Sabotage in Rent-seeking Contests

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Abstract

This paper considers the interaction between two types of effort in lobbying contests: effort that improves the contestant's own performance (standard rent seeking), and effort that reduces particular rivals' performance (sabotage). Due to a positive externality, sabotage is a "small number" phenomenon. Sabotage may increase lobbying efforts and the dissipation rate in lobbying contests, compared to a situation in which sabotage is not feasible.

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1 Introduction

Interests of different lobbying groups are often directly in conflict with each other, as when several firms contest for a monopoly that can be granted to only one of them, when a regulated industry and consumer groups lobby for different regulatory policy, or when farmers lobby for price and income support and consumers against it.[1] Accordingly, when a political decision is made, this typically benefits one or more interest groups, whereas others lose. Therefore, the lobbying process is described in the literature on rent seeking[2] as a contest in which interest groups compete to win a prize.[3] Lobbying groups spend resources in order to increase the likelihood of a policy outcome they favour. For policy outcomes that are mutually exclusive, if one interest group spends more and increases its chances to win, this implies that other interest groups' chances of winning are reduced.

More recently, an information based microeconomic underpinning for the lobbying contest has been given.[4] Interest groups produce information and forward it to decision makers if it supports their interests. The decision maker collects and processes the information received from various interest groups and bases a decision on this information. Interest groups can increase their chances of obtaining a favorable decision by spending more resources on generating information that supports their case, and by spending effort to transfer this information to the decision maker.

Instead of producing information that supports their own favored policy outcome, interest groups may use resources to produce negative information on the attractiveness of particular alternative decisions or try to reduce the effectiveness of a competing interest group's activities. More generally, interest groups may use effort for two different purposes: for promoting their own project or for sabotaging activities of a specific competing interest group.

Suppose there are 3 lobbying groups, A,B and C. Group A may try to improve its own influence on decision makers. This effort increases its winning probability and, thereby reduces the winning probabilities of all other contestants. A's effort involves a negative externality for all other contestants. This type of effort is usually considered in the rent seeking literature and is called *standard rent-seeking effort* here. Alternatively, A may try to harm or destroy the relationship between the lobbying group B and the decision maker, for instance, by publicizing information about the assumed influence B has on the decision maker, thus making it costly for the decision maker to decide in favor of group B, or A may spread rumors about B that damage B's reputation. Such activities could be called *sabotage effort.* Unlike standard rent-seeking, this sabotage harms B and benefits both A and C. The positive externality of sabotage suggests distinguishing systematically between standard rent-seeking effort and sabotage.

These positive externalities make sabotage more important if the number of contesting groups is small, and sabotage typically disappears if the number of contesting groups is sufficiently large. The importance of sabotage for small numbers of contestant groups also changes a result that was obtained in the literature on rent seeking according to which the sum of all efforts in a contest increases with the number of contestants.

It is interesting to relate this to work by Gray and Lowery (1996) and Salisbury (1990). Gray and Lowery analyse lobbying groups' competition for survival and provide a population ecology explanation for the number of lobbying groups, entry, exit, and how they cooperate or differentiate from each other. The positive externalities in sabotage effort have a straightforward implication for the population ecology of lobbying groups' survival. Suppose there is competition for funding among lobbying groups from a set of groups that cater to similar interests. In this competition it makes less sense for each of the groups to spend resources pushing a particular other group out of business if more groups compete for the money of the same sponsors, because the gain from reduced competition is shared among all competitors within the set.

Salisbury (1990) describes that the increase in the number of lobbying groups has led to an increase of activity and has increased the complexity and intransparency of interest group competition, making coalitions between them more difficult and less stable. Fewer coalitions may imply more antagonistic behavior between these groups. While less cooperation does not necessarily imply more sabotage, it would be a source of antagonism and this counteracts the incentives revealed in this paper. Which of these counteracting consequences dominates would, of course, be an empirical matter.

Sabotage has been considered in several different fields. In the context of innovation, Baumol (1992) has developed a dynamic theory of sabotage in which a firm's innovation generates counter-innovation, or other counter measures that destroy the innovating firm's advantage from innovation. Lazear (1989) considers sabotage in contests within firms. He shows that compensation schemes with relative rewards or promotion tournaments induce employees to spend effort that reduces the output or performance of their rival employees and concludes that this feature strongly reduces the attractiveness of compensation schemes that build on relative rewards. Lazear's results extend directly to all kinds of yardstick competition, e.g., the regulation of utilities by relative performance measures. In these cases sabotage is harmful for two reasons. First, sabotage is costly because sabotaging involves effort. Second, this effort reduces other agents' desirable output. Skaperdas and Grofman (1995) discuss positive and negative campaigning in electoral contests. They consider the equilibrium allocation of given resources between activities that attract undecided voters, and activities that turn voters away from a rival candidate (negative campaigning) in two and three candidate contests, concentrating in particular on the effect of asymmetry in initial support. Negative campaigning can be seen as sabotage.

Our results on the number of rival lobbying groups and sabotage are relevant also for these other applications. As a general result, sabotage involves a negative externality to the contestant that is sabotaged, but also a positive externality to all other contestants. This positive externality makes sabotage less attractive the larger the number of contestants is.

2 Sabotage and rent-seeking

We consider a conflict between n lobbying groups contesting for a policy outcome that benefits exactly one of them, which is the standard framework in the literature on rent-seeking. The lobbying group for which the policy outcome is favorable receives a benefit of size B, all others receive zero.

Each contesting group i chooses a vector of monetary efforts, $(e_i, s_{i1}, \dots s_{i(i-1)}, s_{i(i+1)} \dots s_{in})$, with all components non-negative. Here, e_i is contesting group i's rent-seeking effort that is aimed to increase directly its probability of winning the prize, as in the standard model of rent-seeking contests. The new element is sabotage effort. Contestants can choose effort that reduces the effectiveness of a particular contestant group j's rent-seeking effort: s_{ij} denotes i's sabotage effort with respect to j and reduces the effectiveness of group j's rent seeking effort e_j. We define the *effective effort* of contesting group j as a function $b_j = b(e_j, (s_{1j}, \dots s_{(j-1)j}, s_{(j+1)j}, \dots s_{nj}))$ of its own promotional (rent-seeking) effort e_j, and the other contestant groups' sabotage that is directed toward j. We assume that the different sabotage efforts that are directed toward a particular contesting group j simply sum up to aggregate sabotage toward j,[5]

$$S_j \equiv \sum_{i=1, i \neq j}^{n} s_{ij}. \tag{1}$$

This simplifies the function determining effective effort to

$$b_j = b(e_j, S_j), \text{ with } b(e_j, 0) \equiv e_j. \tag{2}$$

We further assume that effective effort is twice continuously differentiable, and non-decreasing and concave in e_j and non-increasing and convex in S_j.

The benefit B is allocated according to a contest success function. In its most general form, this contest success function describes the winning probabilities of contestant i as a function of this group's own efforts, and the other contestants' efforts $p_i = p_i(b_1, \dots, b_n)$. In this general format, little can be said about the equilibrium choices of effort of the n contestants, even in the absence of sabotage. The specific research interest in this paper is on sabotage. Therefore, we narrow down the contest success function as regards effective effort to a functional form suggested by Tullock (1980), which is widely used in the literature, and has been axiomatized by Skaperdas (1996),

$$p_i(b_1, \dots b_n) = \frac{(b_i)^a}{\sum_{j=1}^{n} (b_j)^a}, \text{ with } 0 < a < n/(n-1). \tag{3}$$

Accordingly, lobbying groups' payoffs are

$$\pi_i = \frac{(b_i)^a}{\sum_{j=1}^{n} (b_j)^a} B - e_i - \sum_{j \neq i}^{n} s_{ij} \tag{4}$$

for $i = 1, \dots n$. We first consider a necessary condition for an equilibrium without sabotage.

Proposition 1 *A symmetric equilibrium exists in which all lobbying groups choose sabotage equal to zero ($s_{ij} = 0$ for all i, j) and standard rent seeking effort equal to $e_i = e^0 = \frac{n-1}{n^2} aB$ if*

$$-\frac{\partial b_k(e^0, 0)}{\partial S_k} \leq n - 1. \tag{5}$$

Proof. If sabotage is exogenously constrained to be equal to zero for all contestants, rent-seeking effort e_j and effective effort b_j coincide and the contest reduces to the standard Tullock (1980) rent-seeking contest. The contest has a unique symmetric equilibrium with effort

$$e^0 = \frac{n-1}{n^2} aB. \tag{6}$$

Now allow for positive sabotage. We show that, given $e_j = e^0$ for all $j \neq i$, and $s_{kj} = 0$ for all $k \neq i$, contestant i maximizes its payoff by a choice of $e_i = e^0$ and $s_{ik} = 0$ for $k \neq i$. The first-order condition for lobbying group i with respect to sabotage effort s_{ik} for $i \neq k$ is obtained from (4) as

$$\frac{\partial \pi_i}{\partial s_{ik}} = -\frac{(b_i)^a a b_k^{a-1} \frac{\partial b_k}{\partial S_k}}{(\sum_{j=1}^{n} (b_j)^a)^2} B - 1 = 0. \tag{7}$$

Making use of symmetry, (7) reduces to

$$-\frac{\partial b(e, S)}{\partial S} \frac{aB}{n^2 b} = 1 \tag{8}$$

where subscripts have been omitted. Making use of the concavity properties of the contest success probability with respect to sabotage and $b(e_i, 0) \equiv e_i$, this shows that the optimal choice of sabotage is $s_{ik} = 0$ if $-\frac{\partial b(e^0,0)}{\partial S} \leq \frac{n^2 e^0}{aB}$ holds. Condition (5) is obtained by substituting e^0 according to (6). □

No lobbying group has an incentive to spend positive effort on sabotage if (5) holds. Suppose contesting group i spends some sabotage effort to reduce the effective effort of contesting group k. This reduces k's win probability. However, it is not only contesting group i that gains from this in terms of an increase in its own probability of winning the contest. All other contesting groups $j \neq i, k$ also gain from group i's sabotage effort. I will refer to this as the *dispersion effect* in sabotage. Although the marginal costs of sabotage are born by the group that expends this effort, the larger the number of groups the more dispersed are the gains in probability of winning from this effort and the smaller the group's own share in these gains. If the condition in Proposition 1 holds, the benefit lobbying group i can appropriate from spending the first marginal unit on sabotage is smaller than its cost, and hence, no sabotage occurs in the equilibrium.

The way sabotage affects effective effort of the sabotaged group (left-hand side in (5)) is independent of the number n of lobbying groups, but the right hand side increases linearly in n; accordingly, the larger the number of lobbying groups with diverging interests, the more likely it is that there is an equilibrium with zero sabotage. The following corollary makes this more precise.

Corollary 1 *If the absolute value of* $\frac{\partial b_k}{\partial S_k}$ *is bounded from above for all possible values of effort and sabotage, then a number* n_s *exists such that an equilibrium without sabotage exists if the number of groups in the contest is at least* n_s*.*

One of the standard properties of rent seeking models is that the sum of all contestant groups' efforts is higher if there are more contesting groups.[6] Intuitively, this result is attributed to the idea that lobbying groups contest for a given amount of rents, where additional contestants lead to more competition, such that the sum of all contestants' efforts becomes a larger share in the contested rent. I will refer to this effect as the *competition effect.* Corollary 1 shows that what holds typically for standard rent seeking effort is not true for sabotage effort in contests. Sabotage is essentially a small number phenomenon.

Sabotage makes standard rent-seeking expenditure less effective. Can one hope that this reduces contest effort in the equilibrium?

Proposition 2 *In the symmetric equilibrium with the contest success function (3), standard rent-seeking effort is higher (lower) than in the equilibrium in which sabotage is exogenously constrained to be equal to zero if* $\frac{\partial}{\partial S_i}(\frac{\partial b_i/\partial e_i}{b_i}) > 0$ (< 0).

Proof. Let e^* and $S^* > 0$ be the equilibrium rent-seeking effort and sabotage effort in the symmetric equilibrium, if sabotage is feasible, and e^0 the equilibrium rent-seeking effort if all contestants are exogenously constrained to spend zero sabotage efforts. Consider the first-order condition with respect to rent-seeking effort:

$$\frac{n-1}{n^2}\frac{\frac{\partial}{\partial e}(b(e^*,S))}{b}aB - 1 = 0. \tag{9}$$

For any given value of S, condition (9) determines a unique optimal effort e^* chosen by all contestants, given that sabotage is $S_1 = S_2 = ... = S_n = S$.

The condition requires that the term $\frac{\frac{\partial}{\partial e}b(e^*,S)}{b}$ equals some exogenous constant $\frac{n^2}{(n-1)aB}$ that is independent of the functional form (2) determining effective effort and independent of other contestants' actions. As $\frac{\partial}{\partial e}(\frac{\frac{\partial}{\partial e}b(e^*,S)}{b}) < 0$, to fulfill this condition requires that

$$e^*\{\gtreqless\}e^0 \text{ if } \frac{\partial}{\partial S}(\frac{\frac{\partial}{\partial e}b(e^*,S)}{b})\{\gtreqless\}0. \tag{10}$$

□

If sabotage is feasible, a contestant group's marginal rent-seeking effort is less effective, because other contestants sabotage its effort. This could reduce the incentives to spend much on rent-seeking effort. However, a second effect is at work. All contestants' rent-seeking efforts are sabotaged in the equilibrium. This reduces the effectiveness of each of their total amounts of rent-seeking efforts. For this smaller effective effort, the marginal productivity of effective effort may be higher, inducing more rent seeking effort. The total effect depends on the strengh of these two countervailing effects.[7] In Figure 1, e^0 is determined by the intersection of a horizontal line denoting $\frac{n^2}{(n-1)aB}$ and the downward sloping function $\psi(e;S) \equiv \frac{1}{b}\frac{\partial b}{\partial e}$ which, for $S \equiv 0$, degenerates to $\frac{1}{e}$. An increase in S typically decreases the denominator b and may also decrease the marginal effective effort of an additional unit of rent-seeking effort. Depending on whether one or the other effect dominates, an increase in S shifts ψ to the left ($e^* < e^0$) or to the right ($e^* > e^0$).

Place Figure 1 here

A focus of interest in the rent-seeking literature on lobbying has been the dissipation rate which is the ratio between the sum of all contestants' efforts $E(= ne^* + nS^*)$ and the benefit B they can win, and how this rate changes if the number of lobbying groups increases. In the early literature (Tullock (1967), Krueger) the dissipation rate was suggested as a measure of the welfare loss in contests, because it was implicitly assumed that effort is a social cost; valuable resources are used up in the lobbying contest, and do not generate any benefit to agents outside the group of contestants, or to the group of contestants as a whole. More recent contributions by Austen-Smith and Wright (1992), Lohmann (1995) and Lagerlöf (1997) highlight the information aspects of rent-seeking contests. This theory views lobbying as an R&D process in which lobbying groups spend resources in order to produce information that supports the particular project they lobby for and to deliver this information to decision makers. Sabotage in this context can be seen as effort to produce information about rivals' projects that make a rival's project look less favorable, or to damage the rival's credibility or its ability to transmit information to the decision maker.

Whatever the correct view is, the dissipation rate is of interest, since it measures the size of these activities in relation to the possible benefits contestants have from these activities.

The first-order conditions regarding standard rent seeking and sabotage can be rewritten as

$$\frac{\partial \pi}{\partial e} = 0 \Leftrightarrow \frac{n-1}{n^2} aB = \frac{b(e,S)}{\frac{\partial b(e,S)}{\partial e}} \tag{11}$$

and

$$\frac{\partial \pi}{\partial s} = 0 \Leftrightarrow \frac{-1}{n^2} aB = \frac{b(e,S)}{\frac{\partial b(e,S)}{\partial S}} \tag{12}$$

where all subscripts have been omitted. These conditions reveal that $\frac{\partial b}{\partial S} = -(n-1)\frac{\partial b}{\partial e}$ in the equilibrium. The benefits of sabotaging a lobbying group k are shared between all lobbying groups except k. Hence, in the equilibrium, the marginal productivity of sabotaging must increase compared to the marginal productivity of standard rent-seeking if the number of lobbying groups increases.

However, the effect of an increase in n on aggregate effort E is ambiguous in general, as can be seen from a simple example. Let $b(e,S) = \frac{e}{(1+kS)^{\gamma}}$, with $k \geq 0$ and $\gamma \in [0,1]$. From (12), equilibrium sabotage $S^* = 0$ if $aB \leq \frac{n^2}{k\gamma}$, implying that $\frac{dE}{dn} = \frac{aB}{n^2} > 0$ in this case. If $aB > \frac{n^2}{k\gamma}$ then $S^* > 0$. Straightforward calculations show that $\frac{dE}{dn} = \frac{aB}{n^2} - (\frac{aB\gamma}{n^2} + \frac{1}{k})$ in this case. There is a competition effect (first term) and a dispersion effect (second term) and which one dominates depends on n, γ and k. Intuitively, there is the tendency for the aggregate sum of rent-seeking effort to increase as in the standard rent-seeking contest, due to increased competition, and for the aggregate sum of sabotage efforts to decline if the number of lobbying groups increases, due to the dispersion effect in sabotage. In addition, for more general functions b, rent-seeking and sabotage interact as has been seen in Proposition 2. Given these countervailing effects there is little hope for simple and unambiguous comparative static results.

Proposition 3 *An increase in the number of lobbying groups can decrease the aggregate effort E in the equilibrium. For $n \geq n_s$ (as defined in Corollary 1), aggregate effort increases in n.*

The possibility of a decline in aggregate total efforts in the number of lobbying groups highlights the importance of sabotage. In the rent-seeking literature on lobbying (see, e.g., Nitzan (1994)) which does not take sabotage into consideration rent dissipation with contest success function (3) is higher if there are more contesting groups.

3 Conclusions

Contestants may use effort to improve their own performance, or to reduce some rival's performance. The first type of effort has been called rent-seeking effort and is well studied in the rent-seeking and other contest literature. Rent seeking effort by one contestant has a negative externality for all other contestants as it reduces all other contestants' winning probabilities. It is natural that rent-seeking effort is a more serious problem if the number of contestants is large, because with a larger group the externality affects more rivals.

The second type of effort introduced here is called sabotage. Sabotage is different from standard rent-seeking effort. If a contestant lobbying group spends sabotage effort, sabotage is targeted toward a particular rival group and reduces this group's performance. The reduction in this rival's performance increases the winning probability of the sabotaging group, and also the winning probability of all other groups. Hence, if there are more than two contesting groups, sabotage involves a negative externality (suffered by the contestant that is sabotaged), and also involves a positive externality (enjoyed by all other contestants). Two main results are as follows. First, sabotage is a more important problem if few lobbying groups are in the contest, and under reasonable conditions sabotage disappears in the equilibrium if the number of lobbying groups becomes large. Second, sabotage makes the comparative statics of total effort for increases in the number of lobbying groups ambiguous and may lead to high rent dissipation in lobbying contests even if the number of lobbying groups is small.

The results in this paper can be applied to other contests as well. For instance, in promotion tournaments, yardstick competition between regulated firms, or political election contests, sabotage is more likely to be a problem if the number of contestants is small and can be expected to disappear if the number of contestants becomes sufficiently large.

Footnotes

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[1]An indirect conflict appears if it is assumed that interest groups lobby for policy favors and if the total number of favors is limited. This is the point of departure for a recent literature considering efficient mechanisms for the allocation of such favors, as in the auction menu approach suggested by Grossman and Helpman (1994).

[2]Some seminal contributions are Tullock (1967, 1980), Krueger (1974) and Posner (1975). For a survey see Nitzan (1994).

[3]For suveys of the literature on interest groups and lobbying see, e.g., Browne (1990), Mitchell and Munger (1991), and concentrating on the rent-seeking model, Nitzan (1994).

[4]See, e.g., Austen-Smith and Wright (1992), Lohmann (1995) and Lagerlöf (1997).

[5]Alternatively, sabotage could be a "weakest link" technology, yielding $S_j = \min(s_{1j}, ...s_{(j-1)j},\ s_{(j+1)j}, ...s_{nj})$, or a "best shot" technology, yielding $S_j = \max(s_{1j},\ ...s_{(j-1)j},\ s_{(j+1)j}, ...s_{nj})$, or, more generally, a function $S_j = \varphi(s_{1j},\ ...s_{(j-1)j},\ s_{(j+1)j}, ...s_{nj})$ that is increasing in its arguments. Reasonable stories can support one or the other specification. In the closely related literature on private provision of public goods, the various functional forms and the resulting private provision equilibria have been discussed intensively (see, e.g., Hirshleifer (1983) and Vicary (1990)), but the case with perfect substitutability as in (1) clearly dominates the discussion.

[6]For instance, for the symmetric Tullock (1980) rent seeking contest, $\frac{\partial}{\partial n}(ne^0) = aB/n^2 > 0$.

[7]A result that is structurally related has been obtained in Konrad and Skaperdas (1998). They consider the activity level of organized crime and show that increased countervailing measures chosen by the police may induce even higher activity by organized crime.

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