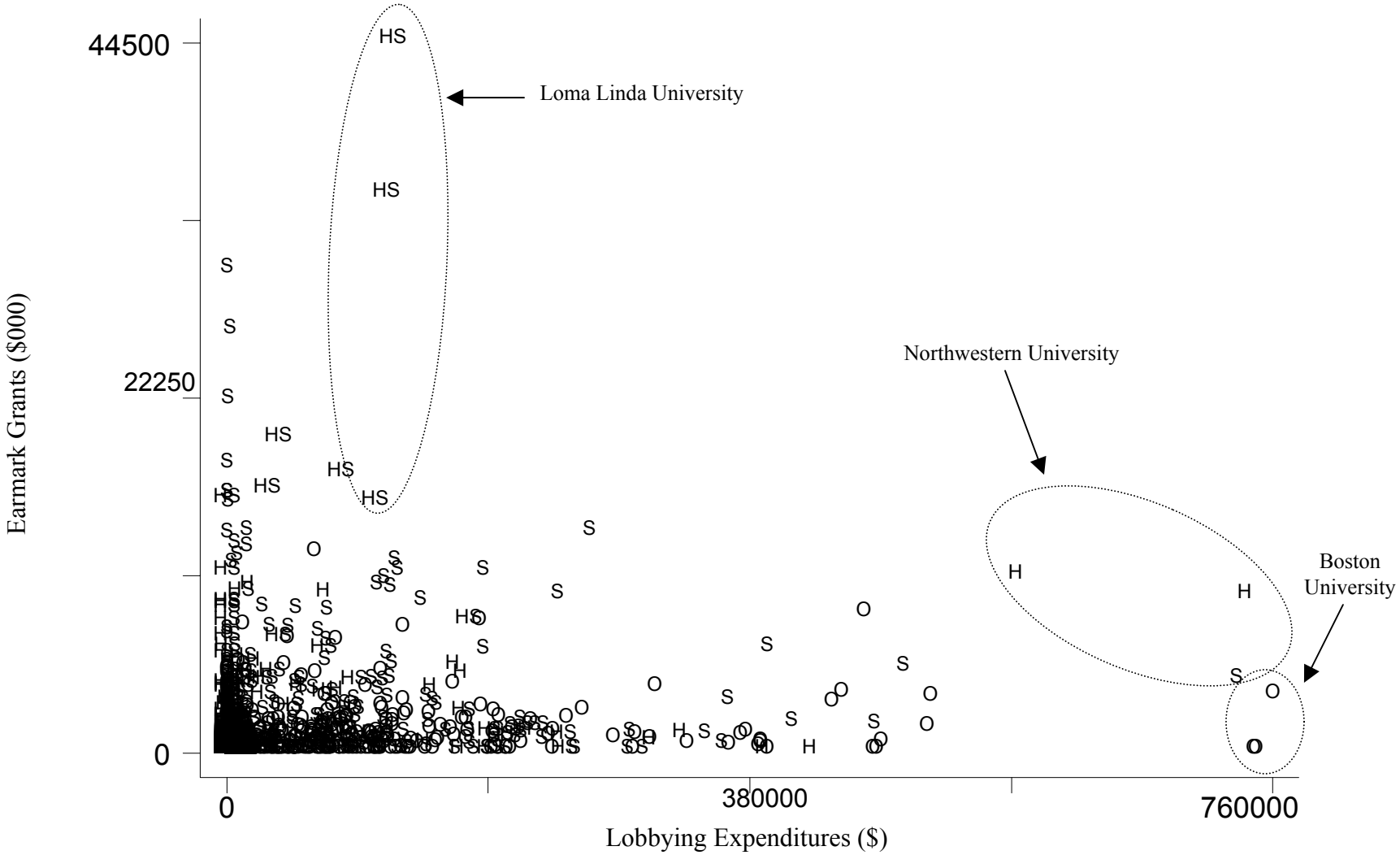


Figure 1b: Total Federal Funding and Earmark Funding for Universities and Colleges, Indexed



[Source: Total funding - NSF, National Patterns of R&D Resources;
Earmarks - Savage (1999); Chronicle of Higher Education]

Figure 2: Distribution of Earmarks and Lobbying by Committee



O = no HAC or SAC representation; H = HAC representation; S = SAC representation; HS = HAC and SAC representation

TABLE 1: MEANS IN LOBBYING AND EARMARKS

FOR ALL UNIVERSITIES IN DISTRICTS WITH AND WITHOUT APPROPRIATIONS COMMITTEE MEMBERS

	Average Lobbying Expenditures	Average Earmark
No Senate Appropriations Committee Member n=3442	$9,430	$144,693
Senate Appropriations Committee Member n=3704	$5,595	$313,686
No House Appropriations Committee Member n=6131	$7,414	$187,331
House Appropriations Committee Member n=1015	$7,612	$503,839

FOR LOBBYING UNIVERSITIES IN DISTRICTS WITH AND WITHOUT APPROPRIATIONS COMMITTEE MEMBERS

	Average Lobbying Expenditures	Average Earmark
No Senate Appropriations Committee Member n=247	$131,410	$1,157,920
Senate Appropriations Committee Member n=176	$117,750	$2,987,555
No House Appropriations Committee Member n=363	$125,225	$1,477,928
House Appropriations Committee Member n=60	$128,765	$4,588,803

TABLE 2: FIRST STAGE RESULTS: DETERMINANTS OF LOBBYING
Dependent variable: Ln of Total Lobbying Expenditures

Variable	**Model 1 OLS**	**Model 2 OLS with Random Effects**
House Appropriations Committee (HAC)	0.216	0.753***
	(0.328)	(0.288)
Senate Appropriations Committee (SAC)	0.177	0.395*
	(0.278)	(0.204)
Ln(Overhead Rate)	0.230**	0.342***
	(0.093)	(0.070)
Ln(Overhead Rate)*SAC	-0.125	-0.185**
	(0.123)	(0.075)
Ln(Overhead Rate)*HAC	-0.089	-0.348***
	(0.148)	(0.101)
NAS Top Ranked School	0.106**	0.117***
	(0.050)	(0.021)
Rural Population	-0.395	-0.535*
	(0.338)	(0.298)
Ages 18-30 Population	1.143	1.359
	(2.701)	(2.219)
College Degree Population (%)	-1.907	-3.005
	(2.987)	(2.428)
Employment in Educational Sector	3.785	5.772
	(7.779)	(6.611)
Median Income	-0.017	-0.012
	(0.011)	(0.010)
Degree PhD	1.501***	1.247***
	(0.259)	(0.139)
Public University	-2.872**	-1.269
	(1.357)	(1.018)
Medical School	2.454***	2.660***
	(0.632)	(0.258)
Athletic Aid	0.07	0.049
	(0.078)	(0.079)
House Chair or Ranking Member	-0.298**	-0.211*
	(0.143)	(0.110)
Senate Chair or Ranking Member	0.027	-0.039
	(0.078)	(0.052)
Representative ADA Score	0.0001	0.0001
	(0.001)	(0.001)

Senate ADA Score	0.002 (0.001)	0.001 (0.001)
Alunmi on HAC	1.161* (0.608)	0.862*** (0.257)
Alumni in House	-0.099 (0.245)	-0.046 (0.140)
Alumni on SAC	0.622 (1.058)	0.691* (0.398)
Alumni in Senate	0.736 (0.621)	0.525** (0.253)
LnEnrollment	0.300*** (0.054)	0.313*** (0.055)
1997	-0.179*** (0.042)	-0.191*** (0.034)
1998	-0.121*** (0.035)	-0.133*** (0.033)
Number of Universities in District	-0.002 (0.015)	0.006 (0.016)
Number of Universities in State	-0.002** (0.001)	-0.002** (0.001)
State Bond Rating	-0.270** (0.121)	-0.146 (0.089)
State Bond Rating*Public	0.269* (0.144)	0.09 (0.111)
Constant	0.582 (1.184)	-0.944 (0.998)
R^2	0.298	.
F-Statistic	10.933	.
n	7,146	7,146

All standard errors are clustered or robust.
All significance reported for two-tailed t-statistics.
*** 99% level of significance **95% level of significance *90 level of signficance

TABLE 3: SECOND STAGE RESULTS: DETERMINANTS OF ACADEMIC EARMARKS
Dependent Variable: Ln of Academic Earmarks Received by Institution (Excluding Overhead)

Variable	Model 3 OLS	Model 4 OLS	Model 5 OLS	Model 6 OLS Random Effects	Model 7 IV	Model 8 IV Random Effects
LnLobby		0.219***	0.173***	0.177***	0.131	0.149
		(0.023)	(0.028)	(0.014)	(0.184)	(0.153)
LnLobby*HAC			0.056	0.053**	0.259	0.282***
			(0.052)	(0.024)	(0.178)	(0.100)
LnLobby*SAC			0.095**	0.031*	0.356***	0.351***
			(0.038)	(0.018)	(0.115)	(0.074)
House Appropriations Committee (HAC)	0.346***	0.347***	0.309***	0.269***	0.172*	0.150*
	(0.100)	(0.096)	(0.093)	(0.075)	(0.099)	(0.093)
Senate Appropriations Committee (SAC)	0.291***	0.328***	0.271***	0.411***	0.128**	0.172***
	(0.060)	(0.056)	(0.051)	(0.054)	(0.055)	(0.064)
NAS Top Ranked School	0.003	-0.019	-0.018	-0.015	-0.024	-0.026
	(0.029)	(0.027)	(0.028)	(0.014)	(0.038)	(0.021)
Rural Population	-0.182	-0.081	-0.055	-0.129	0.059	0.054
	(0.220)	(0.207)	(0.207)	(0.199)	(0.271)	(0.191)
Ages 18-30 Population	-2.128	-2.171	-1.988	-2.176	-1.450	-1.477
	(1.683)	(1.606)	(1.558)	(1.449)	(1.581)	(1.238)
College Degree Population (%)	-1.470	-1.092	-1.160	-1.753	-1.245	-1.442
	(1.769)	(1.639)	(1.652)	(1.634)	(1.892)	(1.426)
Employment in Educational Sector	3.701	2.018	2.519	3.949	3.327	3.779
	(4.696)	(4.428)	(4.462)	(4.317)	(5.280)	(3.861)
Median Income	-0.006	-0.002	-0.001	0.000	0.003	0.004
	(0.008)	(0.007)	(0.007)	(0.007)	(0.009)	(0.007)
Degree PhD	1.470***	1.118***	1.095***	1.085***	0.883**	0.841***
	(0.177)	(0.165)	(0.164)	(0.101)	(0.379)	(0.285)
Public University	0.275***	0.375***	0.366***	0.352***	0.382***	0.388***
	(0.078)	(0.074)	(0.073)	(0.076)	(0.100)	(0.099)
Medical School	2.104***	1.566***	1.539***	1.650***	1.226*	1.186***
	(0.371)	(0.369)	(0.366)	(0.176)	(0.664)	(0.450)
Athletic Aid	0.274***	0.255***	0.254***	0.255***	0.244***	0.242***
	(0.060)	(0.057)	(0.057)	(0.060)	(0.057)	(0.055)
House Chair or Ranking Member	0.080	0.144	0.154	0.062	0.209	0.181*
	(0.109)	(0.101)	(0.102)	(0.094)	(0.131)	(0.101)
Senate Chair or Ranking Member	0.037	0.025	0.028	0.029	0.030	0.028
	(0.058)	(0.055)	(0.055)	(0.049)	(0.057)	(0.048)
Representative ADA Score	-0.001	-0.001	-0.001	-0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Senate ADA Score	0.002*	0.002	0.002	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Alunmi on HAC	0.070	-0.185	-0.146	-0.116	-0.141	-0.139
	(0.360)	(0.339)	(0.338)	(0.199)	(0.416)	(0.248)
Alumni in House	0.108	0.118	0.113	0.169	0.098	0.111
	(0.163)	(0.157)	(0.157)	(0.105)	(0.166)	(0.093)

Alumni on SAC	1.265**	1.140*	0.872	0.898***	0.048	-0.004
	(0.592)	(0.597)	(0.600)	(0.308)	(0.749)	(0.371)
Alumni in Senate	0.382	0.219	0.299	0.221	0.454	0.420**
	(0.369)	(0.365)	(0.358)	(0.200)	(0.390)	(0.209)
LnEnrollment	0.110***	0.038	0.044	0.052	0.033	0.028
	(0.033)	(0.031)	(0.031)	(0.037)	(0.065)	(0.062)
1997	-0.516***	-0.482***	-0.478***	-0.490***	-0.455***	-0.454***
	(0.042)	(0.042)	(0.042)	(0.038)	(0.058)	(0.053)
1998	-0.222***	-0.197***	-0.192***	-0.203***	-0.171***	-0.171***
	(0.040)	(0.040)	(0.040)	(0.038)	(0.051)	(0.050)
Number of Universities in District	0.020	0.021*	0.019	0.021**	0.014	0.014
	(0.012)	(0.012)	(0.012)	(0.011)	(0.012)	(0.009)
Number of Universities in State	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.521	-0.194	-0.273	-0.359	-0.372	-0.375
	(0.439)	(0.427)	(0.416)	(0.422)	(0.465)	(0.427)
R^2	0.265	0.320	0.324	.	0.279	.
F-Statistic	26.184	31.954	30.942	.	22.022	.
n	7,146	7,146	7,146	7,146	7,146	7,146

TABLE 4: ROBUSTNESS
Dependent Variable: Ln of Academic Earmarks Received by Institution (Excluding Overhead)

	Model 9 **No Top Schools**	**Model 10** **No Community Colleges**	**Model 11** **No BU, NWU, and Loma Linda**	**Model 12** **External Lobbying Only**
Ln(Lobby)	0.161	0.190	0.185	0.207
	(0.142)	(0.180)	(0.166)	(0.148)
Ln(Lobby) * HAC	0.410***	0.313**	0.319***	0.325***
	(0.151)	(0.137)	(0.125)	(0.121)
Ln(Lobby) * SAC	0.405***	0.293***	0.360***	0.417***
	(0.095)	(0.095)	(0.083)	(0.089)
HAC	0.117	0.131	0.127	0.164*
	(0.083)	(0.192)	(0.101)	(0.093)
SAC	0.147***	0.205*	0.192***	0.157**
	(0.060)	(0.118)	(0.067)	0.066
n	6,897	4,007	7,137	7,146

All regressions are instrumental variables, random effects models, and include all the variables in Model 8.
All standard errors are clustered or robust.
All significance reported for two-tailed t-statistics.
*** 99% level of significance **95% level of significance *90 level of signficance

APPENDIX TABLE A1: DATA DEFINITIONS AND SOURCE

Variable	Definition (Source)
Earmarks	Total dollar appropriation of all academic earmarks to institution in thousands of dollars. In the regression analysis, the overhead dollars have been removed from the earmark so that the dependent variable is the dollars of earmark minus the dollars of overhead. (Chronicle of Higher Education) -- taken as logs in all specifications.
Lobbying	Total lobbying expenditures on behalf on institutions disclosed (Center for Responsive Politics, Clerk of the House) -- taken as log in all specifications.
House Appropriations Committee (HAC)	Dummy variable =1 if institution is represented by a legislator on the House Appropriations Committee and =0 otherwise
Senate Appropriations Committee (SAC)	Dummy variable =1 if institution is represented by a legislator on the Senate Appropriations Committee and =0 otherwise
House Chair or Ranking Member	Dummy variable =1 if institution is represented by a legislator who is a chair or ranking member of a House committee and =0 otherwise
Senate Chair or Ranking Member	Dummy variable =1 if institution is represented by a legislator who is a chair or ranking member of a Senate committee and =0 otherwise
Representative ADA Score	The ADA score of the House member who represents the institution's district
Senator ADA Score	The ADA score of the Senate member who represents the institution's district
Alumni on HAC	Dummy variable = 1 if institution has an alumus/a on the House Appropriations Committee, and = 0 otherwise
Alumni on SAC	Dummy variable = 1 if institution has an alumus/a on the Senate Appropriations Committee, and = 0 otherwise
Alumni in House	Dummy variable = 1 if institution has an alumus/a in the House of Representatives, and = 0 otherwise
Alumni in Senate	Dummy variable = 1 if institution has an alumus/a in the Senate, and = 0 otherwise
NAS Top Ranked School	The number of departments at the institution that are ranked in the top 20 by the National Academy of Science's 1995 rankings (National Academy of Science)
Degree PhD	Dummy variable =1 if the institution awards a Ph.D., and =0 otherwise (IPEDS)
Private University	Dummy variable = 1 if the institution is a private, =0 otherwise (IPEDS)
Medical School	Dummy variable =1 if institution has a medical school, and =0 otherwise (IPEDS)
Athletic Aid	Dummy variable =1 if institution offers athletic scholarships to students, and =0 otherwise (IPEDS)
Enrollment	Total student enrollment (IPEDS) -- taken as log.
Rural Population (%)	% Rural Population in House District (Census)
Ages 18-30 Population (%)	% Population ages 18-30 in House District (Census)
College Degree Population (%)	% Population with College Degree in House District (Census)
Employment in Education Sector (%)	% of Workers employed in Education Sector in House District (Census)
Median Income	Median Income in House District (Census)
Number of Universities in District	Count of the number of universities in the congressional district
Number of Universities in State	Count of the number of universities in the state
State Bond Rating	The Moody's Bond Rating for the general obligation debt of the state. AAA = 10, AA = 9, A = 8, etc. For those few states without general obligation debt, a AA rating was assigned. (Moody's)
Overhead Rate	The federally negotiated on-campus overhead rate for universities in April (HHS)

APPENDIX TABLE A2: DESCRIPTIVE STATISTICS

	All Universities, All Years (n = 7,146)				Lobbying Universities, All Years (n = 423)			
Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Total Earmarks (in $000)	232.29	1,411.40	0.00	44,500.00	1,919.19	3,937.38	0.00	44,500.00
Earmarks without Overhead (in $000)	164.91	960.27	0.55	27,134.76	1,318.45	2,571.93	0.57	27,134.76
Lobbying ($)	7,442.27	42,224.08	0.00	760,000.00	125,726.00	123,611.90	20,000.00	760,000.00
House Appropriations Committee (HAC)	0.14	0.35	0.00	1.00	0.14	0.35	0.00	1.00
Senate Appropriations Committee (SAC)	0.52	0.50	0.00	1.00	0.42	0.49	0.00	1.00
House Chair or Ranking Member	0.08	0.27	0.00	1.00	0.04	0.19	0.00	1.00
Senate Chair or Ranking Member	0.51	0.50	0.00	1.00	0.51	0.50	0.00	1.00
Representative ADA Score	46.53	39.08	0.00	100.00	58.60	38.58	0.00	100.00
Senator ADA Score	47.27	33.88	0.00	100.00	50.93	31.78	0.00	100.00
Alumni on HAC	0.03	0.16	0.00	1.00	0.18	0.38	0.00	1.00
Alumni on SAC	0.12	0.32	0.00	1.00	0.47	0.50	0.00	1.00
Alumni in House	0.01	0.12	0.00	1.00	0.11	0.32	0.00	1.00
Alumni in Senate	0.03	0.18	0.00	1.00	0.24	0.43	0.00	1.00
NAS Top Ranked School	0.31	2.43	0.00	39.00	3.08	7.42	0.00	39.00
Degree PhD	0.15	0.36	0.00	1.00	0.78	0.41	0.00	1.00
Private University	0.59	0.49	0.00	1.00	0.58	0.49	0.00	1.00
Medical School	0.04	0.20	0.00	1.00	0.37	0.48	0.00	1.00
Athletic Aid	0.50	0.50	0.00	1.00	0.78	0.41	0.00	1.00
Enrollment	5,489.00	6,678.00	17.00	51,445.00	16,309.00	11,644.00	402.00	51,445.00
Rural Population (%)	0.31	0.22	0.00	0.87	0.22	0.22	0.00	0.72
Ages 18-30 Population (%)	0.19	0.02	0.13	0.33	0.20	0.03	0.14	0.33
College Degree Population (%)	0.08	0.03	0.02	0.22	0.08	0.03	0.03	0.17
Employment in Education Sector (%)	0.04	0.01	0.02	0.07	0.04	0.01	0.02	0.07
Median Income	29.19	7.66	15.06	57.22	28.64	6.88	15.26	56.06
Number of Universities in District	7.33	3.52	1.00	20.00	6.65	3.40	2.00	20.00
Number of Universities in State	83.20	54.46	6.00	202.00	80.32	50.91	7.00	202.00
State Bond Rating	9.08	0.58	8.00	10.00	8.98	0.55	8.00	10.00
Overhead Rate (%)	22.13	20.95	8.00	85.00	43.73	17.50	8.00	75.00

REVIEWER APPENDIX (FOR REVIEWERS ONLY)

OLS Random Effects Models for All First Stage Instrumental Variable Specification

	Model R1 Dep. Variable: Ln(Lobby)	**Model R2** Dep. Variable: Ln(Lobby)*HAC	**Model R3** Dep. Variable: Ln(Lobby)*SAC
House Appropriations Committee (HAC)	0.753***	-1.396***	0.484**
	(0.288)	(0.130)	(0.209)
Senate Appropriations Committee (SAC)	0.395*	0.085	-1.582***
	(0.204)	(0.092)	(0.148)
Ln(Overhead Rate)	0.342***	-0.090***	-0.297***
	(0.070)	(0.028)	(0.049)
Ln(Overhead Rate)*SAC	-0.185**	-0.045	0.812***
	(0.075)	(0.033)	(0.054)
Ln(Overhead Rate)*HAC	-0.348***	0.749***	-0.227***
	(0.101)	(0.046)	(0.073)
NAS Top Ranked School	0.117***	0.015*	0.036**
	(0.021)	(0.008)	(0.014)
Rural Population	-0.535*	-0.046	-0.510**
	(0.298)	(0.116)	(0.203)
Ages 18-30 Population	1.359	-0.895	-0.427
	(2.219)	(0.860)	(1.513)
College Degree Population (%)	-3.005	1.575*	-1.215
	(2.428)	(0.935)	(1.652)
Employment in Educational Sector	5.772	-3.088	-1.804
	(6.611)	(2.569)	(4.513)
Median Income	-0.012	-0.011***	-0.010
	(0.010)	(0.004)	(0.007)
Degree PhD	1.247***	0.164***	0.734***
	(0.139)	(0.057)	(0.097)
Public University	-1.269	-0.022	-0.242
	(1.018)	(0.456)	(0.736)
Medical School	2.660***	0.576***	1.293***
	(0.258)	(0.100)	(0.176)
Athletic Aid	0.049	-0.007	0.023
	(0.079)	(0.033)	(0.056)
House Chair or Ranking Member	-0.211*	0.000	-0.154*
	(0.110)	(0.051)	(0.081)
Senate Chair or Ranking Member	-0.039	0.005	0.015
	(0.052)	(0.026)	(0.039)
Representative ADA Score	0.001	0.000	-0.001
	(0.001)	0.000	(0.001)

Senate ADA Score	0.001	0.001***	0.000
	(0.001)	(0.001)	(0.001)
Alunmi on HAC	0.862***	-0.144	-0.028
	(0.257)	(0.111)	(0.183)
Alumni in House	-0.046	0.143**	0.013
	(0.140)	(0.059)	(0.099)
Alumni on SAC	0.691*	0.899***	1.786***
	(0.398)	(0.170)	(0.283)
Alumni in Senate	0.525**	0.081	-0.305*
	(0.253)	(0.110)	(0.181)
LnEnrollment	0.313***	0.034	0.099***
	(0.055)	(0.022)	(0.038)
1997	-0.191***	-0.013	-0.114***
	(0.034)	(0.019)	(0.027)
1998	-0.133***	0.005	-0.104***
	(0.033)	(0.019)	(0.026)
Number of Universities in District	0.006	0.002	0.022**
	(0.016)	(0.006)	(0.011)
Number of Universities in State	-0.002**	0.000	-0.001
	(0.001)	0.000	(0.001)
State Bond Rating	-0.146	-0.018	-0.067
	(0.089)	(0.041)	(0.065)
State Bond Rating*Public	0.090	-0.003	0.014
	(0.111)	(0.050)	(0.080)
Constant	-0.944	0.508	1.158
	(0.998)	(0.427)	(0.708)
R^2	.	.	.
F-Statistic	.	.	.
n	7,146	7,146	7,146

All standard errors are clustered or robust.
All significance reported for two-tailed t-statistics.
*** 99% level of significance **95% level of significance *90 level of signficance