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Reducing Rent Seeking by Providing Prizes to the Minority

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Elected officials or others with influence over decisions by a government agency often exert costly effort to obtain outcomes ("prizes") that further their own goals. Such activity is an example of rent seeking, which occurs when a person spends resources or exerts effort to increase his share of existing or anticipated wealth, without creating wealth. The prizes sought can take many forms: a profitable government contract, a government facility that provides improved service or higher employment in a city, a bus stop or a train stop at a location local residents desire, or the removal of a toxic waste dump. Rent-seeking behavior is both common and – because of the costly effort – wasteful. Under some conditions, rent-seekers may spend so much effort as to dissipate the value of the prizes sought. We might, therefore, expect potential rent-seekers to seek ways of reducing their rent-seeking efforts. In this paper, Glazer and Proost construct a model consisting of a legislature which determines the number, and quality, of prizes to be awarded. The legislature determines the number of prizes, but another agency determines who receives them. Legislators can engage in rent-seeking to try to obtain prizes from the agency. The authors assume that the majority in the legislature aims to maximize their own welfare – defined as the values of the prizes won by members of the majority, minus the taxes they pay to finance the prizes, minus their rent-seeking efforts. The authors consider several strategies the majority may use to reduce their own rent-seeking costs, including:

- Increasing the number of prizes, even if that allows some members of the minority to win prizes.
- Reducing the quality of the prizes.
- Introducing a cost-sharing scheme between the central government and the localities receiving the prizes.

In all cases, Glazer and Proost show that the reduction in rent-seeking costs can be so large that members of the majority can benefit even if they have to pay for the additional prizes, or receive prizes of lower value.

Analysis

Glazer and Proost consider a legislature consisting of N members. Each legislator wishes to obtain a prize, and each has one vote on a committee which decides by majority vote how many prizes, s, will be awarded. Though the majority sets the total budget (or sets the number of prizes), an independent agency selects which legislators are awarded a prize. Each legislator can lobby the agency. The financial cost of providing s prizes is C. C can be thought of as the total amount of taxes which must be collected to finance the prizes. If each legislator pays an equal share, each pays a tax of C/N. Legislators pay the tax whether they receive a prize or not. The net benefit received by a legislator who receives a prize consists of the value of the prize, minus the taxes paid for the prize, minus the cost of lobbying.

An analysis of this model leads Glazer and Proost to the observation that the net benefit of a member of the majority equals the difference between his valuation of the prize, and the valuation by the member of the minority who most highly values the prize (less the taxes required to finance the prizes). The results which follow flow from this observation.

Results

Majority may favor universal prizes

If legislators equally value the prize, the analysis shows that rent-seeking would exhaust all benefits. If, however, the majority chooses a number of prizes which equals the number of legislators, rent-seeking is eliminated. Examples of universal, or near universal, prizes abound. In many instances this results in an excessive number of prizes. Consider the example of bus stops. Studies comparing the actual number of stops to the efficient number of bus stops along a route find too many stops: by about 30% in Portland, Oregon and by about 100% in Boston.

Majority favors low quality of prizes

A reduction in the quality of the prizes reduces the incentives of legislators to lobby, and so may increase the welfare of the majority.

Majority favors cost sharing

In many countries, the central government finances only some of the cost of service, requiring those who receive a prize to bear a share of the cost. The share that prize winners pay reduces the ultimate value of the prize, and in turn reduces the rent-seeking effort of legislators, similar to that of the reduction in quality. This, too, can increase the welfare of the majority.

Majority may favor more prizes than does the minority

As previously demonstrated, the majority gains from increasing the number of prizes partly because rent-seeking declines. Some members of the minority, however, will prefer that the number of prizes not be increased as their taxes and rent-seeking will increase, and they still may end up without a prize.

Policy Implications

Legislators who design policy should care not only about the costs of the policy, or about the benefits that a prize would yield to those legislators who get a prize. When the majority imperfectly controls policy implementation (as when an independent agency controls implementation), members of the majority should also care about their rent-seeking activity. That means that members of the majority should worry about the benefits to members of the minority. The general principle is that the members of the majority gain from reducing the benefits to the member of the minority who values the prize most. Such reductions can take several forms including awarding many prizes, reducing the quality of the prizes, or implementing a cost-sharing scheme for prize winners.

While the analysis focuses on awarding a prize, the same logic can apply to avoidance of a loss. Consider a cut in the governmental budget. If agencies have discretion on what to cut, then legislators or constituents may exert great effort in preserving their favored programs. If, instead, the cuts are universal, or across the board, then such lobbying activity will be restricted. The cuts to the USA federal budget in 2013, under the name of sequestration, cut everything, rather than only programs that benefit the minority. This study offers one explanation for such universalism.
Similar reasoning can apply to other situations where one group determines the number of prizes, with members of the group recognizing that the number of prizes will affect how much rent-seeking effort each of them will later seek to exert. For example, elite research universities with influence over policies of the National Institutes of Health or of the National Science Foundation may want the granting agencies to offer a large number of grants, even if each grant thereby becomes smaller, to reduce the time and effort their faculty must spend on applying for grants. Policies which may appear to be

irrational or motivated by altruism may instead reflect efforts by a powerful group to reduce their own wasteful rent-seeking.

Reducing Rent Seeking by Providing Prizes to the Minority

1 Introduction

Rent seeking—the exertion of costly effort to win a prize—is both common and wasteful to the rent seekers. We might therefore expect potential rent seekers to seek some ways of reducing their rent-seeking efforts.[1] Several mechanisms come to mind. If rent-seeking opportunities occur repeatedly, then the rent seekers may implicitly collude by following a trigger strategy—each of them exerts no effort in rent seeking if in the past all others had exerted no effort, but each will revert to the inefficient Nash equilibrium with rent seeking if any one of them had exerted rent seeking effort in the past. A different mechanism is for some group, at a stage before rent seeking occurs, to make rent seeking by some actors cheaper or more effective; that can reduce rent seeking effort by all involved. An extreme form of such preference is to exclude some people from eligibility to win the prize.

In contrast to the Tullock model of rent seeking, which suggests that an increase in the number of rent seekers increases aggregate effort on rent seeking, we show below that, under plausible conditions, and consistent with some observed phenomena, the opposite can occur. More specifically, we will consider a legislature where a majority can determine the number of prizes. We shall see that by providing prizes that members of the minority will likely win, members of the majority can reduce their own rent-seeking efforts. The reduction in their rent-seeking costs can be so large that members of the majority can benefit even if they have to pay for the additional prizes. Another way of reducing rent seeking, also examined here, is for the majority to set a low quality for the prizes, or to set a co-funding requirement on anyone who wins a prize.

We note that the prizes can take many forms: a profitable government contract, a government facility that provides improved service or higher employment in a city, a bus stop or a train stop at a location local residents desire, or the removal of a toxic waste dump. At a university the prize can consist of the allocation of a new faculty position to a department, or the renovation of a departmental building.

[1] Related literature, on tournaments, considers how to design a game so as to maximize total effort made by players; one such important paper is Moldovanu, and Sela (2001).

2 Literature

2.1 Rent seeking

Models of rent seeking are often used in analyses of politics (Tullock 1967, Krueger 1974, Posner 1975, Buchanan, Tollison, and Tullock 1980, Bhagwati 1982, Tollison 1982). Most of the literature discusses rent seeking that benefits firms or special interest groups. But the concept also applies to transfers of wealth to politicians or to their constituents: a politician, for instance, may lobby for federal funds to his district. Under some conditions, competitive rent seekers may spend so much as to dissipate the value of the rents to be distributed (Tullock 1967, 1980). The costs of rent seeking associated with trade restrictions are estimated as 15% of GNP in Turkey in 1968 and 7.3% in India in 1964 (Krueger 1974). In a direct calculation of spending by firms entering a lottery for cellular telephone licenses, Hazlett and Michaels (1993) find that firms spend about a third of the value of the licenses on rent seeking.

We build on a model of contests, a form of rent seeking, given by Clark and Riis (1998). But we differ in several ways from them and from others studying rent seeking. First, rather than looking at the welfare of the contest organizer, we look at the welfare of a majority of legislators or of the pivotal member of a winning coalition, all of whom will engage in rent seeking. Second, we focus not on aggregate rent seeking, but on welfare, defined as the values of the prizes won by members of the majority, minus the tax they pay to finance the prizes, minus their rent-seeking efforts. Third, we have the contest designed not by some exogenous holder of the prize, but by a majority of the legislators. Last, we apply rent seeking to a question not previously addressed in that literature—the behavior of a majority which determines how may prizes will be awarded.

2.2 Incomplete targeting of benefits

Though much literature supposes that the winning coalition in a legislature can fully specify policy, stating, for example, which city will get what allocation for mass transit, such specificity is often absent. Consider earmarked spending in the United States; one estimate is of \$47.4 billion in 2005, and another estimate is of only \$27.3 billion in 2005.[2] The non-partisan Annenberg

[2]Porter and Walsh 2006.

Political Fact Check (2007) reports pork-barrel spending, where legislation specifies spending in a legislator's district, at about only one percent of federal spending.

Consistent with these data, McCubbins, Noll, and Weingast (1987 and 1989) suppose that a winning coalition has limited ability to set policy. Instead, a winning coalition may adopt institutional rules that affect an agency's future decisions. Furthermore, a legislator may avoid specifying policy if he is unsure about which location or which exact project would most benefit him. For example, a congressman who anticipates redistricting may not know which geographic area he will represent, and so cannot specify the beneficiary. An additional uncertainty at the time legislation is adopted concerns which special interest, or which group in the legislator's district, the legislator would want to benefit. Or, though the legislators may prefer to specify policies, agency officials may not follow, or they may misinterpret, legislative directives. A cost of reducing agency discretion is that a small error in drafting legislation (say mis-spelling the name of a city) may mean that a member of the winning coalition will get no prize at all; delegation to an agency allows for correcting such errors. Lastly, once everyone understands that everybody else will restrict himself from proposing individualized benefits, it becomes rational for each individual to stay in this restrictive set of strategies (Myerson 2009).

3 Assumptions

3.1 The actors

Consider an even number, N, of actors. Each wishes to obtain a prize, and each has one vote on a committee which decides by majority vote how many prizes, s, will be awarded. Because of majority voting, at least $(N/2) + 1$ of the actors must expect to benefit from any policy adopted. We will later show that many of the conclusions also hold when the political system is of the citizen-candidate type (as in Besley and Coate 1997) or of the legislative bargaining type (as in Baron and Ferejohn 1989).

Actors are ordered from highest value of gross benefits (index 1) from the prize to lowest (index N). For simplicity, we assume that the winning coalition consists of the $(N/2) + 1$ actors with the highest valuation. Note, however, that our results do not require that the legislators who most highly value a prize form the majority; all that we require to show that members of the majority can gain from increasing the number of prizes is that the majority includes members who are not the lowest valuers. Nor need we suppose that the pivotal member of the majority determines policy, since, as will be seen, all members of the majority get the same benefit from an increase in the number of prizes.

The aggregate cost of providing s prizes is $C(s)$, with $C'(s) > 0$; this cost is independent of the identities of those who get the prizes. The cost of the prizes is shared across all N actors; the pivotal actor in the majority pays a tax or fee of $fC(s)$, with $0 < f \leq 1$. For example, when the costs are shared equally by the actors, $f = 1/N$. Each actor pays the tax whether he receives a prize or not.

Actor i values the prize at $v_i(i = 1, 2, ..., N)$, with $v_1 \geq v_2 \geq ...v_N$. More generally, the majority may structure the policy so that an actor belonging to the majority benefits at least as much from a prize as does an actor excluded from the majority coalition; that is $v_i > v_j$ if $i \leq (N/2)+1$ and $j > (N/2)+1$. Each actor gets one of the prizes or not; he does not get multiple prizes. The benefit v_i is independent of when an actor gets a prize or of how many prizes are awarded.

For some explicit results we will make more specific assumptions: the cost of providing s prizes is $F + cs$; the ith highest valuation is $v_i = a - bi$, with a and b positive parameters.

3.2 Allocation of prizes

Though the majority sets the total budget (or sets the number of prizes), an agency selects which actors win a prize. Each actor can lobby the agency.[3]

Consider a multi-prize contest, where s identical prizes are distributed to $s \leq N$ actors. Our analysis applies to different lobbying mechanisms. The English auction would have each actor make a bid. The agency provides a prize to each of the s highest bidders; an actor who wins a prize pays his bid and pays the taxes which finance aggregate spending; an actor who gets no prize pays only the taxes.

[3] The lobbying or rent seeking can consist of adopting policies that are unpopular with the local voters, but would appeal to the agency that allocates the prizes; or the cost of rent seeking can arise from the opportunity cost of a mayor and governor lobbying the agency instead of attending to other issues.

A different formulation, which yields almost identical results, builds on Clark and Riis (1998).[4] Let each of the N actors simultaneously choose an outlay (rent-seeking effort that is a sunk cost) $x_i \geq 0$. The actor who spent the most first gets a prize. The remaining $N-1$ actors who had not yet won a prize then engage in a similar game, with each exerting rent-seeking effort; again, of the remaining actors, the one who spent the most is selected. The game repeats until s actors receive a prize. The discount factor is 1, so that an actor does not care when he wins a prize. Note that our results continue to hold in a simultaneous game in which each actor engages in rent seeking only once, with the s actors who spent the most having a higher probability to win one of the prizes.

The majority chooses s to maximize the expected net benefit of its pivotal member; this net benefit is the probability he wins one of the prizes times his valuation of the prize, minus his rent-seeking effort, minus his taxes to finance prizes. We shall suppose that the pivotal member is the median one, with valuation $v_{N/2+1}$. But that is not critical to our results.

The timeline for the sequential all-pay auction follows.

1. Nature assigns a valuation v_i to each actor.
2. The majority chooses the number of prizes, s.
3. Each actor pays taxes that finance the cost of the s prizes.
4. Each actor engages in rent seeking (repeatedly if he had not won a prize in the previous round) to win a prize.
5. The agency assigns prizes to s players
6. An actor i who wins a prize enjoys a gross benefit v_i

For the English auction, the timeline is similar, except that only the winners pay their bids, and the actors play a simultaneous game, with the s actors who spent the most winning a prize.

[4]Clark and Riis (1998) study multiprize, all-pay, complete information auctions, where the valuations of the participants differ. This class of problems is generalized by Siegel (2009).

4 Results

4.1 Equilibrium benefits

Consider first lobbying as described by an English auction. Let N actors with valuations $v_1 \geq v_2 \geq ...v_N$ compete for s identical prizes. The equilibrium has actors $1...s$ each bid v_{s+1}, actor $s+1$ bid an infinitesimal amount below v_{s+1}, and actors $s+2...N$ each bid 0. Each of actors $1...s$ wins a prize, paying v_{s+1}, and so actor i's net benefit is $v_i - v_{s+1} - fC(s)$. Actors $s+1...N$ win no prize, but pay for the prizes others receive. This set of bids is a Nash equilibrium. We shall make much use of the result that in equilibrium the net benefit of actor i (for $i = 1...s$) is $v_i - v_{s+1} - fC(s)$.

The model can be extended to have the agency give preference to members of the majority. For example, the agency may favor a member of the majority by viewing his bid as E greater than what the actor spent. That is, if actor i (where $i \leq (N+1)/2$) bids b, the agency treats the actor as if he spent $b+E$. With s prizes, actor $s+1$ spends $v_{s+1} - \epsilon$. So in equilibrium, each of actors $1...s$ spends $v_{s+1} - E$. Each member of the majority gains, on average, $v_{s+1} - v_{s+2}$ from increasing s, which gain is identical to what we derived above.

Remarkably, though not previously noted, the same net benefits apply for an all-pay auction. As shown by Clark and Riis (1998), in a contest with N players with valuations $v_1 \geq v_2 \geq ...v_N$ competing for s prizes by making (sunk) efforts, a unique equilibrium in mixed strategies exists. Only the $s+1$ players with the highest valuations spend a positive amount on rent seeking. The expected net benefit of actively participating player $i = 1, 2, ...s+1$ is $v_i - v_{s+1} - fC(s)$. Thus, the expected net benefit of the pivotal member of the winning coalition, when s prizes will be awarded is

$$v_{N/2+1} - v_{s+1} - fC(s). \tag{1}$$

For the following, we can rely on the results of Clark and Riis (1998), or we can view lobbying as a form of an English auction. That means that the pivotal member would want to increase the number of prizes from s to $s+1$ if $fC(s+1) - fC(s) < v_{s+1} - v_{s+2}$.

Under the all-pay auction, the probability that actor 1 wins one of the prizes at some round or other is (see result (13) in Clark and Riis 1998)

$$1 - (1/2)^s \frac{v_{s+1}}{v_1}, \tag{2}$$

and, for actors $2...s+1$ the probability that actor i wins a prize is

$$1-(1/2)^{s+2-i}\frac{v_{s+1}}{v_i}. \tag{3}$$

Note that in an all-pay auction, an actor belonging to the winning coalition and who votes for the policy is not sure to win a prize. Thus, the outcomes under an English auction differ from those under an all-pay auction in that the equilibrium under an English auction is efficient—the actors who most highly value a prize always win one. In contrast, under the all-pay auction, with positive probability an actor with valuation greater than v_{s+1} does not win a prize, while the actor with valuation v_{s+1} does.

Under the all-pay auction, an increase in s benefits each member of the majority in two ways: it increases the probability that a member wins a prize, and it reduces the equilibrium level of rent-seeking effort. Under the English auction, only the second benefit appears. Note that if $s = N$, no one engages in rent seeking, each actor wins a prize, and the net benefit to actor i is $v_i - fC(N)$.

It is critical to note that for values of $s < N$, an actor's net expected benefit depends not on his valuation v_i, but on the difference between his valuation and that of the marginal rent-seeker. If $v_{s+1} = v_{s+2}$ for all $s \geq (N/2) + 1$, and if $s < N$, then a member of the majority gains nothing from an increase in s.

PROPOSITION 1: Prizes will be awarded only if their number is at least $N/2 + 1$.

PROOF: Of course, to get majority support, at least a majority of actors must have a chance of winning a prize, or $s \geq N/2 + 1$. For example, if s prizes are provided, only the $s + 1$ actors with the highest valuation seek a prize, with the actor indexed by $s + 1$ enjoying zero expected benefit from engaging in rent seeking. Thus, if $s < N/2 + 1$, the pivotal actor, indexed by $N/2 + 1$, gains zero expected benefit from rent seeking, but must pay a share of aggregate costs. Therefore, a proposal with $s < N/2+1$ cannot gain majority support. .

PROPOSITION 2: The majority sets the number of prizes as follows

$s = N$ if $v_{N/2+1} - fC(N) > 0$ and $v_{N/2+1} - fC(N) > v_{N/2+1} - v_{s+1} - fC(s)$ for all $N/2 + 1 \leq s \leq N - 2$

$N/2 + 1 \leq s < N$ if $v_{N/2+1} - v_{s+1} - fC(s) > 0$ and $v_{N/2+1} - v_{s+1} - fC(s) > v_{N/2+1} - v_j - fC(j)$ for all $N/2 + 1 > j > s$

$s = 0$ otherwise.

PROOF. The proof immediately follows from the observation that when $s < N$ the pivotal actor gets a gross benefit described by (**??**). His benefit when $s = N$ is $v_{N/2+1} - fC(N)$.

So for an interior solution, the number of prizes, s satisfies the condition that the marginal cost to a member of the majority from having one more prize awarded equals the difference in net benefits for the next actor in line. As an extreme case, the majority may favor costly universal prizes, which eliminates rent seeking.

The smaller the benefit for the lower-valuing actors (actors with indices greater than $N/2+1$), the larger the benefit to each member of the majority. First, the lower-valuing actors will spend less on rent seeking, so a higher-valuing actor gains a larger expected surplus $v_i - v_{s+1}$. Second, for some of the N actors v_i may be non-positive; they will not seek a prize, and so reduce the tax cost for the other actors.

The observation that the net benefit of a member of the majority equals the difference between his valuation of a prize and the valuation by actor $s + 1$ has several implications.

Majority may favor universal prizes The majority may favor universal prizes, or $s = N$, which eliminates rent seeking. Non-universal prizes are sub-optimal for the pivotal member of the majority if $v_{N/2+1} - v_s - fC(s) < v_{N/2+1} - fC(N)$ for all s greater than $N/2+1$ and less than N, or if $(C(N) - C(s))f < v_s$ in this range of s. A sufficient condition for universal prizes is that all v_i with $i > (N/2) + 1$ are equal (so that under non-universal prizes rent seeking would exhaust benefits), and that $fC(N) < v_{N/2+1}$ so that the benefit of a prize to the pivotal actor exceeds his share of the costs of universal prizes.

The results imply that the benefit of universal prizes, or the corner solution where $s = N$, increases when the difference between $v_{N/2+1}$ and the valuations of actors with indices higher than that become smaller or more similar. So a more homogeneous society may more often give universal prizes not because of altruism, but to avoid rent seeking.

Though our analysis does not predict universal universalism, it can explain its existence. Examples abound. The interstate highway system in the United States serves all 48 mainland states (plus Hawaii, which connects to no other state), and serves *all* cities with population greater than 400,000. For another example, consider bus services in Flanders, Belgium. By law, bus stops must be sufficiently numerous so that each home is less than half a kilometer away from some bus stop. As a government company provides the bus service, taxpayers subsidize this service. Similar policies apply in other regions of the European Union. Singapore also imposes such an obligation: "To protect commuters, the PTC [Public Transport Council] ...imposes the universal prizes Obligation (USO) upon bus companies; requiring them to provide a comprehensive network of scheduled bus services to within 400 meter radius of any development with a specified minimum level of daily passenger demand. Such scheduled bus services run on predetermined routes and cannot charge fares higher than the fares approved in accordance with the fare review mechanism" (*www.ptc.gov.sg/services.asp*). Following this pattern of what appears to be excessive service, studies comparing the efficient number of bus stops along a route to the actual number find too many stops, by about 30% in Portland Oregon (Li and Bertini 2009), and by about 100% in Boston (Furth and Rahbee 2000). Interview data suggest them members of Congress make earmarks among many projects rather than concentrate funds on a few (Sciara 2012). For a final example, according to a statement by the State University of New York, its "64 geographically dispersed campuses bring educational opportunity within commuting distance of virtually *all* [emphasis added] New Yorkers."[5]

The explanation for universal prizes just given differs from that commonly found in the literature. The literature examines two extreme forms of winning coalitions. One approach, introduced by Riker (1962), predicts the existence of minimum winning coalitions—why should the majority offer anything to the minority. Similarly, when legislators can either adopt a proposal made by the current agenda setter or else reject and repeat the process with a different agenda setter, the equilibrium has a policy that benefits a minimum winning coalition (see Baron and Ferejohn 1989). The other extreme examines conditions under which policies will win the support of very large majorities, with benefits going to almost all legislators. Legislators operating under a "veil of ignorance" (they are uncertain which coalitions will form in the fu-

[5] $http://www.suny.edu/student/university_suny_history.cfm$

ture) will adopt a norm of universalism that calls for all legislators to benefit from pork barrel projects (Weingast 1979, Shepsle and Weingast 1981, and Grofman 1984). From this perspective, universalism amounts to an insurance policy for risk-averse legislators (Shepsle and Weingast 1981). Costs of drafting policy can affect the policies a legislator proposes, by inducing him to introduce policies a large majority of legislators support (Glazer and McMillan 1992), or by proposing policies which other legislators would later not want to amend (Glazer and McMillan 1990). An informational explanation for universalism is given by Kessler (2010), who considers local governments each with private information on the benefits that would be obtained from spending by a central government in that district. In equilibrium, the communication from each local government to the central government may be totally uninformative, leading the central government to give equal grants to all local governments.

An economic, rather than political, explanation for wide service relies on network externalities. Network effects arise when consumption by one consumer increases the benefits obtained by other consumers. In one sense, we too have a network effect—the greater the number of prizes, the greater the net benefit to each. But our network effect arises because actors compete less intensely to obtain the prizes, rather than because the value of a prize increases with the number of actors winning a prize.

Majority favors low quality of prizes We so far took the quality of prizes as exogenous. Rent seeking can generate an incentive for low quality of prizes. To see this, let the majority determine how many prizes are awarded, and also determine the quality of the prizes. Suppose first that the valuation function is positive for all N actors, and remains positive whatever the quality selected. Then if the majority can reduce the valuation by all actors with index greater than $N/2 + 1$, the expected benefit for each member of the majority increases under non-universal prizes. Reduced valuation by low-valuing actors reduces their rent-seeking efforts, thereby reducing the rent-seeking efforts by members of the majority.

In particular, consider a reduction of quality that reduces each actor's valuation by the constant k. We can represent this change with a parallel shift of the v function. Such a shift leaves $v_i - v_{s+1}$ unchanged, and so does not harm a member of the majority. So even for the slightest cost saving, a member of the majority will favor reduced quality.[6]

Majority favors cost sharing In many countries, the higher-level government (say the federal government) finances only some of the cost of service, requiring an actor (say a city) receiving a prize to bear a share of the cost. We shall see that members of the majority may favor a policy which imposes cost sharing on actors who win a prize. We examine only the case where the federal level can require an actor who wins a prize to pay k (with $k < c$), besides paying his share of costs incurred in providing prizes to other actors.

A value of $k > 0$ is equivalent to reduced quality, or to a reduction of each v_i by the amount k. Ignoring for the moment the tax an actor pays, such a uniform reduction in v_i leaves $v_i - v_{s+1}$ unchanged, and therefore does not affect the expected gain of actor i for $i \leq s$. But, in addition, a positive value of k reduces the tax each actor must pay the central government, and so a positive value of k can generate higher benefit to a member of the majority than does a zero value of k.[7]

This explanation for cost sharing complements a common view that local officials know more than do central government officials about local conditions, so that cost sharing induces the adoption of projects in the districts most likely to benefit from them (Oates 1972). A centralized and uniform supply of services is more efficient when preferences are homogeneous. Under our analysis, homogeneity of preferences will induce universal supply but for a different reason—it avoids large spending on rent seeking.[8]

Majority may favor more prizes than does the minority We saw that the majority gains from increasing the number of prizes partly because rent seeking declines. The benefit to the majority need not, however, extend

[6]Matters differ if different actors place different values on quality. Then, ignoring costs of providing prizes, a member of the majority prefers a quality that maximizes the difference between his valuation of the prize and the valuation by actor $s+1$. If the pivotal member values quality more than do actors excluded from the winning coalition, then the pivotal member may favor an increase in quality.

[7]As with the analysis of quality, matters differ if the cost of raising revenue necessary to finance cost sharing differs across actors. If, for example, raising revenue imposes a larger social cost on actors belonging to the winning coalition, then that coalition could oppose cost sharing.

[8]Cheikbossian (2008) sees a benefit of decentralization in reducing rent-seeking activities across regions: under centralization, each region wants the central government to spend more in its region, and to spend less in the other region.

to all members of the minority. Suppose some member of the minority (say actor 10) values a prize at $v_{10} > 0$, which is close to zero. Suppose further that actors 8 and 9 value a prize at $v_8 > v_9$ which are reasonably larger than the cost to an actor of increasing the number of prizes, say c, shared equally among all actors. Then, if the majority (consisting of less than nine members) increases s from 8 to 9, the expected net benefit to a member of the majority increases by $v_9 - v_{10} - c/N > 0$. Actor 10 gets almost no net benefit in equilibrium, while paying added taxes of c/N, and will make efforts to win a prize as it will be provided anyway to 9 actors, perhaps including itself. That is, actor 10 would prefer that the number of prizes not be increased to $s = 9$. The number of prizes is increased over the objections of an actor who might get it.

Allocation is inefficient Outcomes under rent seeking differ from the first-best allocation of prizes. There are four sources of inefficiency. First the chosen level of s is always inefficient when the optimal $s^* < N/2 + 1$, as shown in Proposition 1. Without further functional specification we cannot claim that the number of prizes, s, is always too high.

A second inefficiency lies with the allocation of prizes. For any s, efficiency requires that the actors who most value a prize win one. Under rent seeking with an all-pay auction, such an allocation is not guaranteed: in equilibrium, $s + 1$ actors compete for s prizes, so those with the highest valuations are not necessarily selected.

A third inefficiency lies with the rent seeking itself. Some of the rent seeking can end up as a "salary" for the agency officials (see Krueger 1974), but it is still largely an unproductive sunk cost, which can be particularly large when many of the actors have similar or identical valuations of a prize. A fourth source of inefficiency lies in the incentive for low quality discussed above.

Taxing the supply to the minority Consider a pivotal actor who little values a prize, and so would prefer that no prizes be awarded. If no prizes are awarded, a high-valuing minority would suffer large welfare losses. An extreme solution to this problem is private provision organized by the minority. Another solution is to offer $s < N/2 + 1$ prizes, but with each paying an amount exceeding the cost. The pivotal actor would then want to maximize total revenue minus total costs, and would want to discourage the actors from engaging in rent seeking—such rent seeking would reduce the willingness to pay by the actors who value a prize, and so would reduce revenue. The number of prizes will, however, be less than the welfare-maximizing number: the pivotal actor votes for the solution that maximizes tax revenue, so that at this s, the value to the actor exceeds its marginal cost.

4.2 Risk aversion

Some of our results also arise if rent seeking is absent but voters are risk averse. Under the all-pay auction but not under the English auction, a member of the majority may then fear that he will not win a prize, and so he prefers a large s.

The risk-aversion hypothesis, however, looks at v_i, rather than at $v_i - v_{s+1}$, and therefore does not make our predictions about inefficient policies. In particular, if the v_i's are all equal, then under rent seeking an increase in s benefits no actor, unless prizes are universal. That differs from risk aversion.

When the rent-seeking effects we consider are important, a study which interprets behavior as resulting from risk aversion may overestimate the degree of risk aversion: he aim of reducing rent seeking will call for increasing the number of prizes beyond what risk aversion would call for.

4.3 Dividing a prize among multiple actors

Similar analysis applies if instead of increasing the number of the prizes and the costs, a prize of given aggregate value is divided into more parts. Suppose v_i is the benefit per unit of the prize, and that the total number of units is R.

When the prize is divided into s parts, the expected gain to actor i (with $i \leq s$) is $\frac{R}{s}(v_i - v_{s+1})$. If the prize is divided into $s+1$ parts, the gain to actor i is $\frac{R}{s+1}(v_i - v_{s+2})$. Taking the difference, actor i gains from increasing the number of prizes, while making each prize smaller, if $sv_{s+2} < (s+1)v_{s+1} - v_i$, which can hold for sufficiently small v_{s+2} and for v_i which is not excessively large. In particular, the condition can hold when $s = (N+1)/2$; and so the majority may favor increasing the number of prizes to a number that exceeds the size of the majority.

4.4 Other political mechanisms

Our results extend beyond the simple median voter model. Consider the citizen-candidate model (Besley and Coate 1997), which supposes that any person may run for office, that if he wins he adopts the policy that maximizes his own utility, and that running for office may impose a fixed cost on a person who runs. We can think that an actor chooses to run for the chairmanship of a relevant congressional committee, or that a mayor of a city runs for the office of state governor.

If the entry cost is zero, we are back to the median voter model. Suppose next that running for office costs K, that the cost is identical for all candidates, that the cost is sufficiently high so that in equilibrium only one candidate enters, and that if no one runs for office policy is set at $s = 0$. Suppose also that the only policy variable is the choice of s, with the allocation of costs determined exogenously. We shall see that the results described in the previous section can continue to hold. The candidate who enters will be the one with the highest benefit of adopting his favored policy instead of the alternative. Actor 1 gains $v_1 - v_{s+1} - fC(s) - K$. He would choose the value of s satisfying $v_{s+1} - v_{s+2} > (C(s+1) - C(s))f$ and that $v_{s+2} - v_{s+3} < (C(s+2) - C(s+1))f$. Call this optimal value s_1^*. Note that if this person is the only one who runs for office, he faces no opposition, will win office, and so need not attract a majority of votes. Will a member of the minority who either does not win a prize or not want one enter? The actors who suffer the most from the policy that would be adopted by actor 1 are those who would win no prize. Suppose that $v_N < fC(N)$. If $s_1^* = N$, then all actors win a prize, and actor N gains $fC(s) - v_N$ from having no prize instead of prizes to all actors. If $s_1^* < N$, then the loss to actor N from actor 1's policy would be $fC(s)$. But this loss can be less than actor 1's gain, namely $v_1 - v_{s_1^*+1} - fC(s_1^*)$, and so if $fC(s) < K < v_1 - v_{s_1^*+1} - fC(s_1^*)$ only actor 1 runs for office. He too may want to increase the number of prizes to more than $N/2 + 1$, for the same reasons that applied under the median voter model.[9]

Consider next the legislative bargaining model of Baron and Ferejohn (1989). In that model, some legislator is chosen at random to serve as the

[9] If $fC(s) > K$ then actor N would want to run for office. Whether that actor wins depends on whether s_1^* is less than or greater than $(N/2) + 1$. If s_1^* is less, then actor 1 would lose the election and so not even run for office; otherwise he would win, would run for office, and adopt his favored policy.

agenda setter. He can make any proposal (or, in our terms, choose any s). If a majority approves, the policy is adopted. If a majority votes against the proposal, someone else is chosen to serve as the agenda setter, and the game repeats. An important parameter in the model is the intertemporal discount factor, reflecting the delay in adopting a policy if a current proposal is rejected. For discount factors close to 1, the analysis for the model with the median voter applies: any legislator with valuation equal to or greater than that of the median legislator will wait until someone (who could be himself) with such a valuation is appointed as agenda setter. He will propose a value of s that attracts majority support and gives actor i (for $i \leq s$) net benefits $v_i - v_{s+1} - fC(s)$. In contrast, suppose the discount factor is very high, so that the first agenda setter appointed proposes a policy that maximizes his utility subject to the condition that it generates a non-negative benefit to a majority of actors. If his valuation, v_i, is such that $v_i - v_{s+1} > fC(s)$ then the proposal he makes is the same as under the median voter model. If the agenda setter wants no prizes, that will be his proposal.

So the result on extensive prizes obtained in the median voter model is no artifact of this particular model, and can be an equilibrium under other political mechanisms.

5 Illustration with linear functions

To illustrate the results, consider linear functions, $C(s) = F + cs$, with c and F positive constants, and $v_i = a - bi$. To allow for the possibility of universal prizes, suppose that $v_N = a - bN = 0$. The cost of prizes is divided equally across all actors, so that the pivotal actor's tax is $(F + cs)/N$. We have the following rather strong specific results.

PROPOSITION 3 Consider a linearly declining valuation function and a linear cost function. Then

- a. The pivotal actor favors either prizes to all, or to none.
- b. If the average cost of a prize is less than its benefit, the majority favors universal prizes.
- c. If quality can be set to reduce benefits and save costs by a fixed proportion of the cost per actor, and if $v_N = 0$, then the quality supplied will always be biased downward by 1/2.

- d. If $v_N = 0$, and if the average cost of the prizes is lower than its value to the pivotal actor, and if co-funding can be required, then the pivotal actor always favors co-funding of 1/2.

- e. If the average cost of a prize exceeds the value of a prize to the pivotal actor, and if the majority can require co-funding, then the pivotal actor always favors a co-funding of more than 100%, no one engages in rent seeking, and only half the socially optimal number of prizes are awarded.

- f. Co-funding can increase welfare.

PROOF: Parts a and b: If the pivotal actor prefers less than universal prizes, he will want s to maximize $[a - (b)(N/2 + 1)] - [a - (b)(s + 1)] - cs/N - F/n$. But this maximization entails a corner solution. If $b > c$ the pivotal actor may favor universal prizes; if $b < c$ the pivotal actor prefers no prizes at all. If $b > c$ and if $a - (b)(N/2 + 1) > c + F/N$, or the benefit from a prize exceeds average cost, he will favor universal prizes.

Part c: The proof follows from simple optimization of the reduction in quality and in unit cost (r) such that the net benefit to the pivotal actor is maximized, given that (from part (a)) the pivotal actor favors prizes to all actors who value it. We look for the maximum of $(a - (b)(N/2 + 1) - r) - (c - r)n(r)/N$ where $n(\cdot)$ is the number of actors for which $v_i \geq r$. Solving $a - bn - r = 0$ yields $n(r) = (a - r)/b$, and so $r = c/2$.

Part d: Shown in part (c), as r can be viewed as a monetary contribution to the central government, resulting in a co-funding requirement of 1/2.

Part e: Assume that the majority can require a co-funding of $r > c$ and that the pivotal actor would gain nothing from winning a prize. If the number of actors with $v_i > 0$ is less than $N/2 + 1$ (that is, if only a minority of actors would benefit from a prize), then the best policy for the majority differs from what we discussed above. Any majority would include an actor who does not value a prize. Under the assumption that any revenue raised is distributed equally among all actors, the pivotal actor would then want to maximize the net revenue raised from providing prizes. That is, the pivotal actor acts as a monopolist providing a service at marginal cost c, and charging a price r for it. Notice that any price r will determine a number of actors, $n(r)$ who want the prize at price r. The pivotal actor would then want to set $s = n(r)$, and so no actor would engage in rent seeking. In this case, the pivotal actor chooses r to maximize total net tax revenues, generating the monopoly solution where only half of the optimal number of actors win prizes.

Part f: Assume first that only a minority values a prize. If co-funding at more than 100% is infeasible, the pivotal actor will never favor government providing the prizes. With co-funding at more than 100% feasible, the minority actors can decide for themselves to opt for a prize or not, and so their welfare can never decrease. Assume next that a member of the majority benefits from universal prizes when it cannot impose co-funding. Under our assumptions, with no co-funding requirement the majority always favors universal prizes. Any co-funding rate between 0 and 100% will reduce the number of prizes; because the actors who no longer seek a prize valued a prize at less than the marginal cost, co-funding will increase welfare.

Regarding the effect of s on welfare, it is not necessarily true that if the majority chooses to provide $N/2+1 < s < N$ prizes, that number is socially excessive. The problem is that the pivotal actor may prefer not to offer prizes: he compares his benefit with his share of taxes to finance universal prizes, whereas the social efficiency criterion takes the total benefits of prizes into account.

Figure 1 depicts the results, assuming a fixed cost of zero and assuming that the socially-optimal solution calls for providing s^o prizes (with $N/2+1 < s^o < N$). At this optimum, the marginal cost of a prize, c, equals the benefit, $v(s)$, to the actor with the sth highest valuation. How does this condition compare with our equilibrium? Note first that it is suboptimal for the pivotal actor to set $s = N/2+1$, because the contest would result in the pivotal actor obtaining a gross benefit $b(N/2+1) - b(s+1) = b$; the pivotal actor does better under universal prizes which would give him the benefit $a - bN/2 - c$.

Figure 2 illustrates the effects of reduced quality. Consider a downward shift of the valuation function, with a concomitant reduction in the tax required to finance the prizes. As the valuation function determines how many actors seek a prize, starting from the policy with $r = 0$ and $a - bN = 0$, reducing quality reduces the number of actors who seek a prize. (Recall that in our linear model all actors who want a prize get one, as members of the majority want to limit rent seeking.) But when the benefit of the prize is 0 for the last actor, reduced quality reduces the costs of serving all the actors for whom v_i remains positive by more than the reduction in v_i for the pivotal actor.

Figure 2 can also illustrate the effects of a requirement for co-funding.

If $s^o > N/2 + 1$, a co-funding requirement of r reduces the net benefit of a prize to the pivotal actor, reduces the number of prizes awarded when prizes are offered to all who want it, and reduces the tax paid by the pivotal actor. Increasing the co-funding requirement r beyond c does not benefit the pivotal actor because the pivotal actor cannot use general taxes to spread the costs of the prizes over N actors.

6 Conclusion

Legislators who design policy should care not only about the costs of the policy, or about the benefits that a prize would yield to those actors who get a prize. When the majority imperfectly controls policy implementation, members of the majority should also care about their rent-seeking activity. That means that members of the majority should worry about the benefits to actors excluded from the winning coalition. The general principle is that the members of the majority gain from reducing the benefits to the marginal actor who seeks a prize. Such reductions can take several forms. One is to provide many prizes—the greater the number, the smaller the benefit to the marginal actor who might win a prize, and consequently the larger the expected gain to an infra-marginal actor. Similar effects can arise if the quality of the prizes, is reduced, or if actors who win a prize must pay a share of the costs.

We spoke of awarding a prize. The same logic can also apply to avoidance of a loss. Consider a cut in the governmental budget. If agencies have discretion on what to cut, then legislators or constituents may exert great effort in preserving their favored programs. If, instead, the cuts are universal, or across the board, then such lobbying activity will be restricted. The cuts to the USA federal budget in 2013, under the name of sequestration, cut everything, rather than only programs that benefit the minority. Our approach offers one explanation for such universalism.

Though we spoke about legislatures, similar reasoning can apply to other situations where one group determines the number of prizes, with members of the group recognizing that the number of prizes will affect how much rent-seeking effort each of them will later seek to exert. For example, elite research universities with influence over policies of the National Institutes of Health or of the National Science Foundation may want the granting agencies to offer a large number of grants, even if each grant thereby becomes smaller, to reduce the time and effort their faculty must spend on applying for grants. Policies which may appear to be irrational or motivated by altruism may instead reflect efforts by a powerful group to reduce their own wasteful rent seeking.

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7 Notation

$C(s)$ Cost of providing s prizes

f Fraction of total prize costs incurred by any one member of the majority coalition

N Number of actors

s Number of prizes

v_i Valuation of prize by actor i

FIGURE 1 Benefits for median voter for broader levels of supply

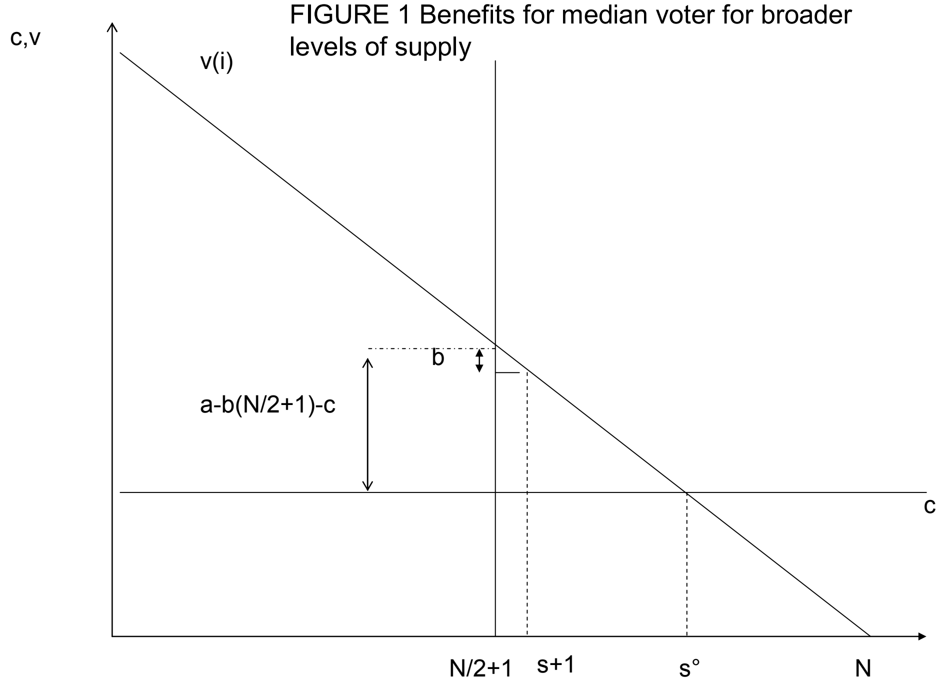

FIGURE 2 Effects of quality decrease or cofunding