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Lobbying of Firms by Voters

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Abstract

A firm may induce voters or elected politicians to support a policy it favors by suggesting that it is more likely to invest in a district whose voters or representatives support the policy. In equilibrium, no one vote may be decisive, and the policy may gain strong support though the majority of districts suffer from adoption of the program. When votes reveal information about the district, the firm's implicit promise or threat can be credible.

1 Introduction

We commonly suppose that a special interest incurs a cost in influencing policy: a firm may have to pay a bribe, hire persuasive lobbyists, and so on. In short, the special interest must pay for a favor it seeks from the voters or politicians who hold power.

But the opposite view, pursued here, can also be fruitful: the voters or politicians seek a favor from the special interest, and pay for it by supporting a policy the special interest favors. An attraction of this view is its explanation for the "Tullock paradox," the observation that the level of political

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contributions is surprisingly small compared to the benefits special interests can receive (Tullock 1972; see also Ansolabehere, de Figueiredo, and Snyder 2003).

In the United States total corporate lobby expenditures and campaign contributions are surprisingly small. Thus, in his work on the effects of campaign contributions on roll-call voting, Chappell (1982) identifies legislation considered important to special interest groups. In the election year preceding the House vote to stop funding of five B-1 bombers, Rockwell International gave a minuscule $7,800 to 35 congressmen. Common Cause (1979) estimates that in the 1979-1980 election cycle corporate PACs contributed only $19.2 million to congressional candidates (Kosterlitz 1982). In the first quarter of 1984, registered lobbyists spent only $11.75 million on such items as office rent, salaries and newsletters. A congressman sitting on the House Armed Services Committee or on the Defense subcommittee of the House Appropriations Committee could expect to receive only about one thousand dollars in annual contributions from the largest defense firms: not from each contractor, but from the twenty largest contributors combined. The recipient of the largest contributions received only $23,450 from these firms (Weinberger and Greevy 1982).

Nor is the size of illegal contributions large. Investigations following the Watergate scandal found that twenty-one companies made illegal contributions in 1972, totaling only $968,000; the largest one was made by Northrop for a mere $150,000 (Alexander 1980). These sums are small compared to the value of government contracts, suggesting that our understanding of rent seeking is incomplete.[1]

The behavior we consider was well captured by Lawrence O'Brien, who had served as Special Assistant to presidents John F. Kennedy and Lyndon B. Johnson, as Postmaster General of the United States, and as National Chairman of the Democratic Party. In an oral interview[2] he said

> The NFL [National Football League] enjoyed an excellent relationship with the Congress. Some of it was, however, on the basis of NFL expansion–where the NFL might locate in the future and the constant quest on the part of some members for a

[1]Additional U.S. data indicating that contributions are small compared to the value of public policies at stake is reported by Ansolabehere, de Figueiredo, and Snyder (2003).

[2]Transcript, Lawrence F. O'Brien Oral History Interview XVII, 12/17/86, by Michael L. Gillette, Internet Copy, LBJ Library.

> franchise location in their state... Over the course of time, expansion was effectively played off against legislation, to the benefit of the NFL...This was an internal matter in the Congress. The league operated directly with the Congress. They could pick their spots and they effectively utilized this leverage that they had...
>
> [They held off] decisions on franchises, because if you had a half a dozen to a dozen possible sites and that involved ten or twelve states, you were in a pretty good position.

The analysis below formalizes this idea, supposing that a legislator who votes for a policy a firm wants may thereby attract a firm's investment to his district. If no legislator is decisive, then a single legislator's vote does not determine policy, so that a legislator may vote for the policy the firm favors even if the policy adopted hurts all districts.

Though we will speak of a firm's investment, the basic mechanism we study also applies to different situations. For example, a congressman aiming to run for higher office may want to establish a particular voting record. A reinterpretation of our model suggests that congressmen may then vote for a policy which they prefer be rejected, and that all the congressmen would be better off if they jointly agreed to oppose the policy.

2 Literature

This paper addresses several issues studied in other models of political influence. Some models suppose that special interests buy influence. Other models suppose special interests provide information to policymakers. Our model relates to both.[3]

2.1 Influence buying

A classic analysis of how special interests may influence public policy is Tullock (1980), who considers rent-seeking contests. In these contests policy makers are modeled through a contest success function which translates a

[3]Other models that combine both strands of literature are Bennedsen and Feldmann (2006) and Dahm and Porteiro (2008a and 2008b). In these models special interests choose between providing policy-relevant information or engaging in non-informational influence activities (such as by making campaign contributions).

special interest's spending on influencing policy to the probability that government adopts the policy it favors. This approach, as usually postulated, suffers from a commitment problem: once rent-seeking efforts are exerted, the utility-maximizing choice for a policy maker need not be to choose a policy with the probability specified by the contest success function.[4]

A different model considers menu auctions (see Grossman and Helpman 1994). The model is usually applied to determine the value of a continuous policy variable government will set in response to payment from firms in affected industries. Each firm is assumed to make an (implicit) offer relating prospective contributions to the policies chosen by the government. The government then sets a policy vector (Grossman and Helpman (1994) consider a set of import and export taxes).

This approach suffers from two weaknesses, that our approach overcomes. First, a menu auction effectively considers bribery, which in most democracies is illegal, and is often unpopular with voters. Second, it assumes that each special interest can commit to a payment. But, of course, after the government sets policy, each special interest would gain by reneging on the promised payment. Nor does punishment by a policymaker appear to work: McCarty and Rothenberg (1996) find that incumbents do *not* punish lobbying groups who had not supported them (or who had supported their opponents) in a prior election.

In a menu auction, special interests commit to contingent payments, and in equilibrium pay the policy maker. Dal Bó (2007) offers a different strategy for the special interest, showing that the equilibrium can have the special interest influence policy while paying almost nothing. His insight (which we adapt) is that if a strong majority of legislators can be induced to vote for the special interest's policy, then no legislator is decisive, and therefore each is indifferent between voting for and against the policy. The special interest can induce legislators to support it by committing to pay a legislator if and only if he casts a *decisive* vote in its favor. This approach, unlike the menu auction model and the rent-seeking model, requires the special interest to make only a very small payment in equilibrium. Like previous approaches, however, it suffers from the problem that special interests must commit to contingent payments.

[4] Analyzing a game with two rent-seekers, Corchón and Dahm (2009) show that some contest success functions can be derived as utility-maximizing choice from a setting in which rent-seekers are uncertain about the type of politician. See also the literature reviewed therein.

2.2 Information provision

Our discussion of lobbying relates to literature which considers information lobbyists may provide policy makers. The information can concern the importance of the problem a legislator is considering (Hansen 1991, Smith 1995), the effectiveness of policy (Krehbiel 1991, Smith 1995), and the electoral consequences of different policies (Kingdon 1984 and Hansen 1991). Hansen (1991) supposes that a reelection-minded legislator is unsure about the policy positions that would best help reelection. He therefore listens to interest groups which have private information about constituency opinion, with the interest groups in turn persuading a legislator that his political self-interest lies in taking group-friendly positions. Hansen (1991) also offers evidence that organizations are granted access by congressmen when the organizations know more than other potential informants about constituent preferences, issues, and other representatives.

Smith (1984) considers legislators who rely on informants that quickly provide interpretations on the political consequences of different actions. Hall (2000) argues that legislators grant access to organized interests because of the informational subsidies groups provide: lobbyists selectively subsidize the information and legislative labor costs of members who already agree with them. Lobbyists can thus make it easier for a legislator to expend greater effort advancing a policy objective she has in common with the group. Legislators in turn act as if they were working on behalf of the group, when instead they work only on behalf of themselves. Several other papers model legislators who seek reelection and who aim to take positions popular in their districts, and groups having private information about district opinion which they strategically transmit to influence the legislator (see Austen-Smith 1993, Austen-Smith and Wright 1992 and 1994, Rasmussen 1993, and Lohmann 1995 and 1998). The information that legislators seek can also relate to the effects of policy (Lohmann 1995, and Wright 1996).

Our model differs from this strand of the literature because we look at the opposite path, how votes inform special interests. Empirical support for our assumption that policy can signal a jurisdiction's type appears in Raff and Srinivasan (1998). They suppose that a firm which is initially uncertain about business conditions in a host country may infer that a government which offers tax incentives is signaling favorable business conditions. The data they report are consistent with a signaling model which predicts that tax incentives correlate positively with country risk and the degree of openness.

In our model the special interest could also become informed by asking each district whether it favors the firm's investment. The answer is cheap talk (see Crawford and Sobel 1982), with information credibly revealed because no district has an incentive to lie. It is in the firm's interest, however, to invest preferentially in districts that support the policy the firm favors, as this allows the policy to be approved.

2.3 Local benefits

Our consideration of benefits to a district or group relates to work by Schwartz (1987) and by Uhlaner (1989). Uhlaner (1989) supposes that a leader of a group can induce turnout by granting members of his group private benefits.[5] Schwartz (1987) discusses a "local public benefit" to a group which increases with the number of votes the winner received from that group.

How legislators can obtain local benefits is discussed by Bernheim, Rangel, and Rayo (2006), who analyze legislative policy making when the default policy changes from period to period, and the agenda setter in each period offers a policy that depends on past policies. The authors show that a majority might support a pork-barrel policy that hurts almost every legislator. This result resembles ours in the sense that (almost) all legislators would be better off if there were no vote. However, the institution Bernheim, Rangel, and Rayo (2006) examine differs from ours, and so has different voting incentives. In particular, in our model a legislator who votes for a tariff wins a reward independently of whether the policy is adopted; that is not true in the pork barrel setting. Another important difference is that, unlike us, Bernheim, Rangel, and Rayo (2006) assume that legislators vote sincerely, as if each was always pivotal. We allow a legislator to recognize that his vote may not be decisive.

3 Assumptions

We consider one special interest, or firm. It favors a policy (say a tariff) that would give it a benefit of B, at a cost of C to each of the $n > 2$ districts. To make the problem interesting, suppose the tariff is inefficient: $nC > B$.

[5] Lapp (1999), however, testing the model, finds little empirical evidence that ethnic leaders can increase turnout among their followers.

Indeed, we can make the stronger assumption that the tariff is bad even when confined to a mere majority of districts: $(n+1)C/2 > B$.[6]

The firm contemplates an investment, say a new factory. In each district, voters may view the investment as either good (giving a benefit of g) or as bad (imposing a cost of b).[7] A district may favor the investment because of job and income creation. A district may oppose the investment because of environmental concerns. Again, we are interested in situations with $C > g$: the benefit to the district from the investment is less than the cost to it of the tariff. We denote by m the number of districts which favor the investment; we assume that m at least equals a majority of districts plus one, or $m \geq 1 + (n+1)/2$. To simplify the notation we also denote the consequences of investment for a district as $\pi \in \{-b, g\}$. A district with consequence g favors the investment; a district with consequence $-b$ opposes it.

The firm prefers to invest in a district which favors the investment rather than a district which opposes it. The firm, however, is initially unaware of the views in each district; it only knows the probability γ that any district favors the investment. Each district, or the voters in it, does know whether it would gain or lose from the investment.

For several reasons the special interest may prefer to invest in a district which favors the investment. The firm may want a favorable business climate, where it will face little litigation, will find it easy to get environmental and zoning approvals, and so on. Or the firm may prefer to locate in a district where many workers (and so, by implication many voters) would want to work at such a firm: it could then offer a lower wage, choose from a larger pool of workers, enjoy the productivity benefits of high morale, and so on.

Each district votes for or against the tariff, or alternatively votes for one of two candidates, whose positions on the tariff are known. The tariff is adopted if a simple majority of districts vote for it.

The timing of the game is as follows:

1. Each district recognizes whether an investment by the firm would benefit or harm it.

2. A district votes for or against the tariff.

3. If a majority of districts vote for the tariff, it is imposed.

[6] For brevity, we take n to be an odd number.

[7] The firm may invest with probability less than 1. The values of g and b can then be taken as expected values.

4. The firm chooses where to invest, independent of whether the tariff is imposed.

5. Payoffs are realized.

4 Benchmark result

As in many other voting games, the game we study has many equilibria. One equilibrium is particularly compelling. Our approach is therefore to characterize this equilibrium quickly and to postpone the analysis of further equilibria.

To do so we simplify the analysis in this section in two ways. First, we assume that the firm infers that a district voting for the tariff favors the investment; we check informally when this inference is consistent with the voting behavior of the districts. This simplification allows us to look at Nash equilibria rather than at Perfect Bayesian equilibria, and will be relaxed later (in Subsection 5.3).

Second, we focus on a symmetric equilibrium with pure strategies. By "symmetry" we mean that each district which favors the investment uses the same strategy as that of the other districts favoring the investment, and similarly for every district which opposes the investment.[8] The next section considers extensions to our basic framework including asymmetric pure-strategy equilibria (in Subsection 5.1) and symmetric mixed-strategy equilibria (in Subsection 5.2).

Consider a district's voting decision. Denote by k the number of other districts that vote for the tariff, and remember that $\pi \in \{-b, g\}$ indicates the district's payoff from the investment. In two situations the district's vote is not pivotal, that is, the collective decision does not depend on the district's vote. In neither situation the district's vote affect whether the cost C of the tariff is imposed. The voting decision matters, however, because by voting for the tariff the district may attract the firm's investment.[9] In the first

[8]Obviously, we do not require that a district which favors the investment uses the same strategy as that of a district which opposes the investment, with the labels 'voting for' and 'voting against' swapped.

[9]Strictly speaking, we assume that a district that does not want the investment cannot prevent the firm from locating in the district. Incorporating such a veto power, Proposition 1 below still holds, although the strategy of the districts that oppose the investment is then weakly dominant.

situation the district in question knows that, excluding itself, a majority of districts vote against the tariff, that is, $k \leq (n-3)/2$.[10] Here a district strictly prefers voting for the tariff if and only if

$$\frac{\pi}{k+1} > \begin{cases} 0 & \text{if} \quad k > 0 \\ \frac{\pi}{n} & \text{if} \quad k = 0 \end{cases} . \tag{1}$$

If all districts vote against the tariff, the firm learns nothing, and chooses randomly where to invest.

In the second situation, the district in question knows that, excluding itself, a majority of districts vote for the tariff, that is, $k \geq (n+1)/2$, implying that a district strictly prefers to vote for the tariff if and only if

$$\frac{\pi}{k+1} - C > -C. \tag{2}$$

On the other hand, when $k = (n-1)/2$ the district's vote is pivotal and the district's vote matters for both the approval of the tariff and the firm's decision where to invest. Here a district votes for the tariff if and only if

$$\frac{\pi}{k+1} - C > 0, \tag{3}$$

or, since $k = (n-1)/2$, $2\pi/(n+1) - C > 0$. Intuitively, a pivotal district only votes for the tariff if possible gains from increasing the chance of attracting the firm's investment outweigh the cost of the tariff to the district.

Consider a district which views the investment as bad ($\pi = -b$). From the above equations (1), (2) and (3), we see that voting against the tariff is a strictly dominant strategy.

Now consider a district that favors the investment ($\pi = g$). By analogous reasoning, when $C/g < 2/(n+1)$, voting for the tariff is a strictly dominant strategy. For higher values of C/g voting for a tariff is not the dominant strategy.

Consider, however, the following voting profile in which each district which favors the investment votes for the tariff, and each other district uses its strictly dominant strategy and votes against the tariff. By our assumption on m, at least $(n+1)/2$ other districts vote for the tariff. Therefore no district's vote is decisive and the trade-off in equation (2) is relevant. Hence, a district which favors the investment prefers to vote for the tariff.

[10] Note that, by definition of n and k, $n-k-1$ other districts vote against the tariff, which constitute a majority if $n-k-1 \geq (n+1)/2$, implying $k \leq (n-3)/2$.

This voting behavior is consistent with the firm's inference. If a district which favors the investment votes for the tariff, whereas a district which opposes the investment votes against the tariff, then the firm will rationally conclude that it would gain more by investing in a district that supported the tariff than in a district which opposed it. Thus, indeed, a district which favors the investment is more likely to attract the investment by voting for the tariff than by voting against it.

Note also that it is not an equilibrium for all districts to vote against the tariff: no district would be decisive, and a district which favors the tariff could then attract the investment by voting for the tariff (see equation (1) with $k = 0$).[11]

We summarize with

Proposition 1 *There exists a unique pure-strategy symmetric Nash equilibrium. In this equilibrium all districts which favor the investment vote for the tariff; all other districts vote against the tariff, and the tariff is approved. If the benefits to the districts which favor the investment is sufficiently high, that is, if $C/g < 2/(n+1)$, then this equilibrium is in strictly dominant strategies.*

Measuring social welfare by the sum of the utilities of the districts and of the firm, we easily see that nothing prevents an inefficient outcome from arising. In the unique equilibrium, a majority vote for the tariff—the firm gains B, while the districts collectively lose nC. The inefficiency arises because for efficiency the benefits and costs of the tariff matter (B and C), but in equilibrium each district's vote is based on its individual benefit or cost in attracting the firm's investment ($\pi \in \{-b, g\}$). For the same reason, there might be an inefficient equilibrium in strictly dominant strategies.[12]

Notice that the preceding supposes that votes on the tariff allow the firm to benefit from matching the firm's investment location to a district which favors the investment. If the benefits from good matches are low as compared

[11] Besides the two voting profiles described above, two other symmetric strategy profiles are candidates for an equilibrium. Each, however, requires districts which do not favor investment to use a strictly dominated strategy.

[12] To see that a dominant strategy equilibrium and an inefficiency are not mutually exclusive, consider the example in which $g = B = 1$. It must hold that $B/n < C$ and $C/g < 2/(n+1)$. These expressions define a non-empty interval for C described by $1/n < C < 2/(n+1)$. But, of course, when the inefficiency becomes increasingly severe, the equilibrium is no longer in dominant strategies.

to the net costs of the tariff, then the inefficiency is not reversed.[13] We state this result with

Proposition 2 *If the welfare costs of the tariff are sufficiently high, that is if C is high in comparison to B, then the outcome of the collective decision is inefficient.*

5 Extensions

We now discuss several ways of relaxing our assumptions. The first three subsections deal with the existence, common in voting games, of multiple equilibria. We analyze the most obvious alternative equilibria and argue why we find that the one established in Proposition 1 will often best describe reality.

To examine when inefficient policy may arise and how it can be avoided, we relax in the remaining subsections several of our assumptions. It turns out that inefficient policy arises in most of these extensions.

5.1 Asymmetric pure-strategy equilibria

Equilibria with asymmetric pure strategies can appear when $C/g \geq 2/(n+1)$. To see this, consider the following strategy profile where $k = (n-1)/2$ districts which favor the investment vote for the tariff and all others vote against. As a result, the tariff is rejected. Here districts opposing the investment use a strictly dominant strategy. The districts voting for the tariff are not pivotal and following equation (1) behave optimally. A district favoring the investment and voting against the tariff is pivotal. As captured in equation (3), such a district also behaves optimally.

But even allowing for equilibria with asymmetric pure strategies, the solution in Proposition 1 remains an equilibrium and can explain why a legislature adopts an inefficient policy though lobbying expenditures are very low.

[13] This argument can be made precise. Denote by B^m the firm's benefits from a successful matching. In the unique equilibrium, social welfare is $B - nC + B^m + g$. Suppose the alternative is that a vote on the tariff is not held, and that the firm decides randomly where to locate the investment. Then $\gamma(B^m + g) + (1-\gamma)(-b)$. If $(1-\gamma)(B^m + g + b)$ is smaller than $-(B - nC)$, the inefficiency is not reversed.

The relevant question is then which equilibrium is more likely to be played. In our view this is the symmetric one, because in an asymmetric equilibrium districts of the same type behave differently. The asymmetry requires explaining why some districts can preempt others and free-ride on the negative vote of other districts. In other words, asymmetric behavior of districts should be based on some underlying asymmetry among districts which should be modeled explicitly. A natural explanation would be a sequential voting procedure. We consider this institutional arrangement in Subsection 5.8.

5.2 Symmetric mixed-strategy equilibria

Of course, an equilibrium can also have each district which favors the investment vote for the tariff with positive probability less than one. By voting for the tariff it would trade off the increased chance of attracting the investment with the increased probability that the inefficient tariff will be adopted.

Consider a given district which favors the investment. Suppose all other $m-1$ districts which favor the investment vote for the tariff with probability x, and all districts which oppose the investment vote against the tariff. If the district votes for the tariff, then for all realizations of the other district's mixed strategies it has a chance of attracting the investment. Moreover, when enough districts vote for the tariff, the cost C is incurred. More precisely, expected payoffs are given by

$$\sum_{k=0}^{m-1} \binom{m-1}{k} x^k (1-x)^{m-1-k} \ \frac{g}{k+1} \ - \sum_{k=\frac{n-1}{2}}^{m-1} \binom{m-1}{k} x^k (1-x)^{m-1-k} \ C.$$

On the other hand, a district which votes against the tariff would attract the firm's investment only when all other districts vote against. Here also the cost C must be incurred–but only when there are enough votes for the tariff excluding the district's vote. Expected payoffs are thus described by

$$(1-x)^{m-1} \ \frac{g}{n} \ - \sum_{k=\frac{n+1}{2}}^{m-1} \binom{m-1}{k} x^k (1-x)^{m-1-k} \ C.$$

A district favoring the investment is indifferent between voting for and against the tariff if and only if the expected benefits of attracting the firm's

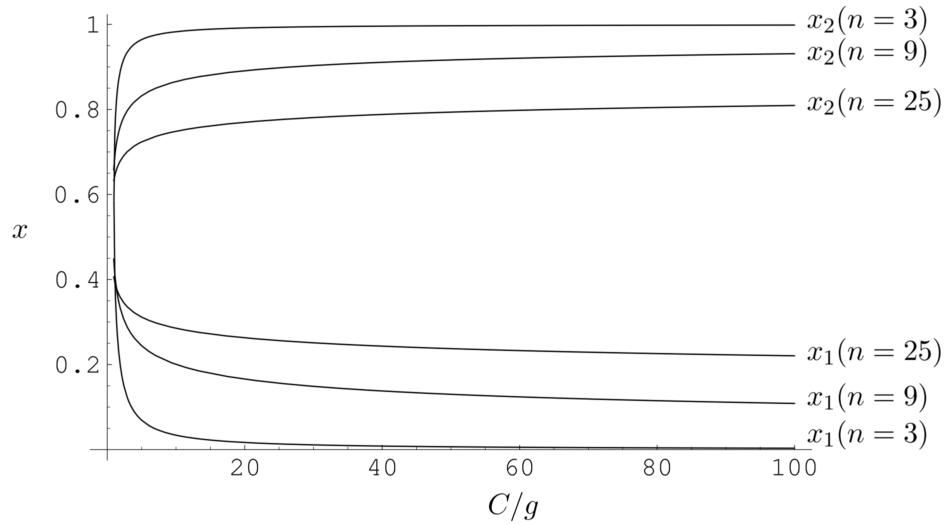

Figure 1: Mixed-strategy equilibria for $n = m \in \{3, 9, 25\}$.

investment for all the possible realizations of the other district's mixed strategies equal the expected benefits of voting against the tariff when the district is pivotal. Formally, we have that

$$(1-x)^{m-1}\,\frac{n-1}{n}\,g \;+\; \sum_{k=1}^{m-1}\binom{m-1}{k}\,x^k(1-x)^{m-1-k}\,\frac{g}{k+1}$$

must equal

$$\binom{m-1}{\frac{n-1}{2}}\,x^{\frac{n-1}{2}}(1-x)^{m-1-\frac{n-1}{2}}\,C.$$

Since this equation involves binomial coefficients, the general case is difficult to solve. But by fixing n and m we can solve explicitly for the symmetric mixed-strategy equilibria. We find that for a mixed-strategy equilibrium to exist C/g must be sufficiently high. However, there then also exist two mixed-strategy equilibria.

The equilibria have very different comparative statics. For the first equilibrium (denoted by x_1), an increase in the ratio C/g reduces the probability a district votes for the tariff; in the second equilibrium (denoted by x_2) the opposite holds.[14] Figure 1 shows these equilibria for $n = m \in \{3, 9, 25\}$. We see that, for these values, as n increases the mixed-strategy equilibria converge to zero and one, respectively.[15] Thus, even under the extension of mixed-strategy equilibria, with positive probability inefficient legislation is approved.

5.3 The firm's beliefs about a district's type

We so far assumed that the firm infers that a district which votes for the tariff favors the investment. This assumption simplified the analysis by allowing us to look at Nash equilibria rather than at Perfect Bayesian equilibria. This inference, however, is not the only possibility.

In a Perfect Bayesian equilibrium the districts and the firm all behave optimally, given their beliefs about the others' actions; these beliefs are, in equilibrium, correct. Notice first that the equilibrium established in Proposition 1 is still an equilibrium when we endogenize the firm's beliefs in this way, because we already checked informally that the firm's inference is consistent with the voting behavior of the districts.

But other equilibria exist. Consider the following candidate equilibrium. All districts that favor the investment vote against the tariff, while all others vote for the tariff. The firm infers that a district which votes for the tariff opposes the investment, so that the firm invests in a district which voted against the tariff. Clearly, the firm's inference is consistent with the districts' voting behavior. Moreover, given this inference and this voting profile, at

[14]It seems that x_1 is a more appealing equilibrium than x_2, because it is plausible that as legislation becomes more inefficient it is less often approved. There are further reasons to focus on x_1. Consider $n = 3$ and suppose x_1 and x_2 exist. Denote by $A(x)$ and $B(x)$ the expected payoffs from voting for and against the tariff, respectively, when the other two districts vote for the tariff with probability x. We have that $A'(x) < 0$, $A''(x) > 0$, $B'(x) < 0$, $B''(x) < 0$, and $A(0) > B(0) > A(1) > B(1)$. Hence, $A(x)$ and $B(x)$ intersect twice (at x_1 and at x_2), and expected payoffs are strictly higher at x_1. Another reasoning could be based on a simultaneous version of Cournot's tatonnement process, adapted to symmetric mixed-strategy equilibria. Consider an equilibrium $\hat{x}$ to be (locally) stable if given a collective mistake in which everyone mixes with probability $\hat{x} + m$, where $m \in \{-\epsilon, \epsilon\}$ with $\epsilon > 0$. Then for all districts $A(\hat{x} + m) > B(\hat{x} + m)$ if $m < 0$, and $A(\hat{x} + m) < B(\hat{x} + m)$ if $m > 0$ Similarly, consider an equilibrium $\hat{x}$ to be (locally) unstable if for some district the opposite inequality holds. Given how A and B intersect, x_1 is stable, whereas x_2 is unstable.

[15]Further simulations for higher n yield chaotic mixing probabilities, which could be due to rounding of values in the computer program Mathematica.

least $1 + (n+1)/2$ districts vote against the tariff. Therefore equation (1) becomes

$$0 > \frac{\pi}{h+1}, \tag{4}$$

where h is the number of other districts that vote against the tariff. This inequality implies that all districts behave optimally and that this profile is indeed an equilibrium. Moreover, this equilibrium is efficient.

We can say that, depending on the beliefs of the firm, in one equilibrium the legislature approves the tariff, and that in another equilibrium it does not. So in one sense the beliefs of the firm determine (partially) the equilibrium. Given that the firm wants the tariff, it has an incentive to manage districts' beliefs so as to induce the inefficient equilibrium.

Another argument in favor of the equilibrium in Proposition 1 rests on expressive voting. Suppose that with some probability a district votes not instrumentally, but to express its feelings. Then a district which opposes the investment may want to express its disapproval of the firm by voting against the firm's interests, that is by voting against the tariff. Similarly, a district which favors the investment or the industry may be more willing than a different district to vote for a tariff the firm desires. So an equilibrium in which districts that favor the investment vote for the tariff appears more natural, and less subject to deviation, than the equilibrium in which the opposite pattern appears.

5.4 Uncertainty about other districts' types

Suppose, in contrast to our previous assumptions, that each district is unsure about how many other districts favor the investment. Let each district believe that any other district favors the investment with probability γ. In what follows we establish values of γ for which it is an equilibrium that all districts favoring the investment vote for the tariff and all others vote against.

Consider a district which favors the investment. Suppose all other districts which favor the investment vote for the tariff, while all other districts use their strictly dominant strategy and vote against the tariff. A district which votes for the tariff trades off the increased chance of getting the investment with the increased probability that the tariff is approved and the costs C must be incurred. More precisely, expected payoffs are given by

$$\sum_{k=0}^{n-1} \binom{n-1}{k} \gamma^k (1-\gamma)^{n-1-k} \frac{g}{k+1} - \sum_{k=\frac{n-1}{2}}^{n-1} \binom{n-1}{k} \gamma^k (1-\gamma)^{n-1-k} C.$$

On the other hand, a district which votes against the tariff could attract the firm's investment only if all other districts vote against the tariff. In addition, the cost C is imposed when even without the vote of the district in question a majority vote for the tariff; that is

$$(1-\gamma)^{n-1} \frac{g}{n} - \sum_{k=\frac{n+1}{2}}^{n-1} \binom{n-1}{k} \gamma^k (1-\gamma)^{n-1-k} C.$$

The district strictly prefers to vote for the tariff if and only if

$$\begin{aligned} 0 < \Delta(\gamma) := \\ (1-\gamma)^{n-1} \frac{n-1}{n} g + \sum_{k=1}^{n-1} \binom{n-1}{k} \gamma^k (1-\gamma)^{n-1-k} \frac{g}{k+1} - \\ \binom{n-1}{\frac{n-1}{2}} \gamma^{\frac{n-1}{2}} (1-\gamma)^{\frac{n-1}{2}} C. \end{aligned}$$

The following Proposition says that in many circumstances the previous inequality holds, implying that Proposition 1 is robust to the introduction of 'noise.'

Proposition 3 *For any C, g and n, there exists $\hat{\gamma} \in [1/2, 1)$ such that for all $\gamma \in [\hat{\gamma}, 1]$, it is an equilibrium for each district that favors the investment to vote for the tariff, while all other districts vote against.*

Proof. Notice that $g(n-1)/n > g/n$ and $g/(k+1) \geq g/n$, for all $k = 1, 2, \ldots, n-1$. Hence,

$$\Delta(\gamma) > \frac{g}{n} - \binom{n-1}{\frac{n-1}{2}} \gamma^{\frac{n-1}{2}} (1-\gamma)^{\frac{n-1}{2}} C := \hat{\Delta}(\gamma).$$

Notice that $\hat{\Delta}(\gamma)$ is continuous and differentiable. Moreover, it attains a unique minimum at $\gamma = 1/2$ and we have $\hat{\Delta}(\gamma = 0) = \hat{\Delta}(\gamma = 1) = g/n$. Suppose that $\hat{\Delta}(\gamma = 1/2) \geq 0$. Then choose $\hat{\gamma} = 1/2$. Suppose $\hat{\Delta}(\gamma = 1/2) < 0$. Then there exist two values, γ_1 and γ_2 with $0 < \gamma_1 < 1/2 < \gamma_2 < 1$, such that $\hat{\Delta}(\gamma_1) = \hat{\Delta}(\gamma_2) = 0$. In this case choose $\hat{\gamma} = \gamma_2$. *Q.E.D.*

5.5 Tax breaks and other inducements to invest

In the benchmark game, a district can attract the firm's investment only by voting for the tariff. But districts compete for investments in additional ways, for example, by giving tax breaks and other incentives.

We suppose that a congressman's preferences or constituency may differ from that of a local official who engages in lobbying—the two types may be elected at different times, have faced different turnouts, or be elected from jurisdictions of different sizes. Let the firm prefer to invest in a locale whose congressman and local lobbyist both favor the investment. Such joint support may increase the firm's confidence that voters support the investment, or may be necessary for the firm to successfully navigate political constraints. Moreover, if the congressmen knows the attitudes of other officials in the jurisdiction, he will vote for the tariff only if the local officials will also offer the firm benefits.

Thus, the firm will not invest in a district which voted against the tariff. Districts which voted for the tariff compete simultaneously with one another to attract the firm's investment. District i offers to pay the firm e_i if the firm locates in the district.

To find a subgame perfect equilibrium we will solve this game by backward induction. Consider the last stage and notice that a district that opposes the investment sets $e_i = 0$, as incentives are costly. Denote the number of districts obtaining access and lobbying (actively) for the investment by l. Suppose the lobbying stage can be described by the following assumption.

Assumption 1 *There is a unique symmetric equilibrium to the lobbying stage, with the following holding for each district which has access:*

- *A district favoring the investment exerts effort* $e_i^*(g,l)$*, with* $\partial e_i^*(g,l)/\partial l > 0$*, and obtains an expected payoff of* $u(g,l) > 0$*.*
- *A district which opposes the investment exerts effort* $e_i^*(-b,l) = 0$ *and obtains an expected payoff of* $u(-b,l) \leq 0$*.*

We give an example which fulfills Assumption 1. Consider a district indexed by i and denote by $E = \sum_{j \neq i} e_j$ the sum of the efforts of the other districts. Assume that after the competition each district's chance of attracting the investment is described by the simple ratio contest success function

$e_i/(e_i+E)$.[16] In contrast, however, to a standard contest, only the district which attracts the investment incurs the cost of its effort (or pays the firm the incentive offered). Under these assumptions district i maximizes

$$\frac{e_i}{e_i+E}(g-e_i).$$

In the unique equilibrium with symmetric pure strategies of the contest game, a district that favors the investment chooses $e^*(g,l)=g(l-1)/(2l-1)$ and obtains an expected payoff of $u(g,l)=g/(2l-1)>0$. A district that opposes the investment chooses $e^*(-b,l)=0$ and receives $u(-b,l)=0$.

Assume that the firm grants access in the second stage to all firms voting for the tariff, because, on the one hand, the firm will not invest in a district which voted against the tariff and, on the other hand, equilibrium effort in the third stage increases with the number of active competitors. If all districts vote against the tariff, then the firm grants access to all districts.

This implies that in the initial voting stage equation (1) becomes

$$u(\pi,l) > 0 \quad \text{if } k>0 \text{ and} \tag{5}$$
$$\pi > u(\pi,m) \quad \text{if } k=0, \tag{6}$$

where again k denotes the number of other districts that vote for the tariff. On the other hand, equations (2) and (3), become

$$u(\pi,l)-C > -C \quad \text{and} \tag{7}$$
$$u(\pi,l)-C > 0. \tag{8}$$

Notice that for a district that opposes the investment, $(\pi=-b)$, it is now a weakly (rather than strictly) dominant strategy to vote against the tariff, as a district now has an alternative way of signaling its opposition to the firm's investment, namely by setting $e_i=0$ in the contest stage.[17]

Again we search for equilibria with symmetric pure strategies. We start with the voting profile in which all districts which favor the investment vote

[16] If all districts with access offer no incentives, we assume that all districts have the same win probability $1/h$, where h is the number of districts with access.

[17] Contrary to the benchmark, when $u(-b,l)=0$ it is now an equilibrium for all districts to vote for the tariff. A district that opposes the investment might vote for the tariff because it does not compete actively at the lobbying stage and, thus, will not attract the firm's investment. Anticipating this, it is indifferent between voting for and against the tariff.

for the tariff, and all others use their weakly dominant strategy and vote against the tariff. Consider a district that favors the investment. By assumption at least $(n+1)/2$ other districts vote for the tariff. Thus, no district's vote is decisive and the trade-off in equation (7) is relevant. Because the district gains from access, voting for the tariff is better than voting against. The firm is strictly worse-off if access is allocated to fewer districts and would not invest in a district that voted against the tariff. As before the voting behavior is consistent with the firm's inference.[18]

As in the benchmark, it is not an equilibrium for all districts to vote against the tariff. For if they did and a district changes its vote to support the tariff, it will be the only district gaining access and is sure to attract the investment (see equation 6).

5.6 Capital mobility

Central to our analysis is the assumption that a special interest can make a choice that benefits one district more than another. An obvious such choice is where to invest. We would then expect a firm to exert more political influence if capital is mobile than if it is not. We would not expect, for example, a mining company in Wyoming to threaten to move its mine to Rhode Island.

But whereas capital mobility within a nation can increase a firm's political influence, international capital mobility may reduce it. Consider outsourcing of call centers, and suppose that some districts in the country want to attract such jobs. If each district believes that the firm will find lower costs in India than anywhere in the U.S., no U.S. district could attract the jobs by supporting a policy the call-industry favors. Similarly, increased capital mobility across member states of the European Union should reduce the political power of special interests within each state, but increase the power of special interests when dealing with the European Commission or with the Council of Ministers.

It turns out that for this reasoning to hold it is crucial that no district can attract the investment by supporting the tariff. If—returning to the example

[18] Notice that even if at the last stage competition is very fierce and the firm can appropriate all the rent from matching to a district favoring the investment, that is even if $u(g,l) = 0$, it is still an equilibrium for a district that favors the investment to vote for the tariff. That is, any one district gains nothing from voting against the tariff when a majority of other districts vote for it, and might as well vote for it.

of call centers—there is an arbitrarily small probability that the firm invests in the U.S., our result is robust.

Suppose a firm can invest in either of two countries, indexed by 1, 2. The countries vote simultaneously on the tariff and then the firm decides where to invest. The firm prefers to invest in a country that approved the tariff. So, if one country approves the tariff (denoted by A), while the other rejects it (denoted by R), investment probabilities p are 1 and 0, respectively. If both approve or reject the tariff, each has a strictly positive probability of attracting the firm's investment. So denoting by $d_i \in \{A, R\}$ the countries' decisions, we have

$$p_1 = \begin{cases} \hat{p}_1^A \in (\frac{1}{6}, \frac{5}{6}) & \text{if} \quad d_1 = d_2 = A \\ \hat{p}_1^R \in (\frac{1}{6}, \frac{5}{6}) & \text{if} \quad d_1 = d_2 = R \\ 1 & \text{if} \quad d_1 = A \text{ and } d_2 = R \\ 0 & \text{if} \quad d_1 = R \text{ and } d_2 = A \end{cases},$$

and $p_2 = 1 - p_1$.

Consider the voting decision of a district in country i. Denoting by k_c the number of other districts that vote for the tariff in country c, (and similarly the total numbers of districts n_c), equations (1), (2) and (3), become

$$p_i \frac{\pi}{k_i + 1} > \begin{cases} 0 & \text{if} \quad k_i + k_j > 0 \\ \frac{\pi}{n_i + n_j} & \text{if} \quad k_i + k_j = 0 \end{cases}, \tag{9}$$

$$p_i \frac{\pi}{k_i + 1} - C > -C \quad \text{and} \tag{10}$$

$$p_i \frac{\pi}{k_i + 1} - C > 0. \tag{11}$$

Notice that when country j rejects the tariff, equations (10) and (11) coincide with equations (2) and (3). Note also that for a district that views investment as bad ($\pi = -b$), it is now a weakly dominant strategy to vote against the tariff.

Again we consider symmetric pure-strategy equilibria and start with the voting profile in which all districts which favor the investment vote for the tariff, and all others use their weakly dominant strategy to vote against the tariff. Consider a district that favors the investment. By assumption, at least $(n_i + 1)/2$ other districts vote for the tariff. Therefore no district's vote is decisive and the trade-off in equation (10) is relevant. Since $p_i > 0$, for each district which favors the investment, voting for the tariff is strictly better than voting against it. As before, this is the unique symmetric equilibrium and the voting behavior is consistent with the firm's inference.

Proposition 4 *There is a unique pure-strategy symmetric Nash equilibrium. In this equilibrium each district which favors the investment votes for the tariff; each other district votes against the tariff. Both countries adopt the tariff.*

Notice lastly that the introduction of capital mobility worsens the outcome compared to the benchmark. Both countries pass inefficient legislation, though the firm will invest in only one. Thus, capital mobility within a nation and international capital mobility can increase a firm's political influence and the inefficiency of political decisions.

5.7 Retrospective voting

Our approach can also work if voters vote for candidates retrospectively rather than prospectively. That entails less sophistication or strategic voting by voters, relying instead on the sophistication of elected officials who seek reelection.

We modify the previous assumptions by supposing that voters in a district are more likely to re-elect an incumbent the greater their welfare during his term before the election. Then in those districts where voters favor the investment the incumbent can increase his chances of winning re-election by voting for the tariff, thereby increasing the chances that the firm will invest in his district.

5.8 Sequential voting

Our argument requires that voting is simultaneous. In this subsection we show that sequential voting can avoid inefficient collective decisions. We argue, however, that sequential voting appears rare in practice.

Suppose that districts vote in an exogenously given order. To find a subgame-perfect equilibrium we solve this game by backward induction.

Consider the district that votes last. Depending on the votes of the districts that already voted, either equation (1), (2), or (3) captures the voting situation. Notice that a district which opposes the investment strictly prefers to vote against the tariff. A district which favors the investment and is not pivotal votes for the tariff; otherwise it votes against.

Consider now the penultimate district. Anticipating the choice of the last voting district, the district votes for the tariff if it both favors the investment and is not pivotal in the vote; it votes against otherwise. Since this behavior holds for all districts going backwards through the voting game, we see that no district which is pivotal votes for the tariff. All districts that favor the investment vote for the tariff until just one vote is missing to approve the tariff. All other districts vote against. Observe that when voting is sequential, at least one district is pivotal during the voting procedure. This never happens under the simultaneous procedure.

It is also straightforward to see that this equilibrium is unique. We summarize with

Proposition 5 *Under sequential voting there exists a unique subgame perfect equilibrium, in which the tariff is rejected. In this equilibrium, of the districts which favor the investment, only the first* $(n-1)/2$ *in the voting order vote for the tariff; all other districts vote against.*

We saw that in our model sequential voting can avoid the inefficient collective decisions. But sequential voting appears rare. Even voting procedures that at first sight appear sequential are effectively simultaneous. For instance, the U.S. House of Representatives employs several voting procedures. Under the so-called roll-call vote the names of congressmen are called alphabetically and each announces his voting decision. Since calling over four-hundred names is very time consuming, this method is rarely used. A similar method exists in the U.S. Senate. However, in both the House and the Senate under these procedures a vote can be changed while the vote remains open, so voting is effectively simultaneous.

6 Conclusion

Standard models of lobbying analyze situations in which special interests seek favors from voters or their representatives. We presented a theory which reverses this structure. Voters seek a favor from the special interest and offer in return support for a policy important to the lobby.

The mechanism we describe has several attractive features. It is consistent with the observed low level of spending by firms on political influence. Our mechanism may dominate direct bribery not only because bribery is more costly and illegal. Indeed, a firm desiring to learn the political preferences of a district may not want to bribe the incumbent congressman. For if it did and he voted for the tariff, the firm would not learn whether the district favors the industry and the investment.

As discussed above, in contrast to standard theories of influence, our mechanism is time consistent—legislators may vote for an inefficient policy, and the firm can indeed have an incentive to invest in a district whose legislator voted for the tariff.

Another attraction of our approach is that, like the menu auction mentioned earlier, it can accommodate multi-dimensional policies, for instance, several tariffs for different industries decided upon at the same time. Though the cost from a given tariff to a district may be higher when other tariffs are imposed, our results hold, since they hold for any level of these costs.

As mentioned in the Introduction, the mechanism can apply to policies other than tariffs or to incentives other than new investment. What is important is the existence of an outside party rewarding a vote for the policy. In the introductory example of congressmen seeking to establish a particular voting record, this outside party is the voters. Another example is a federal rescue program designed to save a firm threatened by bankruptcy. The favor that voters seek could then be to avoid closure of branches, that is, disinvestment rather than investment in the district.

A similar argument can apply to corruption. A corrupt mayor may tell each voting bloc or district that he will favor it if they vote for him, and otherwise will not. An equilibrium is for each district to support the incumbent, corrupt, mayor. For if any one district voted against the mayor, and the mayor had to prioritize service, then he may well give the district which opposed him a lower priority. The district would therefore not have affected the election, but would have hurt itself.

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