How To Avoid Transferring a Valuable Asset

Sam Bucovetsky Amihai Glazer

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Abstract

Many mechanisms (such as auctions) efficiently allocate a good to the firm which most highly values it. But sometimes the owner of the asset or good may wish to transfer it only if it is not too valuable to potential buyers. The allocation problem becomes especially difficult when the potential buyers have private information about the asset's value. We describe several mechanisms which are efficient, or nearly so. We also show that rent seeking, and lobbying, rather than merely wasting resources, can lead to allocations which are close to efficient.

1 Introduction

A standard economic problem is to allocate a good to the person or firm which most highly values it, where the seller does not know the buyers' valuations. In many examples of this sort of problem, simple auctions allocate the good efficiently. But sometimes the allocator (say government) may prefer to keep the good if (and only if) potential recipients value it highly. The reluctance may arise when the owner's use of the asset would reduce social welfare. Two cases appear especially plausible. First, the firm owning the asset may engage in an externality-producing activity which is profitable to the firm but difficult to monitor, or costly for government to monitor. Think of a concession, such as an oil field subject to environmental regulation, or privatization of military housing.

Second, the asset's owner may exercise excessive monopoly power. For example, a privatized railroad may charge a higher price, and reduce consumer welfare by more, than government had initially expected. To elaborate, suppose government owns a facility that produces a good or service. A private firm can produce more efficiently than can government, but government is unsure about the monopoly power a private owner would exercise; for example, the government may be unsure about the ease of entry into the industry. Government would therefore be more willing to sell the facility the less a firm values owning it.

The general idea here thus relates to the market for lemons—the more eager is a party to sell, the more cautious is the buyer. We turn this around, by supposing that the more eager are firms to obtain some prize or asset, the lower is government's gain from transferring it.

2 Literature

We look at mechanisms which reveal private information. Other literature looks at how interest groups provide information. The information can concern the importance of the problem a legislator is considering (Hansen 1991, Smith 1995), the effectiveness of policy (Krehbiel 1991, Smith 1984 and 1995, Lohmann 1995, Wright 1996), and the electoral consequences of different policies (Kingdon 1984, Hansen 1991, Rasmusen 1993, Lohmann 1995 and 1998).

Austen-Smith (1995) models how contributions signal policy preferences.

In Lohmann (1995) interest groups pay a contribution to gain access and provide information to the policymaker. Glazer and Konrad (1995) consider a firm which lobbies for a tariff partly to signal to other firms that it has low costs, and thus to deter entry.

Konrad (2003) elegantly solves a problem related to ours. He considers an agent who wants to award the prize to the contestant who most highly values it, with each contestant knowing the value of the prize to himself and to other contestants, but with the awarding agent not knowing this. Konrad (2003) shows that a sequence of all-pay contests, with the prize awarded to the contestant who won m more contests than the others, will perfectly reveal which contestant most highly values the prize, while aggregate spending by the contestants approaches zero. This mechanism, however, leaves the prize-giver uninformed about the value of the prize (he only knows who values it most highly) and so does not apply to our problem.

The informational benefits of rent seeking are examined by Lagerlof (2005), who considers a lobby that has truth on its side and that can engage in a costly activity to prove it. Tirole and Dewatripont (1999) provide an informational rationale for advocacy, showing how competition among opposing parties can promote information revelation.

The informational problem we consider resembles that studied by Baron and Myerson (1982) on regulating a monopolist with unknown cost. We follow them in one of our mechanisms, with government offering a menu of contracts.

3 Assumptions

Each firm knows the common value of a prize, or asset, the government may award. The value is either high (V_H) or low (V_L), with $V_H > V_L$. Initially the government is ignorant about the asset's value, but may learn about it from the firms' behavior. Government assesses a prior probability, π, that the value is high. If the asset's value to any firm is V_H, government values retaining it at G_H; government values retaining the asset at G_L if its value to any firm is V_L, with $G_H > V_H > V_L > G_L$. Henceforth, when we speak of the asset's value without specifying to whom, we refer to the asset's value to a firm. Given that the government would prefer to retain the asset if its value is high, and allocate it to a firm if its value is low, there is some threshold probability $\bar{\pi}$, such that the government would prefer to retain the asset if and only if it assesses the probability that its value is high as $\bar{\pi}$ or greater. This threshold probability is defined by the condition

$$\bar{\pi} = \frac{V_L - G_L}{(V_L - G_L) + (G_H - V_H)}. \tag{1}$$

We shall at first consider perfectly revealing mechanisms, mostly supposing that government aims to transfer the asset if it knows its value is V_L, but not if its value is V_H. Since these mechanisms are not used in practice, one of our tasks is to show the time-inconsistency problems inherent in perfectly revealing mechanisms. We shall also use these mechanisms as a benchmark for the performance of mechanisms we do see used, such as rent seeking and lobbying.

4 Efficient mechanisms

An efficient outcome here has government transfer the asset to a firm if and only if its value to the firm exceeds its value to the government—that is, if and only if its value to the firm is V_L. An efficient mechanism makes every Nash equilibrium yield an efficient outcome. Maskin (1999) provides conditions under which such efficient mechanisms must exist. Here, however, when the government cannot observe directly the value of the asset, we show that no efficient mechanism exists. On the other hand, if the (uninformed) government can commit, then, as we show, mechanisms exist which are "almost efficient," in that the probability that the government transfers the asset when it should not can be made arbitrarily small.

4.1 Single firm

Consider first a single firm, which knows whether the asset's value is high or low. Consider equilibria with truthful revelation (which we know from Myerson's Revelation Principal is optimal). Let a type-L firm (a firm which values the asset at V_L) which announces it is of type-L be paid K_L, and win the asset with probability π_L. A type-H firm which announces it is of type-H is paid K_H, and wins the asset with probability π_H. The incentive compatibility constraint is that a type-H firm is indifferent about revealing its type, or that $K_L + \pi_L V_H = K_H + \pi_H V_H$. The participation constraint is that $K_L + \pi_L V_L \geq 0$.

With one firm, and a government unable to commit, no mechanism can induce truthful revelation. For suppose a firm reports a high asset value, so that government will retain the asset. If the asset's value is indeed high, and if $K_H > V_H + K_L$, the firm prefers doing so to reporting that the asset's value is low. And if the asset's value is low, and if $V_L + K_L > K_H$, the firm prefers reporting low. Combining these inequalities gives $V_L + K_L > K_H > V_H + K_L$. But since $V_L < V_H$, this is impossible.

Thus, if the government cannot commit, and if a firm which truthfully announced that the value is high would get nothing, no truth-telling equilibrium with a single firm can exist .

4.2 Two firms

Government can do better when it faces not one firm, but two firms with common knowledge of the asset's value, and which compete to obtain it. In particular, government can set payments which do not depend on the asset's realized value. A simple variant of a Maskin (1999) matching mechanism can yield Nash equilibria which are efficient.

Suppose, for example, the government asks each firm to announce a valuation for the asset, either V_L or V_H. The government transfers the asset with positive probability to a firm if and only if both firms announced a low valuation; otherwise the government retains the asset. Then truth-telling is a Nash equilibrium: if the true valuation is V_L, and one firm announces it, then the other firm maximizes its expected benefits by also announcing V_L. But if the true value is V_H and one firm announces it, then the other firm gains nothing by announcing V_L. This outcome if efficient, since the government transfers the asset if and only if its value is low.

The equilibrium just described, however, is not unique. Another equilibrium is for firms always to announce V_L, regardless of the true valuation;yet another equilibrium is for the firms always to announce V_H.

This defect of the mechanism just presented cannot be avoided. In particular, were the mechanism to induce truth-telling as the unique Nash equilibrium for the bidders, then the government would on occasion want to renege on its own mechanism, once it learned the truth.

Proposition 1 *If some direct mechanism induces truth–telling as a Nash equilibrium, and if government keeps the asset whenever it believes that with* *probability $\bar{\pi}$ or higher the asset's value is high, then a Nash equilibrium exists in which each firm always announces that the asset has high value.*

Proof: Let the parameters of the mechanism be γ_{ij} and K_{ij}, with γ_{ij} the probability that firm 1 gets the asset when firm 1 announces i, firm 2 announces j, and with K_{ij} the payment made to firm 1 in this situation. The time-consistency requirement (when government believes the asset likely has high value it retains the asset) means that if truthful revelation is to be a Nash equilibrium, then $\gamma_{HH} = 0$. If truthful revelation is a Nash equilibrium, then firm 1 must not gain from announcing L when the true value is high and firm 2 announces H. Therefore, it must be that

$$(\gamma_{LH} - \gamma_{HH})V_H \leq K_{HH} - K_{LH}. \tag{2}$$

Since time consistency requires that $\gamma_{HH} = 0$, it follows that $\gamma_{LH} \geq \gamma_{HH}$, which implies that

$$(\gamma_{LH} - \gamma_{HH})V_L \leq K_{HH} - K_{LH}. \tag{3}$$

Analogous conditions hold for firm 2, so that inequalities (2) and (3) imply that "always announce H" must also be a Nash equilibrium for the mechanism. QED.

Proposition 1 indicates that when the government cannot observe the asset's value, no efficient mechanism exists. The government, however, can get arbitrarily close to making the dominant strategies for the bidders be to tell the truth, with the government willing to honor its own rules. The following mechanism requires the government to transfer the asset with some positive probability even when it has learned that the asset has high value. The probability, however, can be made arbitrarily small.

The rules of the mechanism are :

- When both firms announce low, government transfers the asset to each of them with probability 1/2. The firm which gets the asset pays $V_L - \epsilon$.
- When both firms announce high, each firm wins the asset with probability ϵ. The firm getting the asset pays $V_L + \epsilon$.
- When one firm announces high and the other low, the firm which announced low does not get the asset. The firm which announced high gets the asset with probability $1/2 + \epsilon$, and pays $V_L + \epsilon$ if it wins the asset.

With the above rules, a firm's dominant strategy is to tell the truth. In equilibrium, each firm gets a non–negative net payoff, whether the true value is high or low, so each participates. In equilibrium, firms give identical answers. So the government's rules oblige it to transfer the asset for sure if it has low value, and to transfer it with probability 2ϵ if it has high value. Since ϵ can be made arbitrarily small, the government is required to behave contrary to its own interest with arbitrarily small probability.

The mechanism can be generalized to more than two bidders: with $n > 2$ firms, each firm wins the asset with probability $1/n$ if all n firms announce a low value, and each firm announcing a high value wins the asset with probability $1/m + \epsilon$ when m firms announce a high value, and $m < n$.

5 Rent-seeking

The mechanisms described above are uncommonly seen, and therefore appear to contribute little to a positive analysis of government behavior. Perhaps they are not used because other mechanisms can do as well, or almost as well. We accordingly examine a model of rent seeking, which is widely studied in the literature, and appears to give the spirit of how special interest politics works. In the standard rent-seeking model, if firm i spends x_i on rent seeking, it wins the asset with probability $x_i/(\sum_j x_j)$. We modify the standard rent-seeking game, in one way: when government believes that the asset has high value, it transfers the asset to some firm only with probability $z < 1$.[1]

5.1 Two firms

As before, let each of the two firms value the asset at either V_H or V_L. When the asset's value is V_L, the equilibrium has each firm spend $V_L/4$; a firm's expected profits are $V_L/4$. When the asset of value V_H is transferred with probability z, the standard rent-seeking game has each firm spend $zV_H/4$, and earn expected profits of $zV_H/4$.

Consider the state of nature where the firms value the asset at V_H. If each firm spent $V_L/4$ on lobbying, the government would learn nothing about the asset's value, and, by assumption, would transfer the asset. A firm's expected profits would be $V_H/2 - V_L/4$. But this is not the equilibrium. For suppose

[1]For the seminal papers on rent seeking, see Tullock (1967), Krueger (1974), Posner (1975), and Bhagwati (1982).

one firm spent $x > V_L/4$. Government would then know that the asset's value is V_H, and by assumption would transfer the asset only with probability $z < 1$. We suppose that which firm gets the asset follows the standard rent-seeking model. A firm spending x wins the asset with probability $z\frac{x}{x+V_L/4}$. Its expected profits are

$$zV_H \frac{x}{x + V_L/4} - x. \tag{4}$$

The the firm's optimal x satisfies the first-order condition

$$x = \frac{2\sqrt{zV_H V_L} - V_L}{4}. \tag{5}$$

If $\sqrt{zV_H V_L} > V_L$, this x exceeds $V_L/4$. Substituting this x into the firm's profit function yields

$$\Pi = zV_H - \sqrt{zV_H V_L} + V_L/4. \tag{6}$$

This profit can exceed $V_H/2 - V_L/4$, the profit were the firm to spend $V_L/4$. For sufficiently large V_H, a firm will prefer to spend $x > V_L/4$ if $z > 1/2$. Thus if the government can be trusted not to renege, rent-seeking among two firms can reveal information, but at a high cost of efficiency.

5.2 More than 2 firms

The previous section considered two firms which rent seek. Here we extend the model to consider $n > 2$ firms. We are particularly interested in behavior when n is large. Extending the analysis given above, with n firms and an asset valued at V_L, yields an equilibrium with each firm spending $V_L \frac{n}{(n-1)^2}$. Each firm's expected profits are V_L/n^2.

Now suppose one firm spent $x > V_L \frac{n}{(n-1)^2}$. Government would then know that the asset's value is V_H, and by assumption would transfer the asset only with probability $z < 1$. We suppose that which firm gets the asset follows the standard rent-seeking model. The firm spending x wins the asset with probability $z\frac{x}{x+(n-1)nV_L/(n-1)^2}$. Its expected profits are

$$zV_H \frac{x}{x + (n-1)V_L \frac{n}{(n-1)^2}} - x. \tag{7}$$

The first-order condition is that

$$x = \sqrt{V_H V_L z(n-1)/n} - V_L(n-1)^2/n^2. \tag{8}$$

Substituting this x into the firm's profit function yields

$$\Pi = 2(1-n)\sqrt{V_H V_L z}/n + V_H z + V_L(n-1)^2/n^2. \tag{9}$$

A firm which instead spent $V_L \frac{n}{(n-1)^2}$ when it valued the asset at V_H would have profits

$$V_H/n - V_L \frac{n}{(n-1)^2}. \tag{10}$$

For large n, the difference between these two approaches is

$$-2\sqrt{V_H V_L z} + V_H z + V_L. \tag{11}$$

This difference is positive if $V_H^2 z^2 - 2V_H V_L z > -V_L^2$; for any given z the inequality holds for sufficiently small V_L and sufficiently large V_H. Under these conditions, rent seeking is efficient. That is, when many firms rent seek, the firms' private information is perfectly revealed. Government will alway transfer the asset when it should (that is, when its value is V_L), and will usually retain the asset when it should (that is, when the asset has value V_H).

6 Lobbying

As our last mechanism, which is also observed in practice, we consider lobbying. We take lobbying as similar to rent seeking, but with the difference that lobbying is a binary choice (a firm either lobbies or not), and that the cost of lobbying is fixed at F. We also consider here only subgame-perfect solutions, with government awarding the asset only when it benefits from doing so.

Thus, each firm, knowing the asset's value, must decide whether to lobby. After observing the firms lobby, the government decides whether to transfer the asset. The lobbying enables the government to update its estimate of the probability that the asset's value is V_H, to some posterior belief $\tilde{\pi}$. It will transfer the asset if and only if $\tilde{\pi} \leq \bar{\pi}$, where the threshold probability $\bar{\pi}$ was defined above by equation (1). If government does transfer the asset, it is indifferent about which firm gets the asset, since the value is common. Hence the government can commit credibly to the following rule:

> If the government transfers the asset after only one firm lobbied, then the firm which lobbied wins the asset.

Firms know the government's prior belief, π, and its valuations G_H and G_L of the asset in the two different states of nature. Therefore, they know that government will transfer the asset only when it benefits from doing so.

If the government transfers the asset after neither firm lobbied, then each wins it with probability 1/2.

Lobbying here involves no transfer to the government, with F representing a real social cost. A firm which lobbies incurs this cost F whether or not it gets the asset. Firms make their lobbying decisions simultaneously, each aiming to maximize its expected profits. (Profits are the asset's value, times the probability of winning the asset, minus any lobbying costs the firm incurred.)

6.1 Firms' behavior

Suppose firms anticipate that if both lobby, government will retain the asset, but that government will transfer the asset if fewer than two firms lobby. We will examine below whether this behavior is rational for the government; we first consider a firms' lobbying activity, given that each anticipates this behavior by the government.

It is not obvious that more firms will lobby when the asset has high value. For a firm which lobbies improves its chance of winning the asset if the other firm did not lobby, but will not gain the asset if the other firm lobbied. We consider the possibility of each firm adopting the identical mixed strategy, choosing to lobby with probability λ_i ($i = H$ or L) when the asset's value is V_i.

These mixed strategies can maximize a firm's profits only if a firm is indifferent about lobbying. If firm 1 does not lobby, it wins the asset only if neither did firm 2 lobby: government chooses firm 1 with probability 1/2. The firm's expected profit is $(1 - \lambda_i)V_i/2$, with $i = L$ or H. If firm 1 does lobby then it wins the asset if firm 2 did not lobby. (Recall that we are looking at a possible equilibrium in which the government keeps the asset if both firms lobby). The firm's expected profit is $(1 - \lambda_i)V_i - F$. So the firm is indifferent between lobbying and not, or a Nash equilibrium in mixed strategies can exist, if $(1 - \lambda_i)V_i/2 = (1 - \lambda_i)V_i - F$, or if

$$\lambda_i = 1 - 2F/V_i, \tag{12}$$

which can hold when $0 < F < V_i/2$. Thus, a necessary condition for the existence of a Nash equilibrium of this type is that

$$0 < F < \frac{V_L}{2}. \tag{13}$$

Equation (12) implies that λ_i increases with V_i: the firms will more likely lobby when the asset's value is high than when it is low. Thus, the number of firms that lobbied signals the asset's value to the firms. Government may rationally retain the asset if both firms lobbied.

The firms' expected joint profits if they play their equilibrium strategies, and if the government transfers the asset when fewer than two firms lobby, is

$$-2\lambda_i F + V_i(1 - \lambda_i^2). \tag{14}$$

Substituting for λ_i gives expected profits as $2F$.

Notice that if the fixed costs of lobbying are very low, then both λ_L and λ_H approach 1: lobbying activity would convey little information. Nonetheless, the government may learn enough from observing lobbying behavior, even when F is very small, to benefit from the proposed strategy of awarding the asset only if at least one firm refrained from lobbying.

6.2 Government's estimate of the asset's value

We now consider the government's optimal actions, given the behavior of the firms. Our first task is to determine the government's expected payoff when it transfers the asset only if the probability that its value to a firm is V_H lies below some $\bar{\pi}$. Government uses the (common) prior belief π and its observation of the number of firms that lobbied to generate a posterior estimate of the probability that the asset has high value. Suppose then that with probability λ_i either firm lobbies when it values the asset at V_i. Then the posterior probability that the asset has high value when n firms lobbied is π_n, with

$$\pi_2 = \frac{\pi \lambda_H^2}{\pi \lambda_H^2 + (1-\pi)\lambda_L^2} \tag{15}$$

and

$$\pi_1 = \frac{\pi \lambda_H (1-\lambda_H)}{\pi \lambda_H (1-\lambda_H) + (1-\pi)\lambda_L (1-\lambda_L)}. \tag{16}$$

If the firms use their equilibrium mixed strategies, equation (12) implies that (15) and (16) can be written as

$$\pi_2 = \frac{\pi(V_H - 2F)^2 V_L^2}{\pi(V_H - 2F)^2 V_L^2 + (1-\pi)(V_L - 2F)^2 V_H^2} \tag{17}$$

and

$$\pi_1 = \frac{\pi V_L^2 (V_H - 2F)}{\pi V_L^2 (V_H - 2F) + (1-\pi) V_H^2 (V_L - 2F)}. \tag{18}$$

Equations (17) and (18) imply that both π_1 and π_2 increase with F. At the maximum value of F consistent with condition (13), $\pi_1 = \pi_2 = 1$. For lower values of F, π_2 always exceeds π_1. When $F = 0$, $\pi_2 = \pi$ and $\pi_1 = (\pi V_L)/(\pi V_L + [1-\pi]V_H)$. Figure 1 depicts π_1 and π_2 as functions of F when $V_H = 2$, $V_L = 1$, and $\pi = 1/2$.

The previous section assumed that when fewer than two firms lobby, each expects government to transfer the asset. The government follows this strategy if and only if

$$\pi_2 > \bar{\pi} > \pi_1. \tag{19}$$

The inequality $\pi_0 \leq \pi_1$ always holds. Therefore, precisely when condition (19) holds will an equilibrium exist in which the government transfers the asset unless both firms lobby.

6.3 Existence of an equilibrium

The previous two sub–sections give necessary and sufficient conditions for the existence of a Nash equilibrium in which lobbying signals the asset's value, and in which the government retains the asset if (and only if) both firms lobby.

Given the government's posited behavior, a firm lobbies with probability λ_i when the asset's value is i, with $0 < \lambda_L < \lambda_H < 1$, only if condition (13) holds. The government is willing to obey the rule "transfer the asset if and only if fewer than two firms lobby" if and only if $\pi_1 < \bar{\pi} < \pi_2$, where π_2 and π_1 are defined by equations (17) and (18).

If the lobbying cost F is small, so that both λ_L and λ_H approach 1, then $\pi_2 \rightarrow \pi$, and $\pi_1 \rightarrow \pi V_L/(\pi V_L + (1-\pi)V_H)$.

At $F = 0$, the requirement that $\bar{\pi} < \pi_2$ is simply that $\bar{\pi} < \pi$: the government would retain the asset based on prior information. Not surprisingly, if the lobbying cost F is very low, a government which sees both firms lobby will little change its prior beliefs. The requirement that $\bar{\pi} > \pi_1$ at $F = 0$ must also hold, so that for low values of F the equilibrium exists whenever

$$\frac{V_L}{V_H} < \frac{\bar{\pi}}{(1-\bar{\pi})} \frac{(1-\pi)}{\pi} < 1. \tag{20}$$

Moreover, whenever the left inequality in (20) holds, for some range of F this equilibrium will exist.

The threshold probability $\bar{\pi}$ is independent of the fixed costs F: it is determined by the relation among V_L, V_H, G_L, and G_H. So the signaling equilibrium proposed here will exist whenever this threshold $\bar{\pi}$ lies between the two curves in Figure 1.

In general, then, if under government's prior beliefs it would retain the asset, if the variation in the asset's possible value is large, and if lobbying costs are small, then lobbying is informative. In such circumstances, exactly one firm lobbying signals a low value for the asset. This signal enables the government to transfer the asset to the private sector precisely when the government would most benefit from the transfer.

The informational benefits we discuss would disappear if firms colluded. Since the equilibrium we described had government retain the asset if both firms lobbied, the firms may agree that in any period in which they highly value the asset, none would bid, thereby reducing their costs and apparently ensuring that government will transfer the asset. Such collusion, however, may be unstable, because if one firm lobbied while the other firm did not, the lobbying firm would win the asset for sure. With more sophisticated collusion only one of the two firms would lobby in each period. Indeed, such collusion might be self-enforcing: if one firm is expected to lobby in a given period, the other firm has no incentive to lobby, because if it did, government would retain the asset.

Such collusion could be effective for a limited number of periods. But note that a government which recognizes that firms collude will recognize that it learns nothing about the asset's value. For some parameter values, this means that government will retain the asset.

6.4 More than two firms

When more than two firms can lobby, each perfectly informed about the asset's common value, the government could, potentially, observe a wider variety of lobbying activity. A natural candidate for an equilibrium has each firm lobby with the same probability λ_i, with $0 < \lambda_L < \lambda_H < 1$ when a firm values the asset at V_i. This behavior by firms would be consistent with equilibrium if each firm correctly believed that the government would retain the asset if and only if at least $m + 1$ firms lobbied, where $\pi_m < \bar{\pi} < \pi_{m+1}$. Here π_i is the government's posterior belief that the value is V_H, given that i firms lobbied. Since $\pi_i > \pi_{i-1}$, as long as $\lambda_H > \lambda_L$ and $\pi_0 < \bar{\pi} < \pi_N$ (with N the total number of firms) such a threshold cutoff m will exist.

Of course, the λ_i's firms choose depend on their expectations about the government's threshold number m of firms which determines whether government will transfer the asset. A higher threshold makes lobbying more attractive. In turn, higher λ_i's will lower the government's threshold. So there will typically be a unique threshold level m of lobbying which is consistent with equilibrium.

But other equilibria with mixed strategies are possible. A simple possibility has only two of the N firms lobby. If firm 1 and firm 2 each lobbies with probability

$$\lambda_i = 1 - \frac{N}{N-1}\frac{F}{V_i} \tag{21}$$

when it values the asset at V_i, then each of the two firms will be indifferent between lobbying and not: the expected payoff from lobbying,

$$(1 - \lambda_i)V_i - F \tag{22}$$

equals the expected payoff from not lobbying,

$$(1 - \lambda_i)\frac{V_i}{N}. \tag{23}$$

In this case, none of the other $N - 2$ firms will lobby. The expected profit of any firm other than firm 1 or firm 2 when it lobbies is

$$(1 - \lambda_i)^2 V_i - F; \tag{24}$$

its expected profit when it does not lobby is

$$(1 - \lambda_i)^2 \frac{V_i}{N}. \tag{25}$$

Since the second expression is $(1 - \lambda_i)$ times firm 1's expected payoff from not lobbying, and the first expression is less than $(1 - \lambda_i)$ times firm 1's expected payoff from lobbying, firms $3, 4, \ldots, N$ would strictly prefer not to lobby.

So with N firms, a Nash equilibrium has each of two firms lobby with probability λ_i defined by equation (21), provided that this strategy implies $\pi_1 < \bar{\pi} < \pi_2$ when the government does its Bayesian updating. But equation (21) is just equation (12), with the fixed cost scaled up by $N/(N-1)$ instead of 2. Figure 1 shows that effectively lowering the fixed cost of lobbying leads to the existence of a signaling equilibrium, if the government's threshold probability $\bar{\pi}$ is close to, but less than, its prior expectation π.

Of course, with more than two firms, many other mixed-strategy equilibria are possible, such as equilibria in which each of $n < N$ firms lobbies with some positive probability λ_i, and in which the other $N-n$ firms never lobby.

6.5 Examples of excessive lobbying

Finding examples where projects were cancelled because of excessive lobbying is more difficult than finding examples where projects were completed—the cancelled ones do not exist, have no officials responsible for them, and are not subject to continuing media coverage or political debate. It is like the dog in the Sherlock Holmes story which did not bark. Yet some examples come to mind. In 2001, the American firms NextWave, Verizon Wireless, and AT&T Wireless intensely lobbied Congress, but it refused to approve an agreement that would have paid NextWave to transfer spectrum rights to the other firms.[2]Our view is that the heavy lobbying signaled that the agreement would excessively benefit the firms, thereby reducing congressional support for the agreement.

A similar history may apply to the SuperConducting Super Collider.[3] Costs were initially estimated at \$2 billion, including the construction of an oval underground tunnel 54 miles in circumference. States lobbied heavily to be selected as the site of the project, with many offering large financial contributions. After a presidential decision in 1987 to proceed with the project, 26 states submitted proposals, of which seven were selected for further review, resulting in the selection of Texas as the site for the project. But then support for the project declined, leading to its cancellation in 1993. The standard story for the decline in support is that congressmen viewed the project as a pork barrel, with states engaged in rent seeking to obtain the project. Once it

[2]See http://www.wirelessweek.com/index.asp?layout=article&articleid=CA 188950. The NextWave example illustrates, incidentally, the grave problems that can arise with auctions.

[3]See Jeffreys (1992).

became clear that only Texas would get the project, congressmen from other states, the story goes, withdrew their support. We would add an additional element. The intensive efforts by states to get the project suggested to other congressmen (including those from states which had not even submitted a proposal) that the project's benefits would be largely local, so that states other than Texas might benefit little. That is, in our view support for the project declined because some states devoted so much effort to getting the project.

7 Conclusion

We considered several mechanisms which would allow government to learn from firms their private information about the asset's value, while not requiring government to transfer the asset when its value is high. The problem differs from that addressed in auctions—the conventional problem has a firm which reveals that it highly values the asset as increasing the probability that it will receive it; in the problem we address we would want the firm's chances of getting the asset to decline with its valuation of it.

We showed how some mechanisms can approach the efficient allocation arbitrarily closely. Perhaps the most interesting of these mechanisms is a rent-seeking game. It can perfectly reveal the information, yet under some conditions would require government to inefficiently transfer the asset only with very small probability.

We also showed how lobbying can generate informational benefits. This contrasts with the standard approach, which views lobbying as effective in getting firms what they want: newspapers often report following the failure of a special interest that "despite intense lobbying" government adopted or failed to adopt some policy. We show how the intense lobbying can cause the special interest to fail.

We thus interpreted rent seeking, and more generally lobbying, in a novel way. Rather than assume that government passively responds to political pressures, we explain how rent seeking can benefit government by informing it about the asset's value. Even when extensive rent seeking causes government to retain the asset, each firm engages in rent seeking because it thereby increases the chance that it rather than the competing firm will win whatever asset is awarded.

8 Notation

F Cost of lobbying

G_i Value of the asset to government when its value to a firm is V_i

V_i Value of the asset to firm, with $i = H$ or $i = L$

z Probability government awards the asset when it believes its value is high

λ_i Probability firm lobbies when value of the asset is i

π Prior probability that value of the asset is high

$\bar{\pi}$ Threshold probability for keeping the asset; the government would prefer to keep it if its assessment of the probability of a high value is $\bar{\pi}$ or greater

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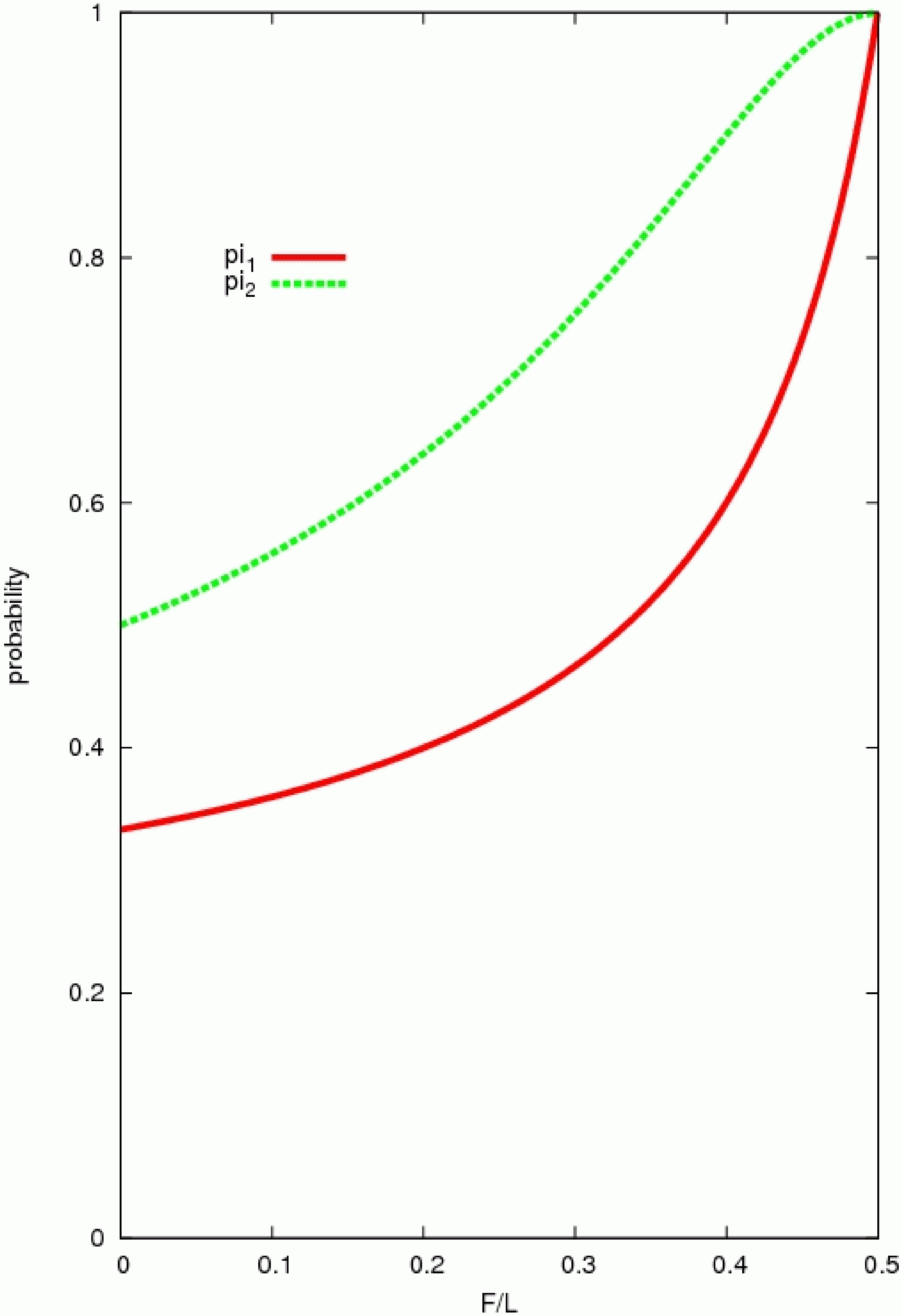

probability
F/L
pi_1
pi_2
0
0.2
0.4
0.6
0.8
1
0
0.1
0.2
0.3
0.4
0.5