

Efforts in two-sided contests

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Abstract The degree of rent dissipation is studied in extended two-sided contests that involve two types of efforts. While usual contestants expend resources in trying to win the contested prize, potential recipients of the rent-seeking efforts also participate in the contest. This is due to uncertainty regarding the source of power in the contest that induces the bureaucrats to expend resources to increase their share in the rent-seeking efforts by trying to appear as the party controlling the allocation of the prize. We show that the existing theoretical and empirical studies are incomplete and may underestimate the extent of rent dissipation.

Keywords Rent dissipation · Contests · Incomplete information · Lobbying · Transparency

1 Introduction

A major theoretical effort has been made to clarify the reasons of rent under-dissipation, (Gradstein and Konrad 1999; Kahana and Nitzan 1999; Konrad 2004; Konrad and Schlesinger 1997; Nitzan 1994; Nti 1997). This effort has been partly stimulated by the empirical estimates of the extent of rent dissipation (e.g., Hazlett and Michaels 1993; Scully 1991; Sobel and Garrett 2002) that concluded that the total level of rent dissipation is quantitatively significant, however, the proportion of rents actually dissipated is considerably

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lower than 100%, in contrast to the prediction in the major and early contributions of Posner (1975) and Tullock (1980). Despite the considerable attention paid to the possibility of over-dissipation in the eighties, it has been shown that over-dissipation is impossible in a pure-strategy equilibrium, regardless of the assumptions on the extent of competition among the contestants (their number, evaluations of the contested prize, income and their ability to affect the contest outcome) or the form of the contest success function.¹

Epstein et al. (2007) have recently considered the case of incomplete information on the source of power in a contest. In such a case the contestants may divide their lobbying efforts between the potential centers of power, only one of which determines the contests' winning probabilities. Their analysis focuses on the effect of ambiguity regarding the source of power on the contestants' aggregate effort in a symmetric, simple lottery contest with two potential centers of power. In particular they examine the effects of varying the informativeness of the contestants' private signals (i.e., the probability that a signal is correct) and the degree of correlation between them on the contestants' efforts.

The main objective of this note is to extend the framework of Epstein et al. (2007), as suggested in the conclusion of their work, by departing from the usual approach in the contest literature of modeling politicians or bureaucrats as passive. More specifically, we intend to apply their contest with incomplete information on the identity of the agent who allocates the prize and analyze a relatively simple sequential "two-sided contests" where the prize or the rent and, in turn, the rent-seeking efforts it induces are both contested.² In such two-stage contests, two types of efforts are incurred. On one hand, the usual contestants (prize seekers, interest groups, lobbyists) expend resources in trying to win the contested prize. On the other hand, due to uncertainty regarding the source of power in the contest, namely, regarding the agent who actually determines the contest outcome, politicians or bureaucrats, who are the potential recipients of the rent-seeking efforts, also take part in the contest and expend resources in order to increase their share in those efforts. This is typically done by politicians making efforts to win elections or to seem to be winning the elections³ or by bureaucrats expending resources to achieve their position of authority. Alternatively, politicians or bureaucrats may simply make efforts to convince the contestants that they control the power of determining the contest outcome and are therefore the correct destination for the rent-seeking outlays. These latter situations often arise in committees of the legislature or in professional committees of civil servants that make decisions that differently affect the interests of the contestants (interest groups). Competing politicians or already elected politicians attempt to affect the contestants' beliefs concerning the appropriate target for their lobbying efforts. Politicians are typically advantageous in terms of information relative to potential lobbyists. Prior to elections, they have access to the results of the public opinion polls secretly conducted by their party that are sheltered from the interest groups. After the elections, in contrast to lobbyists, the politicians or bureaucrats involved in decision making know the identity of the source of power. This informational advantage of politicians or bureaucrats over the lobbying interest groups justifies the assumption of a sequential setting with politicians or bureaucrats who are the leading players. Focusing on the second interpretation of post-election politicians or bureaucrats, our analysis is intended to examine the

¹Over-dissipation in expected terms is possible, however, in mixed-strategy equilibria, see Baye et al. (1999).

²Our approach differs from the one that focuses on politicians who desire to increase the size of the prize in order to increase the expenses rent seekers are willing to make. See Appelbaum and Katz (1987).

³The intense investment in pre-election public opinion polls is one example of such efforts that are intended to convince interest groups that the politician is likely to win the election and is, therefore, an appropriate destination for transferring the lobbyists' efforts.

role of the waste which is due to the efforts incurred by politicians or bureaucrats⁴ and to argue that the existing theoretical and empirical studies that focus just on the waste due to rent seeking are incomplete and may underestimate the extent of rent dissipation.

In the following section the standard one-stage benchmark rent-seeking contest is presented. In Sect. 3 we introduce the more general sequential two-sided contest and our main argument. Section 4 presents a simple benchmark case of the sequential two-sided contest that extends the game studied in Epstein et al. (2007). The last section contains a brief summary.

2 The standard model

Let us consider the standard contest (Tullock 1980), where n homogeneous contestants compete over the same single prize, s .⁵ With probability $0 \leq Pr_i \leq 1$, $i = 1, 2, \dots, n$, contestant i wins the contest. It is assumed that only one contestant wins the contest: $\sum_{i=1}^n Pr_i = 1$. The expected net payoff of the risk neutral contestant i is equal to,

$$E(w_i) = Pr_i s - x_i, \quad i = 1, \dots, n, \quad (1)$$

where x_i are the resources invested by contestant i . The contest success function (CSF) Pr_i specifies contestant i 's probability of winning the contest, given the resources invested by the contestants. It is assumed that $\frac{\partial Pr_i}{\partial x_i} > 0$ and $\frac{\partial Pr_i}{\partial x_j} < 0$, $\forall i \neq j$. Each contestant determines his level of investment in the contest, x_i^* , so that he maximizes his expected net payoff.⁶ The total amount of resources invested in the contest is denoted by $X^* = \sum_{i=1}^n x_i^*$. In Tullock's model the rent-seeking expenditures are assumed to have no social value. That is they are conceived as real resources wasted in the contest. For this reason, X^* is referred to as *the rent dissipation of the contest*.

It has been shown that in the case of imperfectly discriminating contest success functions, the rent dissipation cannot exceed the prize,

$$X^* \leq s. \quad (2)$$

This under-dissipation result remains valid when entry to the contest is not restricted, the contestants differ in their evaluations of the prize, in their lobbying capabilities or in their budget constraints, (Gradstein 1995; Nti 1997).⁷ The impossibility of over-dissipation in a pure-strategy equilibrium is also robust to various extensions of the standard Tullock (1980) contest that allow, for example, loss risk aversion, (Konrad and Schlesinger 1997), uncertainty regarding the award of the rent, (Kahana and Nitzan 1999), various structural contest modifications, (Gradstein and Konrad 1999; Konrad 2004) and the introduction of opposition to the award of the prize, (Baik 1999; Epstein and Nitzan 2003, 2007).

⁴The view that the efforts of the government officials to obtain the expenditures of the potential recipients of the rent may be considered as a social waste is already mentioned in the literature. For example Hindriks and Myles (2006) point out that many of the resources used in seeking election, while anticipating the bribed received once elected, constitute a cost to the economy because they do not result in any net output.

⁵This assumption can be easily generalized to n different evaluations of the same prize: s_i , $i = 1, 2, \dots, n$.

⁶Assuming that the $\frac{\partial^2 Pr_i}{\partial x_i^2} < 0$, it can be shown that there are general conditions that ensure a unique equilibrium. See Epstein and Nitzan (2006a, 2007).

⁷Gradstein (1995) considers the role of intensity of competition in studying entry and entry deterrence in rent-seeking contests. In his study intensity of competition represents the extent of rent dissipation of the contest.

3 The extended two-sided contest

We claim that in a general political-economic contest there are two groups of players: bureaucrats (or politicians) and lobbyists. The former group contains one agent, who will be or already is the source of power in the contest, that is, the agent who determines the contest (probabilistic) outcome, and a subset of the remaining $(k - 1)$ bureaucrats (or politicians). These $(k - 1)$ agents are those bureaucrats who are not going to secure the position of authority or those politicians who will lose the election. Another possible interpretation is that the source of power in the contest is already determined, and these agents are bureaucrats who pretend to be the real decision makers, but actually are powerless. Nevertheless, they may have some negative power, for instance, due to their ability to cause bureaucratic troubles and “put sticks in the wheels” and this power to sabotage enables them to pretend to be the actual decision makers.

The lobbyists in the second group are the usual contestants that attempt to win the contested prize. These prize seekers know that only one of the bureaucrats is going to be or already is the real decision maker (the “center of power”), while the others who compete for the position of authority or pretend to be the decision makers are going to be or actually are powerless. But the lobbyists are usually uncertain as to the identity of the real decision maker. Nevertheless, each lobbyist has beliefs about the chances of the k agents competing for the position of authority or about the structure of the bureaucratic system and the location of the “power center” within this system. Keeping in mind that both interpretations are consistent with our model, we henceforth adopt the second interpretation and assume that the actual distribution of power is already determined, but not transparent to the lobbyists.

We assume that the contestants share the common prior that the source of power d is likely to be one of the bureaucrats. Each contestant receives a signal v regarding d 's identity, which is correct (i.e., $v = d$) with probability $0 < p < 1$ and is incorrect ($v \neq d$) with probability $q = 1 - p$.⁸ We do not specify the nature of the signals, which may be private, public, or a mixture of both. In particular, the contestants' signals may or may not be conditionally independent, given d . We only assume that the conditional coefficient of correlation between all the signals ρ is the same regardless of whether one bureaucrat or another is the real decision maker. The parameters p and ρ uniquely determine the probabilities that all contestants' signals are true and the probability that all are false and any other possible combination (such as some receive the true signal and others the false signal).

A contestant's probability of winning the contest is determined by the lobbying efforts directed by him and by his rivals to the decisive bureaucrat. To illustrate our main point using an analytically tractable, relatively simple model, we do not assume that the two-sided interactions are simultaneous; the lobbyists affect the actions of politicians and simultaneously the politicians affect the beliefs of the lobbyists. Rather, we focus on a simple sequential setting where the competing lobbyists take decisions based on ‘already determined’ beliefs. This assumption, which is spelled out in more detail below, allows us to apply the results of Epstein et al. (2007) regarding the symmetric Bayesian equilibrium of the contest between the lobbyists. To determine the equilibrium in our two-stage game, let x_i^j denote the lobbying effort contestant i directs to bureaucrat j ($j = 1, \dots, k$). In equilibrium, x_i^j , $i = 1, \dots, n$; $j = 1, \dots, k$, maximizes the contestant's expected payoff, taking into account the different possible combinations of signals he and his rivals receive.

⁸If $p = 1/2$, then the prior p is also the *posterior* probability, given v , that the real decision maker's identity is indeed v .

The expected net payoff of the risk neutral agent i is given by:

$$E^g(w_i) = \sum_{j=1}^k Pr_i(p, q, \rho, x_i^j, x_{l \neq i}^j) s - \sum_{j=1}^k x_i^j, \quad i = 1, 2, \dots, n, \quad (3)$$

where $Pr_i(p, q, \rho, x_i^j, x_{l \neq i}^j)$ is the probability of winning taking into account the investment of contestant i (x_i^j), all the other contestants ($x_{l \neq i}^j$) and the probability the signal is correct, p , false, q , and the vector of correlations between signals ρ .⁹

Assuming that there is a unique Bayesian equilibrium, denote the equilibrium expenditures by x_i^{j*} . The total amount of resources invested by the contestants of the second group is denoted by $X^{g*} = \sum_{i=1}^n \sum_{j=1}^k x_i^{j*}$. The main result of the previous section is still valid under the contest with incomplete information on the source of power, that is, the rent-seeking efforts cannot exceed the contested prize: $X^{g*} \leq s$.

However, X^{g*} is not the only expenditure invested in the two-sided contest. Hoping to obtain part of the rent-seeking expenditures of the lobbyists, each of the politicians can invest resources in order to try to convince the contestants that he/she is the source of power. Such resources may affect the common prior beliefs of the contestants, d . The ambiguity regarding the source of power is a typical feature of the post-election political-economic environment that we examine.¹⁰ It is due to the recognition of politicians or bureaucrats that pretending to be the real decision makers might be to their advantage. The interest groups compete in the second stage of the game, which is known to the interest groups and to the politicians. However, the politicians and bureaucrats who are members of committees of the legislature or of the government are those who know who is the actual decision maker that allocates the rent and they can use this information to their advantage, being aware of the contest among the lobbyists. For this reason the politicians in the two-sided contest are assumed to have an advantage over the interest groups, namely, to be the leading players in the extended two-stage contest. Hence, their efforts are determined in light of the anticipation of the contestants' equilibrium rent-seeking efforts that depend on the beliefs that are shaped by the politicians' efforts. In other words, in our two-sided contest, the competition among the contestants yields their Nash equilibrium rent-seeking efforts, given their beliefs. The politicians, being aware of the relationship between these beliefs and the equilibrium efforts of the contestants, compete on their share in the contestants' rent-seeking outlays. This yields the Nash equilibrium efforts of the politicians that determine the contestants' beliefs. Since the politicians take into account the reaction of the contestants to their investment strategies that determine the contestants' beliefs, whereas the competition among the contestants (the followers) is based on their 'already determined' beliefs, the equilibrium of this two-sided game can be referred to as a Stackelberg-Bayesian Nash equilibrium.

Denote by y_i^j the investment made by politician j who tries to convince contestant i that he is the real source of power. We could think of many different objective functions

⁹For the case of two contestants and two bureaucrats, see Epstein et al. (2007).

¹⁰As already noted, ambiguity regarding the source of power is also a natural characteristic of a pre-election political environment. In this context, the politicians are those who know better who is more likely to win the election and become the source of power and they have a clear incentive to persuade potential contributors to their campaign (the interest groups) that they have good chances of winning the election. Political candidates can try to affect the potential contributors' priors regarding their winning chances by ordering polls from research institutes, by affecting the results of these polls or by transmitting (false) messages to the media. Campaign contributions, often to more than one party, can therefore also be perceived as rent-seeking investments undertaken by interest groups.

that represent the politician's preferences.¹¹ In general, the total rent-seeking efforts in the contest are equal to

$$X^{g^*} + Y^* = \sum_{i=1}^n \sum_{j=1}^k x_i^{j*} + \sum_{i=1}^n \sum_{j=1}^k y_i^{j*}.$$

Since $X^{g^*} \leq s$, the relationship between

$$X^{g^*} + Y^* = \sum_{i=1}^n \sum_{j=1}^k x_i^{j*} + \sum_{i=1}^n \sum_{j=1}^k y_i^{j*}$$

and the rent s is unclear. Nevertheless, it may well be the case that $X^{g^*} + Y^* > s$. The reason for this is that, as usual, the contestants invest resources to favorably affect their chances of winning the contested prize—rent type 1. This may result in an investment portfolio that consists of rent-seeking or lobbying efforts that are directed to all or just some of the k politicians. In a two-sided contest the politicians are aware of these resources and conceive them as a rent—rent type 2. This induces them to make efforts to increase their share in this rent. In two-sided contests then, there are two different contests. A contest on the contested prize—rent type 1 and a contest on the rent-seeking efforts that it induces—rent type 2. Clearly, for the same reason that $X^{g^*} \leq s$, we obtain that $Y^* \leq X^{g^*}$. Hence, the total rent-seeking efforts (those of the lobbyists and the politicians) cannot exceed two times the value of the contested prize, that is,

$$X^{g^*} + Y^* = \sum_{i=1}^n \sum_{j=1}^k x_i^{j*} + \sum_{i=1}^n \sum_{j=1}^k y_i^{j*} \leq 2s. \quad (4)$$

In Tullock's model, the rent is dissipated when expenditures by the contestants are considered as directly wasteful; it is assumed that they do not positively affect anyone's utility and, in particular, the politicians' payoffs. In other words, these expenditures are not in-kind or cash transfers, because if they were, they could have no efficiency effects, but only redistribution effects. But in our setting, this is not the case, because the politicians explicitly place a positive value on the expenditures of the contestants. In fact, this positive value is precisely what induces them to compete for these expenditures. Note that the politicians may compete for the transferred part of the rent-seeking expenditures or for all of these

¹¹For example, as commonly assumed in the recent political economy literature, Epstein and Nitzan (2003, 2006b), the politician's objective function $G^j(\cdot)$ could take the form of a weighted average of the expected social welfare and the lobbying efforts. That is,

$$G^j(\cdot) = \alpha_j \sum_{i=1}^n E(w_i^*) + (1 - \alpha_j) \sum_{i=1}^n x_i^{j*} - \sum_{i=1}^n y_i^j.$$

The parameters α_j and $(1 - \alpha_j)$ are the weights assigned to the expected social welfare and the contestants' lobbying outlays on politician j . In one extreme case, if all the politicians care only about social welfare ($\alpha_j = 1, \forall j$), then there would be no contest; competition among the politicians would vanish and each of them would truthfully state whether he is the source of power. The competition among the rent seekers would also vanish, because the actual source of power is interested in eliminating the wasteful rent-seeking efforts. So he would simply decide not to award the prize s and so eliminate the contest. In another extreme case, which is commonly assumed in the rent-seeking literature, the politicians care only about their net lobbying efforts ($\alpha_j = 0, \forall j$).

expenditures.¹² In both cases, in our two-sided contest, one cannot argue that all of X^{g*} is directly wasteful. However, the initial expenditures of the politicians, Y^* , are wasteful, since the lobbyists do not place a positive value on these expenditures. In any event, even if the rent-seeking expenditures are non-wasteful transfers, in our model part of the contested prize is dissipated. To sum up, despite the distinction in our two-sided contest between the initial outlays of the politicians and the subsequent efforts of the lobbyists, efforts that may include transfers to the politicians, the contested prize is under-dissipated, the extent of the dissipation being equal to the sum of Y^* and the directly wasted part of X^{g*} .¹³

4 Illustration

Let us illustrate our main argument in a simple benchmark case of the sequential two-sided contest, applying the setting and results of Epstein et al. (2007). Consider the case of two contestants, 1 and 2, competing over a prize normalized to 1 ($s = 1$) and two politicians, 1 and 2, one of which is the true source of power (this can easily be generalized to n contestants and k politicians as in the general case presented above). Suppose that each of the contestants has the same prior beliefs d regarding the identity of the source of power. Moreover, the investment of each of the politicians affects this common prior in the same way.^{14, 15} More precisely, suppose that d is affected in the following symmetric way by the wooing efforts y_1 and y_2 of the two politicians:

$$d = \frac{(y_1)^v}{(y_1)^v + (y_2)^v}, \quad v \leq 2.$$

In the contest among the lobbyists, we assume that the CSF is the generalized lottery function, Lockard and Tullock (2001), that is, $Pr_1^j = \frac{(x_1^j)^r}{(x_1^j)^r + (x_2^j)^r}$ where $r \leq 2$.¹⁶ In this case, by Proposition 1 in Epstein et al. (2007), in equilibrium of the second-stage sub-game, the maximal total amount of resources invested by the two contestants on politicians 1 and 2 is equal to $x_1^1 + x_1^2 = \frac{r}{2}d$ and $x_2^1 + x_2^2 = \frac{r}{2}(1 - d)$.

Suppose that the objective of the politicians is the maximization of the aggregate lobbying efforts.¹⁷ That is, the objective functions of politicians 1 and 2 are given by:

$$G^1(.) = x_1^1 + x_2^1 - y^1 = d \frac{r}{2} - y^1 \quad (5)$$

¹²The latter case is possible when politicians' utility is positively affected by lobbying efforts that strengthens their self esteem and perhaps their real status in the political system or just in their party.

¹³If the contest success function is the all-pay auction and the contestants have identical stakes, then the expected rent dissipation due to the contestants' efforts is 100%. Therefore, if we now add to their efforts the expenditure incurred by the politicizations, the extent of rent dissipation can exceed 100%.

¹⁴This of course need not be the case. It may well be that politicians can differently affect different contestants' beliefs.

¹⁵In this example it is assumed that there is perfect correlation between the signals; $\rho = 1$.

¹⁶This function is of the logit form. Such logit-form contest success functions have been extensively used in the literature. See for example, (Baik and Shogren 1992; Baye and Shin 1999; Dixit 1987; Hirshleifer 1991).

¹⁷In the case where the politician's objective function $G^j(.)$ is the weighted average of the expected social welfare and the lobbying efforts, see footnote 10, $\alpha_j = 0 \forall j$.

and

$$G2(\cdot) = x_1^2 + x_2^2 - y^2 = (1-d)\frac{r}{2} - y^2. \quad (6)$$

Note that the contest between the politicians can be conceived as a contest over the common prize ($\frac{r}{2}$) where the ‘contest success function’ is given by d . Anticipating the equilibrium in the second stage sub-game, the two politicians share the common interest that $p^* = 0.5$ or $p^* = 1$ because in these cases (by Proposition 1 in Epstein et al. 2007), the total efforts made by the contestants are maximal. Assuming that this is indeed the situation with respect to the quality of the signals the contestants receive, the politicians’ expenditures in the first-stage sub-game are equal to $y^{1*} + y^{2*} = \frac{rv}{4}$.¹⁸ The total rent seeking outlays in this contest are therefore equal to:

$$Y^* + X^{g*} = \frac{r}{2} + \frac{rv}{4}. \quad (7)$$

If the waste associated with X^{g*} is equal to $(1-\delta)X^{g*}$, $0 \leq \delta \leq 1$, and $r = v$, the dissipated rent is equal to $\frac{r}{2}((1-\delta) + \frac{r\delta}{2}) < v$. As we can see, the total rent dissipation increases with r : $\frac{\partial \text{Rent Dissipation}}{\partial r} > 0$. If for example, $r = 1$ and $\delta = 1$, then the total rent dissipation is equal to 0.25, while if, as in the standard literature, the expenditures of the politicians are disregarded, we would have obtained that rent dissipation is equal to 0. In the case where $r = v = 2$ and $\delta = 1$, rent dissipation in the contest is equal to 1 (while disregarding the expenditure of the politicians we would obtain a rent dissipation of 0). In this latter case rent dissipation is maximal, being equal to the value of the contested prize.

5 Conclusion

In this note we pointed to a so far unnoticed incentive for the expansion of wasteful resources in political-economic contests, namely, the fact that the contest can be two-sided. Departing from the usual approach in the contest literature of modeling politicians or bureaucrats as passive, in such contests the prize and, in turn, the prize-seeking efforts it induces are both contested and, therefore, two types of efforts are incurred. First, due to uncertainty regarding the winner of the prize, the usual contestants (rent seekers, interest groups, lobbyists) expend resources in trying to win the contested prize. Second, due to uncertainty regarding the identity of the agent who actually determines the contest outcome, politicians or bureaucrats, who are the potential recipients of the rent-seeking efforts, also take part in the contest, expending resources in order to increase their share in those efforts. This is typically done by making efforts to affect the contestants’ beliefs concerning the appropriate target for their lobbying efforts. In other words, politicians and bureaucrats make efforts to convince the contestants that they will control or that they already control the power of determining the contest outcome and are therefore the correct destination for the rent-seeking outlays. We established that in such two-sided contests the total rent-seeking efforts consist of the expenditures of the lobbyists and the politicians. Usually, part of the former expenditures are

¹⁸If the quality of the signals s differs from 1/2 and from 1, and the conditional coefficient of correlation between the signals received by the two contestants is smaller than 1, then the corresponding total efforts of the contestants are not maximal. In particular, when $r = 1$, by Proposition 4 in Epstein et al. (2007). These efforts range between 0.404 and 0.5 of the prize. In turn, in this case, the total rent-seeking efforts $Y^* + X^{g*}$ would range between $(0.4 + 0.2s)$ and $(0.5 + 0.25v)$ of the prize. The effect of the nature of the signals on the contestants’ efforts is studied in Epstein et al. (2007).

directly unproductive and the rest are resources transferred to the politicians. Our main conclusion is that over-dissipation of the rent is possible. However, even under contest success functions where over-dissipation of rents is impossible, in our extended two-sided contest rent dissipation might still be underestimated and the attempts to empirically measure it are incomplete in the existing studies that focus just on the efforts of the rent seekers. A simple sequential benchmark case of two politicians and two lobbyists illustrates our arguments. This case makes use of the setting and results obtained in Epstein et al. (2007), assuming that the politicians affect the common prior beliefs of the contestants regarding the identity of the politician who allocates the rent.

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