Benefits to the Majority From Universal Service

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Abstract

Rent seekers may attempt to limit costly rent seeking. One way is to increase the number of prizes, even to universal service.In particular, an agenda setter may set the number of prizes to exceed the number of people in the majority (as by too many bus stops, or too many university campuses), thereby inducing each member of the majority to reduce his rent-seeking efforts in equilibrium. This mechanism can also induce the majority to favor low quality of the prizes, and to favor having the central government impose co-funding requirements.

Keywords: Rent seeking, federalism, universal service, public agencies

1 Introduction

Rent seeking—the exertion of costly effort to win a prize—is both common and wasteful to the rent seekers. Potential rent seekers may therefore seek to reduce equilibrium levels of rent-seeking effort.[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 has some group, at a stage before rent seeking occurs, make rent seeking by some actors cheaper or more effective; that can reduce rent seeking 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, consider a legislature with an agenda setter proposing how many prizes will be awarded, and where the total cost of the prizes is shared. We shall see that if the number of prizes is large, an agenda setter (and members of the majority) will need to spend little on rent-seeking. The reduction in their rent-seeking costs can be so large that members of the majority can benefit even if they share in the costs of the additional prizes. Another way of reducing rent seeking, also examined here, is to set a low quality for the prizes, or to set a co-funding requirement on anyone who wins a prize.

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.

One of our central assumptions is that a bill cannot fully specify who will receive the proferred benefits. Evidence supporting that assumption is provided by You (2016), who examines over 600,000 congressional lobbying

[1] Related literature, on tournaments, considers the design that maximizes total effort by players; one such important paper is Moldovanu and Sela (2001).

disclosure reports filed from 1998 through 2012. Over half of all lobbying activity targeting specific bills happened after Congress passed the legislation. In line with our assumptions, the author argues that such ex post lobbying aims to influence the distribution of particularistic benefits that will arise from legislation by targeting regulatory rulemaking processes. The lobbying of legislators appears because legislators can influence the decisions of bureaucrats on specific rulings, with special interest groups often calling on legislators to influence federal regulators (Arnold 1987; McCubbins, Noll, and Weingast 1987; Hall and Miller 2008).

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, and Tollison 1982). Most of the literature discusses rent seeking that benefits firms or special interest groups. But the concept also applies to wealth transfers 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.

The analysis here builds on the 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 agenda setter, 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 an agenda setter who must win the support of the 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 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 who is unsure about which location or which exact project would most benefit him may avoid specifying policy. 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).

2.3 Agency preferences

The governmental agency which allocates prizes or funds may have preferences which differ from those of the majority. For example, the majority

[2] Porter and Walsh 2006.

may care nothing about emissions of pollutants (which affect the minority or another country) but the bureaucrats at the agency do. Similarly, the governmental agency may have preferences over distributional consequences of projects within jurisdictions that differ from those of the legislators in the majority. Such differences can be especially common under divided government, when, say, a president belongs to a different party from the majority in Congress. Theoretical work examines such differences. Congleton (2002) considers a government which purposely gives discretion to officials, because it knows that some officials care about the policies they implement, and that by giving them greater discretion it can attract more talented people. Besley and Ghatak (2005) also model workers who care about the organization's achievements, focusing on matching the preferences of principals and agents. Francois (2000) models a public service motivation which induces employees to provide effort out of concern for the impact of that effort on a valued social service. Prendergast (2008) assumes that workers differ in altruism for clients and shows that the government prefers to attract different worker types for different agencies. Alesina and Tabellini (2007a, 2007b) argue that bureaucrats try to maximize their perceived competence.

Empirical evidence that bureaucrats commonly care about the outputs they produce is also found in the literature. Heckman, Smith, and Taber (1996) investigate training centers under the Job Training Partnership Act, which received monetary rewards based on the employment levels and wage rates attained by the program's graduates. The rewards create an incentive for the manager to 'cream-skim' the most employable applicants into the program. But the authors find that people with lower expected earnings are more likely to be accepted into the program: these bureaucrats appear to prefer helping the disadvantaged over earning more money. Another indication that appointed officials do not just follow the instructions of elected officials is that elected commissioners from the insurance industry follow more pro-consumer policies than their appointed counterparts (Fields et al. 1997). Besley and Coate (2003) find a similar effect in electricity regulation.

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.

Actors are ordered from the largest value of gross benefits from the prize (index 1) to the smallest (index N).

Actor j values the prize at $v_j (j = 1, 2, ..., N)$, with $v_1 \geq v_2 \geq ...v_N$. The values are common knowledge for the actors. More generally, the agenda setter 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 $v_i \geq v_j$ if $i \leq (N/2) + 1$ and $j > (N/2) + 1$. Each actor gets either one of the prizes or no prize at all. The benefit v_j is independent of when an actor gets a prize or of how many prizes are awarded.

Providing s prizes costs $C(s)$, with $C'(s) > 0$; this cost is independent of the identities of those who get the prizes. For simplicity, assume that the costs of services are equally shared by all actors, with an actor paying the same tax when he gets service as when he does not. In particular, the tax paid by each actor is $fC(s)$.

More explicit results require more specific assumptions: providing s prizes costs $K + cs$; the jth highest valuation is $v_j = a - bj$, with a and b positive parameters.

3.2 Agenda setting

We have two stages of decision making. In the first stage the legislature sets the number of prizes, s. In the second stage an agency decides who gets each of the s prizes, with lobbying affecting the allocation.

The policy decision is the number of prizes s and is determined by majority voting, but with only one actor allowed to propose a policy. If his proposal is not approved, then $s = 0$ and each actor gets a benefit of zero. What proposal is made depends on who makes it. We shall often consider the proposal that would be made by the median voter. It turns out that any actor with a valuation for the service which exceeds the median voter's valuation would make the same proposal as that made by the median voter. An actor with lower valuation may choose a higher s (so that he has a good

chance of getting the service), or may propose $s = 0$ if his valuation is sufficiently small. Section 6 considers an alternative to the median voter model, namely the citizen-candidate model (as in Besley and Coate 1997).

3.3 Allocation of prizes

Though the legislature 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] The analysis mostly refers to rent-seeking effort as though it was lobbying, but it can be interpreted as spending by an actor which the agency views as useful, whereas no actor does. For example, the agency may value proposals that include spending to reduce income inequality, or to limit global warming, to promote culture, and so on. The agency would maximize its objective function by providing the services to the actors spending the most on these activities.

Consider a multi-prize contest, where s identical prizes are distributed to $s \leq N$ actors. We consider two types of auctions: the English auction, and the multi-prize all-pay auction.

The English auction has players make bids knowing the bids all other players made. The agency provides a prize to each of the s highest bidders; a player who wins a prize pays his bid. All players pay the taxes which finance aggregate spending, with the tax not depending on whether the player did or did not win a prize.

The analysis of the multi-prize all-pay auction relies on Clark and Riis (1998).[4] Let each of the N actors simultaneously choose an outlay (rent-seeking effort that is a sunk cost) $x_j \geq 0$. 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

[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.

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

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.

3.4 Timeline

The timeline for the sequential all-pay auction follows.

1. Nature assigns a valuation v_j to each actor.
2. An agenda setter makes a proposal for the number of prizes, s.
3. The agenda setter's proposal is adopted if a majority of actors favor it over the default of $s = 0$.
4. Each actor pays taxes that finance the cost of the s prizes.
5. Each actor engages in rent seeking (repeatedly if he had not won a prize in the previous round) to win a prize.
6. The agency assigns prizes to s players.
7. An actor j who wins a prize enjoys a gross benefit v_j.

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 Results

In the game's first stage, the legislature or committee sets the number of prizes. In the second stage an agency allocates the prizes. We solve the game backwards, first determining the individual equilibrium pay-offs for the second stage game for a given number of prizes. Next we solve the first stage where the number of prizes is set, taking into account the equilibrium pay-off functions.

4.1 English auction

We consider first the agents' pay-offs as a function of the number of prizes s when the allocation of prizes is determined by an English auction. Let N actors with valuations $v_1 \geq v_2 \geq ...v_N$ compete for s identical prizes. An equilibrium has actors $1...s$ each bid v_{s+1}, actor $s+1$ bids an infinitesimal amount below v_{s+1}, and actors $s+2...N$ each bid 0.[5] 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 the tax share for the prizes others receive. This set of bids is a Nash equilibrium for given s. In equilibrium actor i's net benefit (for $i = 1...s$) is $v_i - v_{s+1} - fC(s)$; this result will prove important.

One view of the English auction is that the agency knows the valuations of a prize by the different actors, but that the actors engage in rent seeking to sway the agency. A different view, with the same results, is that the valuations by the actors are private information held by each actor, and that the agency seeks to implement efficient allocations. The English auction is then a Vickrey-Groves-Clark mechanism (Groves 1973), with each actor paying the externality that he imposes on the other bidders. To understand the result, consider for the moment truthful revelation. If actor i gets a prize, so that actor $s+1$ does not, then the opportunity cost of giving actor i a prize is v_{s+1}. A mechanism, such as the English auction, that induces each winning actor to pay this opportunity cost, then induces efficient allocation.

Given the agents' payoffs as a function of the number of prizes s, we need to determine the number of prizes set by the legislature. Consider the outcome when the agenda setter is actor i, with valuation v_i. So we need to check whether the s that maximizes his payoff receives a majority. The payoff for the median voter when s prizes will be awarded is:

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

The agenda setter would want to increase the number of prizes from s to $s+1$ if $fC(s+1) - fC(s) < v_{s+1} - v_{s+2}$.

This condition leads to the following two propositions:

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

[5] It would also be an equilibrium for each of actors $s+2...N$ to bid anything below v_{s+1}: each of them would not win a prize and pay nothing for its losing bid.

PROOF: Of course, to get majority support, at least a majority of actors must obtain positive expected benefits, which requires that, $s \geq N/2+1$. 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 median voter, 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: An agenda setter with valuation v_i, sets the number of prizes as follows

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

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

$s = 0$ otherwise and if $v_{N/2+1} - v_s - fC(s) < 0$.

PROOF. The proof immediately follows from the observation that when $s < N$ an agenda-setter with valuation v_i gets a benefit of $v_i - v_{s+1} - fC(s)$. His benefit when $s = N$ is $v_{N/2+1} - fC(N)$.

The policy desired by the agenda setter will also be desired by any actor with valuation $v_j > v_i$. To get majority support, any proposal that agenda-setter i makes must have $s \geq N/2+1$. Furthermore, given that $s \geq N/2+1$, the benefit to agenda-setter i of increasing s by one is $v_i - v_{s+2} - (v_i - v_{s+1}) - (fC(s+1) - fC(s))$. The values of v_i in this expression cancel out, so that the benefit is the same as for any actor with valuation greater than that of agenda setter i.

The following considers the interesting case where the agenda setter and a majority of actors all favor $s > 0$; that is his valuation and the valuations of a majority are sufficiently large.

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.

4.2 All-pay auction

Remarkably, though not previously noted, the same pay-off functions apply for an all-pay auction for a given s. 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 agenda setter i, when s prizes will be awarded, is

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

The following relies on the results of Clark and Riis (1998). 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)

$$1 - (1/2)^s \frac{v_{s+1}}{v_1}, \tag{3}$$

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

$$1 - (1/2)^{s+2-i} \frac{v_{s+1}}{v_i}. \tag{4}$$

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 v_{s+1} wins a prize while an actor with higher valuation does not.

Turn now to the number of prizes under the all-pay auction. The agenda setter chooses s to maximize his expected net benefit; this net benefit is the probability he wins a prize times his valuation of the prize, minus his rent-seeking effort, minus his taxes to finance prizes.

Under the all-pay auction, an increase in s can benefit the agenda setter in two ways: it increases the probability that he wins a prize, and it reduces the equilibrium level of rent-seeking effort. Under the English auction, only the second benefit appears.

Because the pay-off functions for a given s for an all-pay auction are the same as under an English auction, the equilibrium number of prizes is the same. Propositions 1 and 2 derived for the English auction continue to hold.

5 Implications

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 agenda setter and the majority may favor universal prizes, or $s = N$, which eliminates rent seeking. Non-universal prizes are sub-optimal for agenda-setter i if $v_i - v_{s+1} - fC(s) < v_i - fC(N)$ for all $s > i$ and $s < N$, or if $(C(N) - C(s))f < v_{s+1}$ in this range of s. A sufficient condition for universal prizes when the agenda setter is i is that all v_j with $j > i$ are equal (so that under non-universal prizes rent seeking would exhaust benefits), and that $fC(N) < v_i$ so that the benefit of a prize to agenda-setter i 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_i 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 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 Service 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."[6] 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 that 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."[7]

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 about which coalitions will form in the future) 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

[6] `http://www.ptc.gov.sg/services.asp`

[7] `http://www.suny.edu/student/university_suny_history.cfm`.

of legislators support (Glazer and McMillan 1992), or by proposing policies that other legislators would later not want to amend (Glazer and McMillan 1990). An informational explanation for universalism is given by Kessler (2014), 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 actor. But our network effect arises because actors compete less intensely to obtain the prizes, rather than because a prize's value increases with the number of actors winning a prize.

Majority favors low quality of prizes The analysis above took the quality of prizes as exogenous. Rent seeking, however, can generate an incentive for low quality of prizes. First, suppose that the valuation function is positive for all N actors, and remains positive whatever the quality selected. Then if the agenda setter who wants $s > 0$ can reduce the valuation by all actors with valuations less than his, his expected benefit increases under non-universal prizes. Reduced valuation by low-valuing actors reduces their rent-seeking efforts, thereby reducing the rent-seeking effort by the agenda setter and by members of the majority.

Second, consider a reduction of quality that reduces each actor's valuation by the constant k. This change is represented by a parallel shift of the v function. Such a shift leaves $v_i - v_{s+1}$ unchanged, and so does not harm the agenda setter or other members of the majority. So even for the slightest cost saving, the agenda setter and a member of the majority will favor reduced quality. Third, a lower quality also reduces the number of actors that want to obtain the service and so reduces the tax cost. [8]

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

Majority favors cost sharing In many countries, the higher-level government (say the federal government) finances only part 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 an agenda setter may favor a policy which imposes cost sharing on actors, including himself, 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 $k < c$), in addition to paying his share of taxes required to finance the remaining aggregate costs of the prizes.

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 taxes other than the cost sharing, 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 remaining 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.[9]

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 wasteful rent seeking.[10]

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 to all members of the minority. Recall that everybody shares equally in the total cost. 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; let this cost be c/N. Then, if the majority

[9] 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.

[10] 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.

(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 himself. 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, it cannot be claimed 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 an agenda setter 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 recipient paying more than the cost of provision. So prizes are "sold" at monopoly prices, thereby maximizing tax revenues which also benefit the majority. The agenda setter 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 agenda setter

favors the solution that maximizes tax revenue, so that at this s the value to the actor exceeds its marginal cost.

6 Citizen-candidate model

To illustrate that the results can hold under a wide variety of conditions, 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.

Suppose that running for office is sufficiently costly 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, because costs are always shared equally. 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. Consider first actor 1 who either prefers $s_1 < N$ or else $s = N$. If $s_1 = N$, all other agents will prefer either $s = N$ or $s = 0$. The agent that has the most to lose from not entering is N and he will enter only when his loss is larger than the gain of entering for agent 1. This result again points to universal service, as the loss for the agent with the lowest valuation has to be much greater than the gain for the agent with the highest valuation.

Consider next the case where $0 < s_1 < N$. Then he 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 $s_1^* < N$. Note that if only this person 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 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 $N/2 + 1$.[11]

[11] If $fC(s) > K$ then actor N would want to run for office. Whether that actor wins

7 Illustration with linear functions

To illustrate the results, consider linear functions, $C(s) = K + cs$, with c and K 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 tax each actor pays is $(K + cs)/N$. We have the following rather strong specific results.

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

- a. The agenda setter favors either prizes to all, or to none.
- b. If the average cost of a prize is less than its benefit, the agenda setter 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 agenda setter, and if co-funding can be required, then the agenda setter favors co-funding of 1/2.
- e. If the average cost of a prize exceeds the value of a prize to the agenda setter, and if co-funding can be required, then the agenda setter always favors 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 agenda setter i (with valuation v_i) prefers fewer than universal prizes, he will want s to maximize $[a-bi]-[a-b(s+1)]-cs/N - K/n$. But this maximization entails a corner solution. If $b > c$ the agenda setter may favor universal prizes; if $b < c$ the agenda setter prefers no prizes at all. If $b > c$ and if $a - bi > c + K/N$, or the benefit from a prize exceeds average cost, he will favor universal prizes.

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.

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 agenda setter is maximized, given that (from part (a)) the agenda setter favors prizes to all actors who value it. We look for the maximum of $(a-bi-r)-(c-r)n(r)/N$, where $n(\cdot)$ is the number of actors for whom $v_i \geq r$. 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 policy can require co-funding of $r > c$, and that the agenda setter 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 agenda setter differs from that 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 agenda setter would then want to maximize the net revenue raised from providing prizes. That is, the agenda setter 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 agenda setter would then want to set $s = n(r)$, and so no actor would engage in rent seeking. In this case, the agenda setter 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 agenda setter will never favor government providing the prizes. With co-funding at more than 100% feasible, the minority actors can choose 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 number of prizes is $N/2+1 < s < N$, that number is socially excessive. The problem is that the agenda setter 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 into account the total benefits of prizes.

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 $N/2+1 < s^o < N$). Suppose further that the agenda setter is the actor with the median valuation, $v_{N/2+1}$. 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 agenda setter to set $s = N/2+1$, because the contest would result in the agenda setter obtaining a gross benefit $b(N/2+1) - b(s+1) = b$; the agenda setter 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 agenda setter.

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 agenda setter, reduces the number of prizes awarded when prizes are offered to all who want it, and reduces the tax paid by the agenda setter. Increasing the co-funding requirement r beyond c does not benefit the agenda setter because he cannot use general taxes to spread the costs of the prizes over N actors.

8 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 control over policy implementation is imperfect, an agenda setter should also care about his own rent-seeking activity, and so consider the benefits to actors unlikely to win prizes. The general principle is that the agenda setter gains 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.

The logic of awarding a prize can also apply to avoiding 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 federal budget of the United States 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 of legislatures, similar reasoning can apply to other situations where members of a group determining the number of prizes recognize that the number of prizes will affect their rent-seeking efforts in the next stage. 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 many 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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9 Notation

$C(s)$ Cost of providing s prizes

f Fraction of total costs incurred by each actor

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

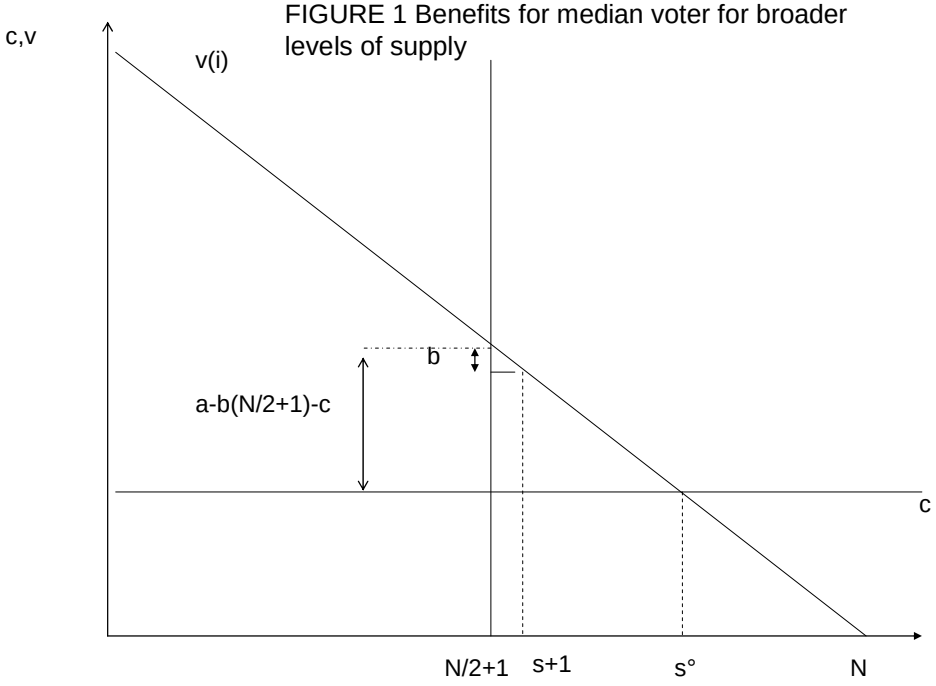

FIGURE 2 Effects of quality decrease or cofunding