Firm Lobbying for Private vs. Collective Rents[1]

R. Kenneth Godwin[2]
Marshall Rauch Distinguished Professor
Department of Political Science
University of North Carolina-Charlotte
godwink@email.uncc.edu

Edward J. López
Assistant Professor
Department of Economics
University of North Texas
elopez@unt.edu

Barry J. Seldon
Professor of Economics and Political Economy
School of Social Sciences
The University of Texas at Dallas
seldon@utdallas.edu

October 25, 2002

Abstract

How do firms allocate their lobbying resources among their political goals? We approach this question using a game-theoretic model that integrates three concepts from the lobbying literature: the distinction between a private and a collective rent, the level of competition over the rent, and the impact of political institutions over the availability of the rent. The model demonstrates how rent competition and political institutions affect optimal lobbying expenditures and net expected returns (profits), for both private and collective lobbying. We demonstrate our findings through a series of simulations, which suggest first that firms spend more lobbying for private rents, and second that institutions and competition determine when firms are better off lobbying for private goods rather than forming coalitions to lobby for collective goods. The model's predictions differ from much of the existing literature on lobbying and suggest that new directions are needed in the empirical studies of corporate lobbies and their influence.

[1] An earlier version of this paper was presented at the Annual Meeting of the American Political Science Association, Boston MA, September 3-6, 1998. This version was presented at the Conference of the Southern Political Science Association, Savannah GA, November 7-9, 2002. The authors thank session participants as well as Edward J. Harpham, Rebecca B. Morton, and Suzanne Robbins for comments and suggestions.

[2] Authors' names appear in alphabetical order, their contributions to the paper are equal.

1 Introduction

How do firms select their political objectives, and how do they decide to allocate resources among them? When do firms join lobbying coalitions versus work alone to pursue their political goals? Despite the centrality of these questions to understanding America's largest lobbying sector, prior research has failed to explore their implications in a single framework. We present a game-theoretic model that addresses these questions by integrating three interrelated concepts: 1) the distinction between a private rent (one that is firm specific) and a collective rent (one that benefits more than one firm); 2) the degree of competition over a desired rent; and 3) the impact of political institutions on the availability of the desired rent.[3] The model demonstrates how competition and institutions affect equilibrium lobbying expenditures and expected net returns in both private and collective lobbying. From this, we are able to predict when firms are better off lobbying for private versus collective rents, and how these predictions change under increased competition. Our predictions differ—in some ways fundamentally—from common views of lobbying, and they offer new insight into the nature and influence of corporate lobbying in America.

We build on insights from a wide range of previous work. Olson (1965) argued that lobbying would be greatly affected by whether the desired benefit is private or collective. Lowi (1969) and Wilson (1973) demonstrated that the degree of conflict between potential winners and losers influences strongly the willingness of public officials to supply a rent. Denzau and Munger (1986) showed that a legislator's cost of supplying a rent affects her interactions with interest groups. Gray and Lowery (1998) showed that coalition behavior is positively related to conflict and to collective goods. And the behavior-shaping role of institutions has been a dominant theme in the positive analysis of political processes (Ostrom 1991; Persson and Tabellini 2000).

The subsequent literature built some of these seminal insights into formal models, but an integrated approach is lacking. One class of theoretical models assumes that rent-seekers lobby only privately (e.g., Tullock 1980; Ferejohn and Noll 1985; Snyder l992).[4] Other models assume

[3] Our inquiry is directed at rent-seekers who lobby a policymaker with the authority to create rents. We are specifically interested in corporate lobbying in the United States. As such, our study is narrower in scope than general models of collective behavior such as Lohmann (1998) or Esteban and Ray (2001), but more general than most previous models of corporate lobbying. Our analytics are generally extendable to lobbying by any organized interests in any analogous environment.

[4] A large part of the literature on private good lobbying has focused on Tullock's (1980) "efficient rent seeking" paradox, which involves a lobbying equilibrium in which expenditures exceed the value of the

only collective lobbying (e.g., Nitzan 1991; Grier, Munger and Roberts 1994). Competition has been modeled by varying the number of actual or potential firms in the rent-seeking contest (e.g., Posner 1975; Rogerson 1982; Sun and Ng 1999). And institutions, while incorporated into models of other political processes (e.g., Snyder and Weingast 2000), have been generally absent in previous models of rent-seeking contests.

We begin by noting three interrelated characteristics of corporate lobbying. First, profit-maximizing firms must choose between lobbying privately or collectively. When a firm lobbies alone, there is no collective action problem, but when firms form coalitions then standard public good problems emerge. Second, many formal rules and implicit norms (i.e., institutions) structure the interactions among policymakers and lobbyists. Committee assignments, seniority, and electoral considerations affect the ability and willingness of legislators to supply rents. Formal oversight by Congress and the White House, agency budgets, organizational missions, and professional norms all constrain policymakers in executive agencies (Meier 1985). Contribution limits, regulatory rules, and judicial norms constrain lobbyists. These and other institutions help determine firms' political objectives and resource allocations among them. Third, competition for rents includes, among other things, such factors as the exclusivity of the rent, the overlap among firms' political objectives, and the extent of opposition coming from outside interests—even for a fixed number of firms.[5]

We attempt to capture these characteristics of corporate lobbying within the same model. Our model will consider two rent-seeking firms and two types of rents, or "goods." Generally, a "private good" imparts rents to a single firm exclusive of other firms. Alternatively, a "collective good" is non-excludable within the group: it imparts rents on multiple firms in an industry (though not necessarily equally), possibly to firms that did not contribute to lobbying for the good. In an important recent article, Esteban and Ray (2001) model the degree of "publicness" as a continuous variable using a similar distinction between private and public goods. Their private-public distinction draws solely on the degree of rivalry in the good, whereas our distinction emphasizes

---

rent. In a companion paper, we address this problem and others in the rent seeking literature by applying the structure of our model to rent seeking games more broadly.

[5] Previous studies have considered other aspects of competition for rents, such as the number of firms and entry conditions. We do not consider these aspects here, concentrating instead on aspects of rent seeking omitted in the previous literature.

exclusivity.[6] Moreover, in our model the firm can choose between private and collective lobbying based on expected profitability. This tradeoff depends partly on the exclusivity of the rent: a regulation worth $1 million to the firm is a fundamentally different opportunity than a regulation worth $1 million to the industry The private-collective tradeoff also depends on how firms share collective lobbying costs: a free rider may easily prefer collective lobbying to private lobbying. The degree of competition (i.e., conflict) over a policy proposal also affects private vs. collective lobbying: a firm typically would rather secure a policy quietly to fighting for an equally valuable, highly visible policy that may engender opposition. Finally, it is plausible that passing policies with collective rents involves greater political costs to policymakers compared to private rents, especially if collective goods require legislative action versus agency action for private goods.

Our approach departs from the existing literature in two methodological ways. First, we model firms' expenditures and expected profits for both private and collective lobbying.[7] This allows us to simulate the tradeoff between private and collective lobbying. In doing so, we allow competition to come from other firms in the industry or from outside lobbying interests. For example, competition can arise in private lobbying when two firms compete for the same exclusive rent, as with the FAA allocating routes to the airline industry. Competition could also occur when one firm's lobbying success diminishes the profits of other firms, as with a regulatory waiver for a specific firm's product. Competition in collective lobbying typically comes from outside the industry, as with rent protection by another industry (e.g. Wenders 1987, Baron 1995), or efforts by a consumer group protecting its consumer surplus (Ellingsen 1991), or an ideologically-driven group fighting for its cause (Austen-Smith and Wright 1994). The success

[6] 1n their conception of a "private good," the group as a whole lobbies and members share a rival prize equally [Each share = (Value of prize)/(Number of members)]. For a "public good," the group as a whole lobbies and members share a non-rival prize equally [Each share = Value of prize]. No one outside the group enjoys the benefits of either type of good. Hence, their public good is *non-rival within* group, non-excludable within group, and excludable outside the group, while their private good is *rival within* group. In contrast, our private-collective distinction depends only on the exclusivity of the good. Given that firms must choose between lobbying for exclusive vs. non-exclusive goods that are typically rival, this distinction is more appropriate in the specific case of corporate lobbying. This definitional difference may seem innocuous, but it is not. We discuss it further below.

[7] As noted above, Esteban and Ray (2001) also model this distinction in an effort to solve a theoretical problem—Olson's famous group size paradox. Our aim is instead to guide empirical research. Curiously, though targeted more generally their model is restricted to our collective lobbying case: because their definition of publicness draws solely on rivalry, their model does not address goods that are excludable within the group (e.g., coalition or industry), as does our private game. As such, we view our contribution as complementary to their study—in a sense by adding the private lobbying case and addressing the tradeoff between lobbying privately and lobbying collectively.

probabilities in our model constitute a second methodological difference. Whereas most game theoretic models of competitive lobbying assume that some player will receive the desired rent, we model the rent-seeking contest such that the probability of no player winning is positive. More than an arithmetic detail, this feature derives from incorporating institutions into the model. We model institutions as creating some scarcity of the policymakers' resources—or, equivalently, as constraining their ability and willingness to supply rent.[8] We capture this scarcity with a single variable, explained below, that represents the policymakers' costs in granting the rent. These costs impose some inertia on the effectiveness of firms' lobbying expenditures, and thus reduce the probability of success, ceteris paribus. Of course, this implies that the probability of neither firm winning is positive.[9] With these considerations, our model provides greater verisimilitude to political reality than past models and predicts different outcomes than previous lobbying games.

Our approach offers many advantages. First, the model is very general. It is applicable to lobbying in all branches and levels of government.[10] Most importantly, it draws attention to an aspect of corporate lobbying that is almost completely neglected in empirical work: the pursuit of private goods. The vast majority of empirical work has emphasized issues of high salience that typically involve legislation to provide collective goods over which there is fierce competition among many organized interests. There are numerous studies to explain highly visible roll-call votes and confirmation proceedings, hut there are few studies of lobbying for regulatory rules and waivers, loan guarantees, government contracts, and specific tax loopholes. Much of this trend is because data are better and there is broader appeal when it comes to high-conflict issues. But suppose most lobbying is for private goods and most rents are granted in low-conflict situations far removed from the House and Senate floors. In fact, the few studies of firms' actual lobbying expenditures indicate that corporate lobbyists tend to avoid high-conflict, high-visibility issues,

[8] A given rent can be supplied by a single policymaker but most rents, whether private or collective, involve multiple policymakers. On this reasoning, we use the plural throughout this paper, but this is not meant to exclude the possibility of a single policymaker.

[9] One can easily think of situations in which none (neither) of the firms wins because policymakers choose another (third) alternative. For example, firms bidding on construction projects for the Supercollider project in Texas spent considerable money lobbying for contracts only to have the entire project cancelled. Similarly, two airlines lobbying for the same international route might see the route cancelled or, because of trade negotiations, given to a foreign carrier. A firm might oppose EPA granting a waiver to the plant of another firm only to have EPA investigate and decide that plants of both firms are failing to meet existing rules.

[10] Although we limit our analysis to lobbying by firms, the model can be extended to other types of lobbying organizations.

preferring instead to lobby quietly on issues where they are unopposed by other interests. Browne (1995) and Godwin and Seldon (2002) found that almost 90 percent of the issues on which firms lobby involved only their firm or their firm plus one other. By modeling private and collective goods and examining the incentives to pursue each, our results highlight the extent to which empirical research on corporate lobbying has neglected a major class of political activity.

In the next section, we define variables and discuss the probability structure of the rent seeking game for four cases of the general model: competitive and noncompetitive for both private and collective goods, respectively. We then solve the model for each case, and discuss some of the important comparative statics of the respective equilibria. Following this, we present the results from simulations that demonstrate our main findings. We conclude with a discussion of future empirical research.

2 Institutions and the Probability of Winning the Rent

In our model, a firm can lobby for private and/or collective goods as defined above. A firm's lobbying expenditures are a function of the value of the rent and the probability of winning the rent (i.e., success probability). Consider a private good on which Firms 1 and 2 expend R_1 and R_2 lobbying dollars. The typical way of modeling this rent seeking game follows Tullock (1980) with the probabilities specified as

$$\frac{R_1}{R_1 + R_2} = \text{probability that Firm 1 receives the good;} \tag{1}$$

$$\frac{R_2}{R_1 + R_2} = \text{probability that Firm 2 receives the good,} \tag{2}$$

which obviously sum to one.[11] This formulation omits political institutions. We model institutional factors as constraining policymakers' willingness and ability to impart the rent. Define $N \in (0, \infty)$ as the policymakers' costs of passing the relevant policy. N can depend on issue salience: it might be very low for an obscure policy, but extremely high if granting the rent would attract a great deal of negative publicity. N also can depend on the size of the policy's minimum winning coalition. For example, N normally would be higher for a rent that is passed via a contested roll call vote than for one that needs only a change during subcommittee markup. It is plausible that N

is higher for collective than for private rents, and higher for more valuable rents as well, but our model does not presume either of these necessarily to be the case. Finally, the policymakers' policy preferences may partly determine the value of N on any given rent. In private good lobbying we denote these costs as N_R, and later in collective good lobbying we denote them as N_U.[12] As N_R increases, a logical consequence is that firms' lobbying expenditures become less effective at winning the private rent. This implies modifying the above probabilities for Firm 1:

$$\frac{R_1}{R_1 + R_2 + N_R} = \text{probability that Firm 1 receives the good;} \quad (3)$$

$$\frac{R_2 + N_R}{R_1 + R_2 + N_R} = \text{probability that Firm 1 fails to receive the good.} \quad (4)$$

Note that for any $N_R > 0$ there is some chance that neither firm wins the rent. Specifically, the latter probability is the sum of the probability that Firm 2 receives the good [$R_2/(R_1+R_2+N_R)$], plus the probability that *neither* firm receives the good [$N_R/(R_1+R_2+N_R)$]. Firm 2's probabilities are defined similarly to probabilities (3) and (4).

Probabilities (3) and (4) follow probabilities (I) and (2) in assuming that the firms lobby directly against each other. Such lobbying is highly competitive. In our model, however, lobbying can be "competitive" or "noncompetitive" for both private and collective goods. In private lobbying, competition is driven by the extent to which firms directly oppose each other. In collective lobbying, competition occurs to the extent that there is opposition from outside interests.

2.1 Private Good Competitive Lobbying

We define private good lobbying as "competitive" insofar as firms have incentive to lobby directly against each other. This occurs when firms seek the same excludable rent, in which case an increase in either firm's success probability would diminish the other's. For example, two firms may both seek to secure a contract to produce tires for government vehicles, or a particular band of the radio frequency spectrum. Competition may also occur when a firm's lobbying success would

---

[11] Probabilities (I) and (2) implicitly suggest that the firms have equal lobbying abilities. We will maintain this assumption in what follows.

[12] Modeling institutions as policymakers' costs has the advantage of monetizing institutional constraints. With N in monetary units, it may be appropriately introduced into the probability functions. Monetizing N also makes it comparable to the value of the private and collective rent, which we define below. Along these lines, it is intuitively appealing (though not necessary) to think of N as the policymakers' supply price for producing the rent, as in Denzau and Munger (1986).

decrease another firm's profits. For example, if one firm lobbies successfully for a regulatory waiver for one of its production facilities, this gives it an advantage over a firm with which it competes. By definition, as these examples illustrate, only one firm can receive the rent in private good lobbying. Therefore, if either firm succeeds then its rival loses. A third possibility, which we introduce, is that neither firm succeeds. The probabilities of such a contest are as discussed above, where the firm's success probability increases as it spends more relative to its rival, but the probability that neither firm wins is positive for $N_R > 0$.[13]

2.2 Private Good Noncompetitive Lobbying

Private good lobbying may be "noncompetitive" if a firm's success does not preclude the rival from also achieving its objective. In that case, firms do not directly oppose each other's objectives. For example, a defense firm may try to increase the contract price for missiles it sells to the government. If the firm succeeds, its success will not necessarily affect the policies that determine the other firm's contract price. Nevertheless, the firms still compete indirectly for the policymaker's time and support and, perhaps, for rents that may be partially exclusive in the sense that one firm's lobbying reduces the success probability of the other firm. This competition is embodied in the parameter α, discussed below. A common scenario involves numerous firms lobbying for the attention of a home district legislator who then lobbies fellow legislators on behalf of the firms that gained her consideration (Hall and Wayman 1990). In short, both firms may succeed, but policymaker costs make it possible for one or both firms to fail. The probabilities for Firm 1 are

$$\frac{R_1}{R_1 + \alpha R_2 + N_R} = \text{probability that Firm 1 receives the good;} \tag{5}$$

$$\frac{\alpha R_2 + N_R}{R_1 + \alpha R_2 + N_R} = \text{probability that Firm 1 fails to receive the good,} \tag{6}$$

where $\alpha \in (0, 1)$ is an index number that increases as firms compete for the policymaker's time and resources or for partially exclusive rents. Firm 2's success and failure probabilities are defined

[13] In addition, note that these probabilities sum to one and are continuous in nonnegative values of R_1 and R_2 and positive values of N_R. Continuity of the probabilities on [0, 1] is preserved by bounding N_R away from zero. If N_R increases without bound, the probability that neither firm wins increases to 1. But the probability of one of the firms winning increases as the sum of both firms' lobbying expenditures increases. There are natural upper bounds on R_1 and R_2, which we will discuss below.

similarly. Compared to the competitive case above, notice that if we allow $\alpha = 1$, so $\alpha \in (0, 1]$, then we incorporate the competitive case. The probability that neither firm succeeds again depends on $N_R > 0$. As above, Firm l's success probability falls as R_2 increases because both firms are bidding for the policymakers' resources. But as α decreases from 1, Firm l's success probability *increases* for any given level of rival expenditures.[14] This is the sense in which α represents competition between firms in the model: when $\alpha = 1$ each firm's expenditures fully oppose the other's success probability, but as α declines from 1 each firm's expenditures have a smaller negative impact on the other firm's success probability. By allowing $\alpha \in (0, 1]$, we can treat the competitive and noncompetitive cases with the same maximization problem and let α vary throughout its range in our results.

2.3 Collective Good Competitive Lobbying

Collective good lobbying is "competitive" if outside interest groups lobby against the firms.[15] For example, firms in the chemical industry might lobby to reduce regulatory restraints on the production of a particular type of resin. As the firms' lobbying expenditures increase, ceteris paribus, so does their success probability. However, environmental interest groups and perhaps labor unions might oppose the firms through their own lobbying, which decreases the probability of the firms receiving the collective good. Denoting lobbying expenditures by Firm 1 and Firm 2 for the collective good as U_1, $U_2 \geq 0$ and policymaker costs in the collective good case as $N_U \in (0, \infty)$, the probabilities are

$$\frac{U_1 + U_2}{U_1 + U_2 + P + N_U} = \text{probability that the firms receive the good;} \tag{7}$$

$$\frac{P + N_U}{U_1 + U_2 + P + N_U} = \text{probability that the firms fail to receive the good.} \tag{8}$$

Here $P > 0$ is lobbying expenditures by the outside interest group(s). For example, in lobbying for

[14] Suppose that $R_1 = R_2 = 50$ and $N_R = 10$. In the competitive case where $\alpha = 1$, the probability of either firm receiving the good is 50/110. This is lower than the ceteris paribus noncompetitive case: if, say, $\alpha = 1/2$ then the probability of either firm receiving the good is 50/85 > 50/110.

[15] The maximization problem of the outside lobby is beyond the scope of this paper. However, after developing the model for the noncompetitive collective good, we solve for the amount of outside lobbying expenditures that would be required to block the industry from receiving the good.

looser regulation of their production process, the firms may incur lobbying by environmental or labor interest groups. And the firms must still face policymaker costs, N_U, which, in our example, might arise from a policymaker having a conservationist ideology, reelection or oversight constraints, or pressure imposed by the media or the EPA. Note that the probabilities sum to one, that an increase in firms' lobbying expenditures increases their success probability, and that the firms may fail to receive the good even if P is very close or equal to zero because $N_U > 0$. Moreover, if the firms succeed then the outside lobbies fail and vice-versa. Thus, equation (7) can be interpreted as the probability that the outside lobbies lose, while equation (8) would be the probability that they win even if they do not lobby against the good.

2.4 Collective Good Noncompetitive Lobbying

In "noncompetitive" collective good lobbying, outside interests do not oppose the firms. The disposition of federal taxes on airline tickets is one example. Suppose that airlines lobby for the tax revenues to be earmarked for airport improvement rather than allocated to general funds, and that taxpayers perceive the same tax bill in either event. Then no outside opposition would be mobilized against the airlines. In this case, the success and failure probabilities are equations (7) and (8) but with $P = 0$. Of course, by our construction, the failure probability is still positive because $N_U > 0$. In the maximization problem, therefore, we will treat the competitive and noncompetitive collective good cases with the same probability expression, and let $P \geq 0$ vary throughout its range in our results.

3 The Model

The firms maximize their expected net benefits from lobbying, henceforth "profits." Let $V > 0$ be the value of the private good and $L > 0$ be the value of the collective good (for simplicity we initially suppose V and L are the same for both firms). Assuming efficient capital markets, we impose no budget constraint on the firms. Thus, for Firm 1 the problem is to choose R_1 and U_1 to maximize expected profits by

$$\max_{R_1, U_1} \Pi_1 = \left(\frac{R_1}{R_1 + \alpha R_2 + N_R} \right) V + \left(\frac{U_1 + U_2}{U_1 + U_2 + P + N_U} \right) L - R_1 - U_1. \tag{9}$$

Firm 2's problem is identical after interchanging subscripts. The first order conditions are

$$\frac{\partial \Pi_1}{\partial R_1} = \left(\frac{\alpha R_2 + N_R}{(R_1 + \alpha R_2 + N_R)^2} \right) V - 1 = 0; \tag{10}$$

$$\frac{\partial \Pi_1}{\partial U_1} = \left(\frac{P + N_U}{(U_1 + U_2 + P + N_U)^2} \right) L - 1 = 0. \tag{11}$$

The second order conditions ensure that solutions to (10) and (11) maximize profits.[16] Before solving the problem, we make note of a few more of its important aspects. First, reflection upon equation (9) reveals that if the values V and L were small enough relative to the policymaker's political costs N_R and N_U, then neither firm would lobby. The following assumptions will be sufficient to ensure that firms have an incentive to lobby:

Assumption 1: $V > N_R$;

***Assumption* 2:** $L > N_U$.

Second, notice that equation (9) is separable in the choice variables so we can treat the firm as maximizing the profit from private good lobbying and collective good lobbying separately. Finally, since firms can refrain from lobbying, R_i and U_i are bounded below by 0; and assuming individual rationality R_i and U_i are bounded above by the value of the goods. Therefore, we have $R_i \in [0, V]$ and $U_i \in [0, L]$ for $i = 1, 2$.[17] The strategy space determined by these bounds is compact and convex, which helps to assure the existence of a Nash equilibrium.[18]

3.1 The Private Good Game

We first consider the private good lobbying problem in order to determine pure strategy Nash equilibria. Solving equation (10), we obtain the profit-maximizing level of R_1 as a function of R_2:

$$R_1 = \sqrt{(\alpha R_2 + N_R)V} - \alpha R_2 - N_R \tag{12}$$

From (12) we obtain Firm l's best reply function. R_1 will be positive if R_2 is low enough that it pays Firm 1 to engage in lobbying. R_1 will be zero if R_2 is just high enough so (12) equals zero—

---

[16] The second order sufficient conditions are satisfied because $\partial^2\Pi_1 / \partial R_1^2 < 0$; $\partial^2\Pi_1 / \partial U_1^2 < 0$; and $\partial^2\Pi_1 / \partial R_1 \partial U_1 = 0$. Thus the Hessian matrix is negative definite, assuring that the objective function is concave and the solutions to (10) and to (11) assure a global maximum.

[17] V and L are not the least upper bounds.

[18] The proof of the existence of a Nash equilibrium is available to the reader upon request. **[Note to Referee: See Section C of the Referee's Attachment for this proof.]**

or if R_2 is even higher so (12) would become negative, which is not feasible. Moreover, not every point in the set of R_1s is on (12). Therefore, we define any R_1 that satisfies (12) as $\rho_1 \geq 0$ where

$$\rho_1 = \begin{cases} \sqrt{(\alpha R_2 + N_R)V} - \alpha R_2 - N_R & \text{for } 0 \leq R_2 \leq \dfrac{(V - N_R)}{\alpha} \\ 0 & \text{for } \dfrac{(V - N_R)}{\alpha} < R_2 \end{cases}. \quad (13)$$

[Note to Referee: All proofs referenced in this Section 3 are enclosed as "Referees' Attachment".] In our companion paper, we establish that expected profits are nonnegative on the portion of (13) on which $0 \leq R_2 \leq (V - N_R)/\alpha$. For negative expected profits, spending zero strictly dominates the solution to (12). In short, (13) gives Firm l's best reply function from (12) for nonnegative expected profits **[See Attachment, Section A]**. In the companion paper we demonstrate that (13) is strictly concave over the range $0 \leq R_2 \leq (V - N_R)/\alpha$., but that its exact shape depends on the relative magnitudes of V and N_R **[See Attachment, Section B]**. In addition, if V is sufficiently small relative to N_R (precisely, if $V \leq 4N_R$) then the best reply function is strictly concave and monotonically decreasing in R_2. The problem is symmetric, so Firm 2's best reply function is given by (13) after interchanging subscripts. The solid curves in Figure 1A show the reaction functions for the numeric example $V = 100$, $N_R = 30$, and $\alpha = 3/4$.

[Figure 1 about here.]

Alternatively, if V is sufficiently large relative to N_R (precisely, if $V > 4N_R$) then the best reply function has an interior maximum at $R_2 = (V/4 - N_R)/\alpha$ **[See Attachment, Section B]**. Figure lB shows the reaction functions for the numeric example $V = 100$, $N_R = 12$, and $\alpha = 2/3$, and Figure 1C for $V = 100$, $N_R = 1$, and $\alpha = 2/3$, where the interior maximum is more visually obvious.[19]

3.1.1 Equilibrium in Private Good Game

In the companion paper, we prove that the points of intersection in Figure 1 are the Nash equilibria in the respective cases $V \leq 4N_R$ and $V > 4N_R$, and that profits are positive in equilibrium **[For all proofs in this paragraph, see Attachment, Section C]**. Stability of the equilibrium exists if, given that we are at any non-equilibrium point, one or both firms would make a higher profit by being closer to the equilibrium. We illustrate stability in Figure 1 with arrows indicating the direction of higher profits from points off equilibrium. The uniqueness of the equilibrium is

[19] Ignore Figure 1D for the moment.

proven for the case $V \leq 4N_R$, but the case of $V > 4N_R$ is not as simple. If V is not extremely greater than $4N_R$ then uniqueness is proven. However, if V were to become extremely larger than $4N_R$ there could be three equilibria—two asymmetric and one symmetric. We illustrate this possibility without data in Figure 1D. We have been unable to construct a numeric example of this possibility (and we believe that such a game does not exist, but we have been unable to prove nonexistence). However, even if such a game exists, the asymmetric equilibria would be unstable, which we illustrate with the directional arrows in Figure 1D. Therefore, even if multiple equilibria exist, the symmetrical equilibrium would seem the appropriate equilibrium to consider.

In the foregoing discussion, the payoffs are symmetric, but equilibrium does not depend on this. If the value of the private goods differed between firms, the best reply function for the firm with the higher-valued good would shift outward. Our results on existence and stability would still apply except that the firm with the higher-valued good would spend more on lobbying than its rival.

3.1.2 The Effect of Increasing Competition in the Private Good Game

In our model, higher competition does not derive from increasing the number of firms or reducing barriers to entry as in other models (e.g., Posner 1975; Rogerson 1982; Sun and Ng 1999). Nor does it comment on the contestability of the rent (e.g., Kahana and Nitzan 1999). Rather, we conceive of competition between rent seeking firms as the sensitivity of one firm's success probabilities to the other firm's expenditures. This sensitivity is driven by the extent to which the firms oppose each other's efforts, as discussed above. In other models, greater competition is represented as an increase in rivals' expenditures, by either existing firms or new entrants. In our model, competition and expenditures are not conflated in this way.

In this section, we demonstrate the effect of increased competition on equilibrium expenditures. To begin, note that for the i^{th} firm, $i = 1, 2$, we have

$$\frac{\partial \rho_i}{\partial \alpha} = \frac{R_j \sqrt{V}}{2\sqrt{(\alpha R_j + N)}} - R_j \tag{14}$$

from equation (13). Using equation (14), we prove the following proposition to proceed with analyzing the effect of competition.

Proposition 1: If $V \leq 4N_R$ then $\frac{\partial \rho_i}{\partial \alpha} \leq 0$. Therefore, if $V \leq 4N_R$, combined equilibrium rent seeking expenditures decrease with greater competition.

Proof: Note from equation (14) that $\frac{\partial \rho_i}{\partial \alpha} \leq 0$ if $\frac{R_j \sqrt{V}}{2\sqrt{(\alpha R_j + N_R)}} \leq R_j$ or, equivalently, if $\frac{\sqrt{V}}{2\sqrt{(\alpha R_j + N)}} \leq 1$, which requires that $V \leq 4(\alpha R_j + N_R)$ or $V - 4N_R \leq 4\alpha R_j$. Therefore, the best reply function will he non-increasing with increases in α so long as $4\alpha R_j \geq V - 4N_R$. If $V < 4N_R$, then $4\alpha R_j > 0 > V - 4N_R$ everywhere on ρ_i. Since Firm *j*'s response is identical, combined rent seeking expenditures necessarily fall. Similarly, if $V = 4N_R$, the only part of the best reply function which will not decrease with an increase in α is the intercept where $R_j = 0$. At all other points on the best reply function, ρ_i will decrease and the equilibrium investment of the two firms will fall because the equilibrium is an interior point in the first quadrant. **Q.E.D.**

Thus, if the value of the private good is sufficiently low relative to policymaker costs, then equilibrium lobbying expenditures fall as competition increases. In Figure 1, the effect of increased competition is illustrated with dashed lines. Figure 1A illustrates this for the case where $V = 100$, $N_R = 30$, and α increases from 3/4 to 1. As shown, higher competition decreases lobbying expenditures.

If $V > 4N_R$ then the effect of competition on spending depends on whether the initial equilibrium lay in the downward or upward sloping portion of ρ_i. To see this, consider Figure lB versus 1C. In both graphs, as α increases the downward sloping portion and a segment of the upward sloping portion of the ρ_i function falls, whereas a segment of the upward sloping portion rises. In Figure 1B, when α increases from 2/3 to 1, combined equilibrium expenditures decreases from 49.5 to 48. In Figure 1C, however, when V is much larger than $4N_R$, higher competition causes equilibrium expenditures to rise.

Intuitively one might expect that as competition increases, so would the combined amount that firms spend lobbying. This view finds support in some previous models that rely on the number of firms or entry conditions to model competition (Posner 1975; Rogerson 1982; Sun and Ng 1999). However, our model predicts that the effect of competition depends on the value of the rent relative to the political costs of supplying the rent. Greater competition will *decrease* expenditures if $V \leq 4N_R$ and for many cases where $V > 4N_R$. This result is in line with empirical research that indicates that firms lobby legislators or bureaucrats on issues consistent with the officials' ideology and/or constituency interests, where the visibility is low (small N_R), and over which there is little competition (small α). This also reflects the empirical result that campaign contributions are more likely to "buy votes" on narrow issues with concentrated benefits and dispersed costs than on broader votes (Stratmann 1991, 1995). To state this another way, firms look for "issue niches" where their rent seeking activities are unlikely to conflict with other firms' activities, and the granting of the good will not offend other interests (Browne 1995, Evans 1991, Hojnacki and Kimball 1998). In contrast, greater competition causes an *increase* in spending only when the rent is extremely valuable compared to the political costs involved.

3.2 The Collective Good Game

3.2.1 The Noncompetitive Case: A Prisoners' Dilemma?

Recall that in noncompetitive collective lobbying $P = 0$. We first suppose that $L = L_1 = L_2$; i.e. that the collective good is non-rival within the group and payoffs are therefore symmetric. Solving the first order condition (11) we obtain Firm l's profit maximizing expenditures as

$$U_1 = \sqrt{N_U L} - N_U - U_2. \tag{15}$$

From equation (15), we obtain Firm l's best reply function. By Assumption 2, $\sqrt{N_U L} - N_U > 0$. Therefore, U_1 will be positive for levels of U_2 low enough that it pays for Firm 1 to engage in lobbying. U_1 will be zero for levels of U_2 high enough so that equation (15) is zero (or if U_2 is even higher so equation (15) is negative, which is not feasible). In addition, not every U_1 is on (15). Therefore we define any U_1 that satisfies (15) as ν_1, for which we write

$$\nu_1 = \begin{cases} \sqrt{N_U L} - N_U - U_2 & \text{for } 0 \le U_2 \le \sqrt{N_U L} - N_U \\ 0 & \text{for } U_2 > \sqrt{N_U L} - N_U \end{cases}. \tag{16}$$

In the Appendix of this paper, we prove that equation (16) is the best reply function for the collective game. For a non-rival good with symmetric payoffs ($L = L_1 = L_2$), Firm 2's best reply function is also given by equation (16) after interchanging subscripts. So for i = 1, 2, Firm i will spend a positive amount ($\nu_i > 0$) if Firm j spends strictly less than $\sqrt{N_U L} - N_U$; otherwise Firm i will spend zero. We illustrate this in Figure 2A.

[Figure 2 about here]

As can be seen in the Figure, because the ν_1 and ν_2 functions have the same intercepts and slope, they lie on the same locus. Therefore, any point on the best reply functions of the two firms, including the intercepts, is a Nash equilibrium. In the Appendix, we show that the profit of Firm 1 is positive on any point of the downward-sloping segment of equation (16). Thus, there are an infinity of equilibria if $L = L_1 = L_2$.

Notice that equilibrium in the collective game embodies the free-rider incentive. Each firm would increase its profits by decreasing its expenditures so long as the other firm increases its expenditures in equal magnitude. The equilibrium features this effect. The firms are not caught in a prisoners' dilemma, however, because in any equilibrium at least one firm makes positive expenditures.

Proposition 2: $U_1 = U_2 = 0$ is not a Nash equilibrium. That is, at least one of the firms will lobby for the collective good. The other firm may or may not free ride.

Proof: If both firms' spending were zero, each would make zero profits, but either firm could make a positive profit by unilaterally increasing spending from zero. Lemma A2 of the Appendix shows that if Firm 1 spends $U_1 = \sqrt{N_U L} - N_U > 0$ while $U_2 = 0$, Firm 1 will make a positive profit. If either firm chooses to spend zero, the other firm does best to spend $\sqrt{N_U L} - N_U$, which, from Lemma Al of the Appendix, is positive. **Q.E.D.**

To illustrate these properties concretely, it is instructive to conceive of the equilibrium as $\nu_1 + \nu_2 = \sqrt{N_U L} - N_U$, which will hold when both firms are on their reaction functions. Then consider some numeric examples.

Example 1: Let $L = 100$ and $N_U = 25$. In equilibrium $\nu_1 + \nu_2 = 25$. Suppose that $\nu_1 = 25$ and $\nu_2 = 0$. Then by equation (9) profits from collective good lobbying are $\Pi_1 = 25$ and $\Pi_2 = 50$. Firm 1 can do no better by increasing or decreasing its expenditures from 25 (e.g., with $\nu_2 = 0$ and $U_1 = 24$ or $U_1 = 26$, $\Pi_1 \approx 24.98$). At the same time, given that $\nu_1 = 25$, Firm 2 can do no better by increasing its expenditures above zero (e.g., with $\nu_1 = 25$ and $U_2 = 1$, $\Pi_2 \approx 49.98$).

***Example* 2:** Let $L = 100$ and $N_U = 25$, but consider a focal point equilibrium where $\nu_1 = \nu_2 = 25/2 = 12.5$. By equation (9) $\Pi_1 = \Pi_2 = 37.5$. If either firm deviates from $\nu_i =$

12.5 while the other firm maintains $\nu_j = 12.5$, profits will fall (with $\nu_j = 12.5$ and $U_i = 11.5$ or $U_i = 13.5$, $\Pi_i \approx 37.48$).

In short, for a non-rival benefit with symmetric payoffs, it is in neither firm's interest for both to spend zero. However, to the extent that Firm *i* can get Firm *j* to assume more of the cost, Firm *i* is able to increase its profits. Each has the incentive to free ride. If one firm is a free rider, however, it is rational for the other firm to lobby.

For $L_1 \neq L_2$ there is a unique equilibrium in which the firm that receives the smaller benefit will be the free rider. Suppose Firm 1 stands to gain more from the collective good so that $L_1 > L_2$. The firms still have best reply functions given by equation (16), but the asymmetric payoffs separate the two functions, as depicted in Figure 2B. There is now a unique equilibrium where the best reply functions intersect on the vertical axis. Firm 1 incurs the total cost of lobbying while Firm 2 is able to free ride. In Olson's terms, Firm 1 is the "great" that is being exploited by the "small" Firm 2.[20]

The noncompetitive collective good game suggests important implications for understanding actual collective lobbying. In equilibrium with symmetric payoffs, the firm's incentive to free ride is overcome by the industry's disincentive to leave available rents unexploited. Thus, for certain kinds of political goods our model provides a theoretical basis for firms to pool their resources—to form lobbying coalitions such as industry PACs (in a formal sense) and lobbying partnerships (less formally), and so forth. If payoffs are not symmetric, the firm that stands to gain less can "force" the other firm to lobby for the collective good. Thus, our model confirms Olson's (1965, p. 29) seminal result that there is a "systematic tendency for `exploitation' of the great by the small." Finally, because the firm that stands to gain less can free ride, coalitions to seek collective goods may be less likely when payoffs are more uneven. This is consistent with previous empirical research (e.g. Browne, 1995), but deserves greater and more systematic attention in future empirical work.

3.2.2 The Competitive Case in Collective Lobbying

[20] If a firm has high sunk costs (e.g., an established Washington lobbying office), the firm may perceive a very low marginal cost of nominal coalition participation (cf. Esteban and Ray 2001). In light of this point, we emphasize that our $\nu_i = 0$ prediction is suggestive and may be interpreted to mean "a very small contribution." Our free-rider result is consistent, for example, with a large firm contributing nominally in

In competitive lobbying for collective goods, an outside interest opposes the firms by making lobbying expenditures $P > 0$, which decreases the firms' success probability as we discussed earlier. The substantive results from the previous section carry over intact. However, we now show that if P is high enough, the outside lobby will be able to dissuade the firms from lobbying because it would diminish the firms' expected profits to zero. If payoffs are symmetric Firm l's best reply function under opposition from outside interests changes to

$$\nu_1 = \begin{cases} \sqrt{(P+N_U)L} - P - N_U - U_2 & \text{for } 0 \le U_2 \le \sqrt{(P+N_U)L} - P - N_U \\ 0 & \text{for } U_2 > \sqrt{(P+N_U)L} - P - N_U \end{cases}, \tag{17}$$

and the conditions under which both firms maximize profits changes to

$$\nu_1 + \nu_2 = \sqrt{(P+N_U)L} - P - N_U \,. \tag{18}$$

For any pair (ν_1, ν_2) that satisfies the last equality, the profit to the i^{th} firm is

$$\Pi_i = \left(\frac{\sqrt{(P+N_U)L} - P - N_U}{\sqrt{(P+N_U)L} - P} \right) L - \nu_i \tag{19}$$

Thus, an outside lobby could discourage industry lobbying by spending an amount P such that profits are driven to zero or, equivalently, that the firms' optimal spending equals zero ($\nu_1 + \nu_2 = 0$). To achieve this objective, P must satisfy $\sqrt{(P+N_U)L} - P - N_U = 0$ or $P = L - N_U$. Then, because the intercepts of the firms' best reply functions are $\sqrt{(P+N_U)L} - P - N_U$, no positive profits are available to the firms for any positive level of lobbying expenditures. Increasing P from zero causes the best reply functions to shift to the southwest, as in Figure 2C. Setting $P = L - N_U$, the reaction functions would shift sufficiently to where they pass through the origin and the net returns to the firms are, at best, zero. If the payoffs are not symmetric, the outside lobby must discourage lobbying by the firm that values the good more highly. Suppose Firm 1 receives the higher benefit ($L_1 > L_2$). Then the outside lobby must set $P = L_1 - N_U$.

Thus, the outside lobby could completely discourage the industry from lobbying by spending appropriately. Whether it can and will do so depends upon its funding and objective, which are beyond the scope of this paper. Because we do not model the outside lobby, we cannot say that it would spend sufficiently to completely block the firms' efforts, even if the funds were available. We can see, however, that the threat of action by an opposing group may be sufficient to

---

order to maintain or build lobbying relationships (Hojnacki and Kimball 1998). Placing a phone call to the policymaker's staff is greater effort than zero, but in our model it would effectively constitute free riding.

discourage firms from the pursuit of a particular collective good and encourage them to seek a good over which there is less potential conflict. These results are consistent with the literature concerned with the social costs of monopoly, in which efforts by consumer groups to protect consumer surplus have a negative impact on firms' rent-seeking outlays (Wenders 1987; Ellingsen 1991).[21]

4 Private vs. Collective Lobbying Simulations

Previously we have shown that firms' decisions to lobby for private or collective rents *(V* or *L)* depend on policymaker costs (N_R or N_U) and the competitiveness of the rent (α or *P).* Through numeric simulations, we now show the circumstances under which one type of lobbying is more favorable, and vice-versa. Our approach to the simulations is as follows: for a given-sized rent and given level of policymaker costs, how does private lobbying profitability compare with collective lobbying profitability, as the level of competition in both varies? In other words, when is it in a firm's interests to lobby for private vs. collective goods, ceteris paribus?

Specifically, we will show that for plausible parameters of the game, the areas in α–*P* space for which private lobbying profits exceed those of collective lobbying are typically greater than the areas for which collective lobbying profits exceed those of private lobbying. Thus, we show by construction that, given the choice between a private rent versus a collective rent, cases where the firm will opt to lobby for the private rent predominate cases where the firm opts to lobby for the collective rent. Given a choice between a private rent and a collective rent, then the firm will typically spend a positive amount on private lobbying and zero on collective lobbying. Alternatively, where there are a number of similar choices between lobbying for private rents versus collective rents, the private goods that the firm would pursue would tend to outnumber the collective goods that the firm would pursue. Part of this, of course, would be due to the firm attempting to free ride to the extent possible. Nevertheless, it is reasonable to suppose that if the firm has a number of private and collective lobbying opportunities where the values of the parameters are close to those in the special cases, firms will spend more on private lobbying, even

[21] Keem (2001) demonstrates that this result is driven mostly by assuming that the firms are equally suited to lobbying. Asymmetric lobbying abilities would appear in our model as differently valued exponents on outlays or, equivalently, as marginal cost of lobbying curves with different slopes. We reserve the modeling of this effect for a future paper.

if they spend to some extent on collective lobbying.

Before proceeding, we draw attention to some important aspects of the analysis. First assuming symmetrical firms, we examine one of them, Firm 1, in equilibrium. Second, recall that the private game equilibrium depends on whether $V > 4N_R$ or $V \leq 4N_R$. We consider multiple cases to incorporate the different possibilities. Third, in the collective good game each firm's performance depends on whether lobbying expenditures are shared equally or if one firm is a free rider—and especially on whether the firm in question is the free rider. We account for these possibilities by considering sub-cases with different shares of burdening collective lobbying costs. Finally, for each of these various possibilities, defining Π_R and Π_U as the maximum profits associated with the profit-maximizing values of ρ and ν, respectively, we compare combinations of α and P to delineate areas under which private lobbying is more profitable than collective lobbying, and vice-versa.

4.1 Simulation Results

We begin by fixing values of V, L, N_R, and N_U. We then let α and P increase from their respective minima to their respective maxima. For any value of the constant variables, α ranges from 0 to 1, but P ranges from 0 to $(L - N_U)$. For example, if $L = 100$ and $N_U = 30$ then the maximum value for P is 70. We consider three cases with different values of the constant variables: 1) $V < 4N_R$ with $N_U = N_R = 30$; 2) $V > 4N_R$ with $N_U = N_R = 20$; and 3) $V > 4N_R$ with $N_U > N_R$ (i.e., the political costs are higher for collective than for private lobbying). Profits will depend also on how the firms distribute the burden of collective lobbying costs. So within each of these three cases, we examine three sub-cases: a) Firm 1 is the free rider; b) the firms share equal cost burdens; and c) Firm 1 pays all costs. Thus, we have a total of nine sub-cases.

[Figure 3 about here.]

In Figure 3, for the nine sub-cases, we place α on the vertical axis and P on the horizontal axis. We then plot a contour along which private and collective lobbying are equally profitable (i.e. on which $\Pi_R = \Pi_U$) given optimal values for choice variables. In the area to the right/below the contour, $\Pi_R > \Pi_U$. In the area to the left/above the contour, $\Pi_R < \Pi_U$. We see that the results depend heavily on the distribution of collective lobbying costs. Collective lobbying is more profitable most of the time in sub-cases la and 1b, in which the firm is the free rider and political costs are equal for both types of lobbying. It is interesting to note, however, that even when the firm is a free rider, there are sizable areas where private lobbying becomes increasingly more profitable under more conditions. As V increases relative to N_R, the area where Π_R exceeds Π_U increases. Moreover, as the firm bears more of the collective lobbying costs, private lobbying becomes increasingly more profitable under more conditions. In addition, as political costs generally are higher for collective lobbying (Suarez 2000), private lobbying is increasingly more profitable than collective lobbying. In sub-case 3c, private lobbying is always more profitable than collective lobbying.[22]

4.2 Discussion

Our earlier comparative statics indicated that firms spend less as the lobbying environment becomes more competitive—the exception being private rents that are extremely valuable compared to the political costs involved. In collective lobbying, firms would like to free ride but not at the expense of foregoing the collective rent: one of the firms will make the profit-maximizing expenditures. Moreover, the simulation results above suggest that firms avoid competition in collective lobbying more than they avoid competition in private lobbying. In addition to our discussion thus far, we elaborate on two implications of our results.

First, a firm should attempt to free ride when its desired rent is collective, and the firm with the greatest stake in the collective good is likely to be exploited by firms with smaller stakes in the good. This result not only fits with Olson's classic work, it also helps to explain why most small and medium sized firms do not have lobbying offices in Washington (Humphries 1990). In addition, even when firms have DC lobbying offices and have an interest in a collective rent, their contributions to the collective lobbying effort often are minimal and occur only to maintain good relations with other organizations with which they share political monitoring costs (Heinz et al. 1993; Hojnacki 1998).

A second implication of our model is that increasing competition over rents strongly encourages firms to lobby for private rather than collective goods.[23] This helps us understand the frequently observed preferences of firms and policymakers for distributive politics. Firms seek

---

[22] Using this same approach, we also obtained equal expenditure contours for the same nine sub-cases. In seven of the nine sub-cases, the diagram was "empty" (i.e., $\rho_1 > \nu_1$ for all combinations of α and P). In sub-cases 1c and 2c, $\rho_1 < \nu_1$ for approximately 15 percent of the α and P combinations, occupying the upper left of the diagram. These results are available from the authors on request.

[23] Competition increases in Figure 3 as we move to the northeast.

issue niches where there is little competition from outside interests and little reluctance by policymakers to supply the desired rent. Browne (1995) and Godwin and Seldon (2002) have shown that these issue niches generally involve only private goods. Highly inclusive collective goods stand in sharp contrast to private goods and issue niches. Smith (2000) demonstrates empirically that as a desired rent becomes more inclusive, the opposition from outside interests grows at an increasing rate, and the likelihood that business interests will win falls rapidly because public officials face escalating political costs. Rapidly rising coalition costs also occur when firms pursue highly inclusive rents. These costs grow because coalition members and their shares of the rent become increasingly diverse. Suarez (2000) shows that this heterogeneity augments the coordination costs among coalition members, the likelihood that firms will free ride, the probability that the coalition will fragment, and the odds that members will lobby for more particularistic rents.

5 Conclusion

A critical normative and empirical question for American democracy concerns the extent to which corporate political activity influences public policy. Corporations spend enormous sums attempting to influence government, but there is considerable disagreement over the effects of these investments. Perhaps because there lacked a general model that applied to all branches of government and all desired rents, empirical work focused attention too narrowly to provide the understanding of corporate lobbying necessary to evaluate its influence. This paper helps fill this gap by developing a model of lobbying that is highly general while incorporating three fundamental aspects of real-world corporate lobbying decisions: the distinction between private and collective rents, the impact of governmental institutions on the willingness and ability of government officials to supply the rent, and the level of competition over the rent. The results from our approach generally indicate that firms eschew competition and collective goods, preferring instead to lobby for private goods where competition and costs to policymakers are low.

These results have two important empirical implications. First, they directly suggest such empirical questions as: What proportions of lobbying resources are devoted to private as opposed to collective rents? What determines how firms allocate their lobbying efforts among the legislative, executive, and judicial branches? What are the conditions under which firms will form lobbying coalitions? Which types of rents do policymakers prefer to grant? Do these preferences differ across the branches of government? Second, to the extent that our results are met with empirical support, corporate lobbying research has emphasized the wrong issues and the wrong location. Almost all existing studies focus on lobbying legislatures, where group conflict is high and goods are typically collective.[24] However, most public policy affecting business originates in the bureaucracy, and bureaucratic rules are many times more numerous than legislative statutes. As one FCC Commissioner put it, administrative agencies mass-produce laws whereas legislatures and courts engage in handicraft production (Fritschler 1969, p.94).

There are scores of empirical studies estimating the influence of PAC contributions on roll call votes, but the vast majority of corporate rents are granted without a roll call vote. Most corporate rents such as government contracts and regulatory waivers stem either from decisions in committee markup or, more likely, from decisions in executive agencies. This suggests the influence of PAC contributions would be found elsewhere than on the House and Senate floors. [25] Like pointing out the fallacy of looking for lost keys under a street lamp because the light is better, our results underscore the need for empirical work on corporate lobbying to unearth activities in the executive agencies, even if the light (i.e., data) is not as convenient.

---

[24] For excellent reviews of this literature, see Salamon and Siegfried (1977) for work prior to 1975 and Baumgartner and Leech (1998) for work after 1975.

[25] A strain of the literature considers individual corporate PAC contributions as unilateral provision of public goods (Jacobson 1980; Munger 1989; Stratmann 1992). Our approach would shift the focus onto individual PAC contributions as unilateral provision of excludable goods in low conflict circumstances.

Appendix: Best Reply Function in Collective Lobbying

Because the firms' spending must be nonnegative, we restrict analysis to the first quadrant and its axes. We first establish that the U_1 and U_2 intercepts of equation (15) from the body of the paper are positive. Then, because (15) is obviously continuous, the equation passes through the first quadrant. It follows that, for $N_U \in (0, \infty)$, there are some points of (15) at which U_1 and U_2 are both positive.

The U_1 intercept, found by setting $U_2 = 0$ in equation (15), is $U_1 = \sqrt{N_U L} - N_U$. The U_2 intercept is also $\sqrt{N_U L} - N_U$, as implied by the slope of −1. To assure that (15) passes through the first quadrant, we must establish

Lemma Al: The U_1 and U_2 intercepts are positive.

Proof: $L > N_U$ by Assumption 2. Hence, $\sqrt{N_U L} - N_U > \sqrt{N_U N_U} - N_U = 0$, so by transitivity $\sqrt{N_U L} - N_U > 0$. **Q.E.D.**

Because the intercepts are positive and equation (15) describes a straight line between these intercepts, any point on (15) for which $U_2 \in [0, \sqrt{N_U L} - N_U]$ is nonnegative. We next establish Firm l's willingness to invest in lobbying. By symmetry, the results also hold for Firm 2.

Lemma A2: Firm l's profits from collective lobbying are positive on any point of (15) where $U_2 \in [0, \sqrt{N_U L} - N_U]$.

Proof: We rearrange (15) to see that, at any point of the equation, $U_1 = \sqrt{N_U L} - N_U - U_2$ implies that $U_1 + U_2 = \sqrt{N_U L} - N_U$. Profit for Firm 1 is given by

$$\left(\frac{U_1 + U_2}{U_1 + U_2 + N_U}\right) L - U_1 = \left(\frac{\sqrt{N_U L} - N_U}{\sqrt{N_U L}}\right) L - U_1 . \qquad (20)$$

Firm l's profit is lowest if $U_1 = \sqrt{N_U L} - N_U$ and $U_2 = 0$, so if profit is positive at this point it will be positive for all points on (15) where $U_2 > 0$. Thus we need only show that equation (20) is positive, or

$$\left(\frac{\sqrt{N_U L} - N_U}{\sqrt{N_U L}}\right) L > \sqrt{N_U L} - N_U \, . \tag{21}$$

Recall that $\sqrt{N_U L} - N_U > 0$ by Lemma Al. Thus we can divide both sides of equation (21) by $\sqrt{N_U L} - N_U$ to obtain $L / \sqrt{N_U L} > 1$ or $L > \sqrt{N_U L}$, which is true by Assumption 2. **Q.E.D.**

If equation (15) is met, Firm 1 maximizes profits for any value of U_2. Defining the set of U_1s that comprise the best reply function as ν_1, we have proven:

Theorem Al: The best reply function of Firm 1 is completely characterized as equation (16) in the body of the paper. **Q.E.D.**

References

Austen-Smith, David and John Wright. 1994. "Counteractive Lobbying," American Journal of Political. Science 38:, 25-44.

Baron, David. 1995. "Integrating Market and Nonmarket Strategies," California Management Review 37:2, 73-85.

Baumgartner, Frank R. and Beth L. Leech. 1998. Basic Interests: The Importance of Groups in Politics and in Political Science. Princeton, NJ: Princeton University Press.

Baumgartner, Frank R. and Beth L. Leech. 2001. "Interest Niches and Policy Bandwagons: Patterns of Interest Group Involvement in National Politics," Journal of Politics 63:4, 1191-1213.

Browne, William P. 1990. "Organized Interests and Their Issue Niches: A Search for Pluralism in a Policy Domain," Journal of Politics 52:, 477-509.

Browne, William P 1995. Cultivating Congress. Lawrence, KA: University of Kansas Press.

Denzau, Arthur T. and Michael C. Munger. 1986. "Legislators and Interest Groups: How Unorganized Interests Get Represented," American Political Science Review 80:, 89-106.

Ellingsen, Tore. 1991. "Strategic Buyers and the Social Costs of Monopoly," American Economic Review 81:3, 648-657.

Esteban, Joan and Debraj Ray. 2001. "Collective Action and the Group Size Paradox," American Political Science Review 95:3, 663-672.

Evans, Diana M. 1991. "Lobbying the Committee: Interest Groups and the House Public Works and Transportation Committee," in Allan J. Cigler and Burdett A. Loomis (eds.) Interest Group Politics, 3rd edition. Washington, DC: CQ Press.

Ferejohn, John A. and Roger D. Noll. 1985. "Promises, Promises: Campaign Contributions and the Reputation for Services," Stanford, CA: Hoover Institution Working Papers in Political Science No. P-85-1.

Fritschler, Lee J. 1969. Smoking and Politics. New York: Appleton-Century Crofts.

Godwin, R. Kenneth and Barry J. Seldon. 2002. "What Corporations Really Want From Government: The Public Provision of Private Goods," in Allan J. Cigler and Burdett A. Loomis (eds.) Interest Group Politics, 6th edition. Washington, DC: CQ Press.

Gray, Virginia and David Lowery. 1998. "To Lobby Alone or in a Flock: Foraging Behavior Among Organized Interests," American Politics Quarterly 26: 5-34.

Grier, Kevin B., Michael C. Munger and Brian E. Roberts. 1994. "The Determinants of Industry Political Activity, 1978-1986," American Political Science Review 88: 911-926.

Hall, Richard L. and Frank W. Wayman. 1990. "Buying Time: Moneyed Interests and the Mobilization of Bias in Congressional Committees," American Political Science Review 84: 797-820.

Heinz, John P., Edward O. Laumann, Robert L. Nelson, and Robert H. Salisbury. 1993. The Hollow Core: Private Interests in National Policy Making. Cambridge, MA: Harvard University Press.

Hojnacki, Marie. 1998. "Organized Interests' Advocacy Behavior in Alliances." Political Research Quarterly 51 (June): 437-460.

Hojnacki, Marie and David C. Kimball. 1998. "Organized Interests and the Decision of Whom to Lobby in Congress," American Political Science Review 92: 775-790

Humphries, Craig. 1990. The Political Behavior of American Corporations. Unpublished Ph.D. dissertation, Washington University St. Louis, MO.

Jacbson, Gary. C. 1980. Money in Congressional Elections. New Haven: Yale University Press.

Kahana, Nava and Shmuel Nitzan. 1999. "Uncertain Preassigned Non-Contestable and Contestable Rents," European Economic Review, 43: 1705-1721.

Lohmann, Susanne. 1998. "An Information Rationale for the Power of Special Interests," American Political Science Review 92:4 809-827.

Lowi, Theodore J. 1969. The End of Liberalism, New York: Norton.

Meier, Kenneth J. 1985. Regulation, Politics, Bureaucracy, and Economics. New York: Saint Martins.

Munger, Michael C. 1989. "On the Political Participation of the Firm in the Electoral Process: An Update" Public Choice 56:3 295-298

Nitzan, Shmuel. 1991. "Collective Rent Dissipation," The Economic Journal, 101: 1522-1534.

Olson, Mancur. 1965. The Logic of Collective Action: Public Goods and the Theory of Goods, Cambridge, MA: Harvard University Press.

Ostrom, Elinor. 1991. Governing the Commons: The Evolution of Institutions for Collective Action: Political Economy of Institutions and Decisions. Cambridge, England: Cambridge University Press.

Persson, Torsten and Guido Tabellini. 2000. Political Economics. Cambridge, Mass: MIT Press.

Posner, Richard A. 1975. "The Social Costs of Monopoly and Regulation," Journal of Political Economy, 83: 807-827.

Rogerson, William P. 1982. "The Social Costs of Monopoly and Regulation: A Game-Theoretic Analysis," Bell Journal of Economics, 13(2): 391-401.

Salamon, Lester M. and John J. Siegfried. 1977. "Economic Power and Political Influence: The Impact of Industry Structure on Public Policy," American Political Science Review 71 (December): 1026-1043.

Smith, Mark A. 2000. American Business and Political Power: Public Opinion, Elections, and Democracy. Chicago: University of Chicago Press.

Snyder, James M. 1992. "Long-Term Investing in Politicians; or, Give Early, Give Often," Journal of Law and Economics 35: 15-43.

Snyder, Susan K. and Barry R. Weingast. 2000. "The American System of Shared Powers: The President, Congress, and the NLRB," Journal of Law, Economics and Organization 16:2 269-305.

Stratmann, Thomas. 1991. "What Do Campaign Contributions Buy? Deciphering Causal Effects of Money and Votes," Southern Economic Journal. 606-620.

Stratmann. Thomas. 1992. "Are Contributors Rational? Untangling Strategies of Political Action Committees," Journal of Political Economy, 100:3, 647-664.

Stratmann, Thomas. 1995. "Campaign Contributions and Congressional Voting: Does the Timing of Contributions Matter?" Review of Economics and Statistics, 127-136.

Suarez, Sandra L. 2000. Does Business Learn? Tax Breaks, Uncertainty, and Political Strategies. Ann Arbor: University of Michigan Press.

Sun, Guang-Zhen and Yew-Kwang Ng. 1999. "The Effect of Number and Size of lnterest Groups on Social Rent Dissipation," Public Choice, 101, 251-265.

Tullock, Gordon. 1980. "Efficient Rent Seeking," in James M. Buchanan, Robert D. Tollison and Gordon Tullock (eds.) Toward a Theory of the Rent Seeking Society, College Station, TX: Texas A&M University Press.

Wenders, John T. 1987. "On Perfect Rent Dissipation," American Economic Review, 77:3, 456-459.

Wilson, James Q. 1973. Political Organizations, New York: Basic Books.

Referees' Attachment

This attachment contains proofs for the model in "Firm Lobbying for Private vs. Collective Rents."
The authors intend to publish this material as part of a separate paper regarding the rent-seeking literature.
It is provided here to assist the referees.

A The Best Reply Functions for the Private Good Game

We restrict analysis to the first quadrant and its axes because firms' spending must be nonnegative. We first establish that the R_1 and R_2 intercepts of equation (12) in the paper are positive. Then, because equation (12) in the paper is obviously continuous, we know that it passes through the first quadrant. It follows that, for $N_R \in (0, \infty)$, there are points of equation (12) at which R_1 and R_2 are both positive. The R_1 intercept is found by setting $R_2 = 0$ in equation (12). This intercept is

$$R_1 = \sqrt{N_R V} - N_R \,. \tag{1}$$

The R_2 intercept is found by setting $R_1 = 0$ in equation (12) and solving to find

$$R_2 = \frac{V - N_R}{\alpha} \,. \tag{2}$$

Lemma Al: The R_1 and R_2 intercepts of equation (12) are positive. Furthermore, the R_1 intercept is less than the R_2 intercept.

Proof: By Assumption 1 in the paper, $V > N_R$. Hence, $\sqrt{N_R V} > \sqrt{N_R N_R} = N_R$. Therefore, $\sqrt{N_R V} - N_R > 0$, so the R_1 intercept given by equation (1) is positive. Next, because $V - N_R > 0$ by Assumption 1 and because $\alpha > 0$ by assumption, it follows that $\frac{V - N_R}{\alpha} > 0$, so the R_2 intercept is positive. Finally, $V > N_R$ implies $V = \sqrt{VV} > \sqrt{N_R V}$, hence $V - N_R > \sqrt{N_R V} - N_R$. Because $\alpha \in (0, 1]$, we have $\frac{V - N_R}{\alpha} > \frac{\sqrt{N_R V} - N_R}{\alpha} \geq \sqrt{N_R V} - N_R$, and we have proven the lemma. **Q.E.D.**

We next establish Firm l's willingness to invest in lobbying according to equation (12) in the paper.

Lemma A2: Firm l's profit is non-negative on equation (12) for $R_1 \in [0, \sqrt{N_R V} - N_R]$.

Proof: Expected profit is

$$\Pi_1 = \left(\frac{R_1}{R_1 + \alpha R_2 + N_R}\right)V - R_1. \tag{3}$$

It is obvious that if $R_1 = 0$ then $\Pi_1 = 0$. Next consider $R_1 \in (0, \sqrt{N_R V} - N_R]$. Rearranging (3), we see that profit is non-negative if $V \geq R_1 + \alpha R_2 + N_R$ or equivalently if $V - \alpha R_2 - N_R \geq R_1$, which by equation (12) can be expressed as $V - \alpha R_2 - N_R \geq R_1 = \sqrt{(\alpha R_2 + N_R)V} - \alpha R_2 - N_R$. So profit is non-negative if

$$V \geq \sqrt{(\alpha R_2 + N_R)V} \tag{4}$$

We complete the proof by showing that equation (4) holds on equation (12). To that end, note that the right-hand side of (4) increases in R_2, and that R_2 reaches a maximum of $(V - N_R)/\alpha$ in the interval of this lemma. Then, because $(V - N_R)/\alpha \geq R_2$ it follows that $\sqrt{\left[\alpha(V - N_R)/\alpha + N_R\right]V} = V \geq \sqrt{(\alpha R_2 + N_R)V}$, and we have proven the lemma. **Q.E.D.**

Defining the set of R_1 values that satisfy equation (12) as ρ_1, we have proven

Theorem Al: The best reply function of Firm 1 is

$$\rho_1 = \begin{cases} \sqrt{(\alpha R_2 + N_R)V} - \alpha R_2 - N_R & \text{for } 0 \leq R_2 \leq \dfrac{(V - N_R)}{\alpha} \\ 0 & \text{for } \dfrac{(V - N_R)}{\alpha} < R_2 \end{cases} \tag{5}$$

B The Shape of the Best Reply Function for the Private Good Game

We show that ρ_1 is strictly concave over $R_2 \in [0, (V - N_R)/\alpha]$, but that its exact shape depends on the relative magnitudes of V and N_R. Two lemmas prove these conjectures and will be useful later.

Lemma B1: Firm l's best reply function is strictly concave over $R_2 \in [0, (V - N_R)/\alpha]$.

Proof: The first derivative of ρ_1 with respect to R_2 is

$$\frac{\partial \rho_1}{\partial R_2} = \frac{\alpha \sqrt{V}}{2\sqrt{\alpha R_2 + N_R}} - \alpha \tag{6}$$

and the second derivative is therefore

$$\frac{\partial^2 \rho_1}{\partial R_2^2} = \frac{-\alpha^2 \sqrt{V}}{4\sqrt{(\alpha R_2 + N_R)^3}},$$

which is clearly negative. Therefore, ρ_1 is strictly concave. **Q.E.D.**

Lemma B2: If $V \leq 4N_R$ then ρ_1 is monotonically decreasing over $R_2 \in [0, (V - N_R)/\alpha]$. If $V > 4N_R$ then ρ_1 has an interior maximum at $R_2 = (V/4 - N_R)/\alpha$, which is in the interior of $[0, (V - N_R)/\alpha]$.

Proof: The slope of ρ_1 is given by $\partial\rho_1/\partial R_2$. Rearranging equation (6), we see that

$$\frac{\partial \rho_1}{\partial R_2} > 0 \qquad \text{if} \qquad R_2 < \frac{V/4 - N_R}{\alpha}$$

$$\frac{\partial \rho_1}{\partial R_2} < 0 \qquad \text{if} \qquad R_2 > \frac{V/4 - N_R}{\alpha}$$

$$\frac{\partial \rho_1}{\partial R_2} = 0 \qquad \text{if} \qquad R_2 = \frac{V/4 - N_R}{\alpha}$$

We are concerned with ρ_1 over $R_2 \in [0, (V - N_R)/\alpha]$. Now $V/4 - N_R < V - N_R$, so $(V/4 - N_R)/\alpha < (V - N_R)/\alpha$. Thus the critical point $R_2 = (V/4 - N_R)/\alpha$ is less than $(V - N_R)/\alpha$. However, if V is small enough that $(V/4 - N_R)/\alpha \leq 0$ then R_2 cannot be less than $(V/4 - N_R)/\alpha$ since R_2 cannot be negative. It follows that $\partial\rho_1/\partial R_2 \leq 0$ on $R_2 \in [0, (V - N_R)/\alpha]$. Note that $(V/4 - N_R)/\alpha \leq 0$ implies that $V \leq 4N_R$. Thus, we see that if $V \leq 4N_R$ then ρ_1 is decreasing and strictly concave in R_2. However, if $V > 4N_R$ then there exist values of $R_2 \in [0, (V - N_R)/\alpha]$ for which ρ_1 is increasing in R_2, and some for which ρ_1 is decreasing in R_2. Because the second derivative is negative by Lemma B1, ρ_1 reaches a maximum where $R_2 = (V/4 – N_R)/\alpha$. Hence, if $V > 4N_R$ then ρ_1 has an interior maximum at $R_2 = (V/4 - N_R)/\alpha \in (0, (V - N_R)/\alpha)$. **Q.E.D.**

C Equilibrium in the Private Good Game

We must establish the existence of equilibria because games with infinite strategy sets, such as the one we explore, may not have an equilibrium (Morrow 1994, p. 90). We first note the following: 1) the strategy space $R_i \in [0, V]$ for $i = 1, 2$ are compact and convex; 2) the expected profit function, $\Pi_i = [R_i/(R_i + \alpha R_j + N_R)]V - R_i$ is (obviously) defined, continuous, and bounded on the strategy sets; 3) Π_i is strictly concave in R_i because $\partial^2\Pi_i/\partial R_i^2 < 0$.

Theorem Cl: The game has at least one Nash equilibrium.

Proof: The profit function is concave, hence it is also quasiconcave (Varian 1992, p. 496). This, together with points (1) and (2) above, satisfies the conditions for a well-known existence proof for Nash equilibrium (see, e.g., Fudenberg and Tirole, 1995, p.34). **Q.E.D.**

Thus, there exists at least one Nash equilibrium. However, it is possible that multiple equilibria exist, in which case we would have to decide which equilibrium is most appropriate. We therefore consider uniqueness. To this end, we establish

Theorem C2: If $V \leq 4N_R$ then there is a unique and stable Nash equilibrium for the game. Furthermore, the equilibrium is symmetric, so in equilibrium $\rho_1 = \rho_2$.

Proof: Theorem 3.4 of Friedman (1990, p. 84) establishes that, given points 1 and 2 above, a unique equilibrium exists in this game so long as the best reply functions are contractions. In our game, the best reply functions, given by equation (5), do not contain R_1 on the right hand side. Thus, because the best reply functions are symmetrical, to show that the best reply functions are contractions we need only show that the absolute value of $\partial\rho_1/\partial R_2$ for equation (5) is less than one. Suppose $V \leq 4N_R$.

Then by Lemmas B1 and B2, ρ_1 is monotonically decreasing and strictly concave. Hence, $\partial\rho_1/\partial R_2 \leq 0$ and reaches its minimum value at the largest possible value of R_2, where $R_2 = (V - N_R)/\alpha$. Substituting this into equation (6), we get

$$\frac{\partial\rho_1}{\partial R_2} \geq \frac{\alpha\sqrt{V}}{2\sqrt{\alpha(V - N_R)/\alpha + N_R}} - \alpha = \frac{\alpha\sqrt{V}}{2\sqrt{V}} - \alpha = \frac{-\alpha}{2}.$$

Note that $|-\alpha/2| \leq 1$ because $\alpha \in (0, 1]$. Hence $0 \leq |\partial\rho_1/\partial R_2| \leq 1/2 < 1$, and uniqueness is guaranteed for $V \leq 4N_R$. Symmetry of the best reply function assures that the unique equilibrium occurs where $\rho_1 = \rho_2$ **Q.E.D.**

Uniqueness is not so easy to show in the case where $V > 4N_R$ because the best reply function is not necessarily a contraction. As R_2 approaches 0 from above, $\partial\rho_1/\partial R_2$ increases, approaching

$$\frac{\alpha\sqrt{V}}{2\sqrt{N_R}} - \alpha > \frac{\alpha\sqrt{4N_R}}{2\sqrt{N_R}} - \alpha = 0$$

While we know that the derivative is greater than 0, we have no upper bound for it. Certainly, for some cases the derivative will be less than 1, but this will not hold with generality. Another well-known uniqueness theorem requires the Jacobian of the best reply functions to be negative quasidefinite (see, e.g., Friedman 1990, pp. 85-87). However, our best reply functions do not satisfy this condition. On the other hand, we can apply the contraction theorem to special cases where $V > 4N_R$. We have

Theorem C3: If $4\left(\frac{1+\alpha}{\alpha}\right)^2 N_R > V > 4N_R$, there is a unique and stable Nash equilibrium for the game. The equilibrium is symmetrical, so in equilibrium $\rho_1 = \rho_2$.

Proof: First note that this is not a vacuous case, because $(1 + \alpha)/\alpha > 1$. By Theorem 3.4 of Friedman (1990, p. 84) we must show that the best reply function is a contraction. For the portion of the best reply function that is downward sloping, we know from the proof of Theorem C2 that $|\partial\rho_1/\partial R_2| < 1$. On the upward sloping portion, $\partial\rho_1/\partial R_2 \geq 0$; and the largest value of $\partial\rho_1/\partial R_2$ occurs at $R_2 = 0$, where, by equation (6) of the Attachment we see that

$$\frac{\partial \rho_1}{\partial R_2} \leq \frac{\alpha\sqrt{V}}{2\sqrt{N_R}} - \alpha$$

Suppose $V < 4\left(\frac{1+\alpha}{\alpha}\right)^2$ N_R. Then

$$\frac{\partial \rho_1}{\partial R_2} \leq \frac{\alpha\sqrt{V}}{2\sqrt{N_R}} - \alpha < \frac{\alpha\sqrt{4\left(\frac{1+\alpha}{\alpha}\right)^2 N_R}}{2\sqrt{N_R}} - \alpha = \frac{2(1+\alpha)\sqrt{N_R}}{2\sqrt{N_R}} - \alpha = 1\,.$$

Thus, on the upward sloping portion of ρ_1, $0 \leq \partial\rho_1/\partial R_2 < 1$, so the best reply function is a contraction. Therefore, $|\partial\rho_1/\partial R_2| < 1$ for the best reply function in the special case of this Theorem, so there is a unique equilibrium for such special cases. Furthermore, symmetry of the best reply functions assures that $\rho_1 = \rho_2$. **Q.E.D.**

We have not been able to prove uniqueness in the case where $V > 4\left(\frac{1+\alpha}{\alpha}\right)^2 N_R$, but as we point out in the body of the paper, even if cases of multiple equilibria existed, the symmetrical equilibrium is the only stable equilibrium and would be the appropriate equilibrium to consider.

References for Referees' Attachment

Friedman, James W. 1990. Game Theory with Applications to Economics (2nd ed). New York: Oxford University Press.

Fudenberg, Drew and Jean Tirole. 1995. Game Theory. Cambridge, MA: The MIT Press.

Morrow, James D. 1994. Game Theory for Political Scientists. Princeton: Princeton University Press.

Varian, Hal R. 1992. Microeconomic Analysis (3rd ed.). New York: Norton and Company