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Committees and rent-seeking effort under probabilistic voting

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Abstract. Congleton (1984) shows that a rent awarded by a committee results in smaller aggregate rent-seeking expenditures than a similar rent awarded by a single administrator. This note modifies Congleton's model by considering a model in which voting is probabilistic instead of deterministic. I show that the relative magnitudes of rent-seeking expenditures could go either way depending on the relative weighted sensitivities (to rent-seeking efforts) of the committee and the single administrator. I show how the distribution of voting powers of committee members affects rent-seeking efforts. I also examine the case where there is some probability that the rent may not be awarded, if the committee is unable to reach a majority decision. My results diverge from Congleton (1984) because of the absence of majoritarian cycles in my model.

1. Introduction

In an interesting article, Congleton (1984) shows that a rent awarded by a committee results in smaller aggregate rent-seeking expenditures than a similar rent awarded by a single administrator. Congleton's conclusion is correct within the context of his model. Congleton (1984: 207–208) writes: "…games of influence have a tendency to escalate under one-man administration…[T]he usually undesirable absence of stable majority coalitions allows award-seekers to economize on efforts devoted to influencing committee deliberations by targeting alternative majority coalitions".

The instability of majority coalitions in Congleton (1984) arises because voting, in his model, is deterministic since each committee member votes for the contestant who exerts the highest effort (expenditure). In this paper, I consider a model in which voting is probabilistic,[1] where each committee member does not necessarily vote for the contestant with the highest effort. In this case, rent-seeking efforts will tend to escalate to a point and stabilize at that point, regardless of whether the rent is awarded by a committee or a single administrator. I show that Congleton's (1984) result does not necessarily hold when voting is probabilistic.

As noted by Coughlin (1992: 21) "deterministic voting models are most appropriate with candidates who are well-informed about the voters and their preferences...[p]robabilistic voting models...are most appropriate in elections in which candidates have incomplete information about voters' preferences and/or there are some random factors that can potentially affect voters' decisions...".

In my model, the contestants could be seen as the candidates and the committee members as the voters. Hence, one could interpret my model as one in which the contestants do not know the exact preferences of the committee members or that some random factors affect the decisions of the committee members. Indeed the Tullock (1980) probability function, which I use in the analysis, has been explicitly derived by Clark and Riis (1996) based on these assumptions.

2. The model

Suppose, as in Congleton (1984), that a three-member committee is responsible for awarding a rent of size, say V. Let there be $N \geq 2$ risk-neutral and identical contestants, and denote the committee members by A, B, and C. Let P_{iA} be the probability that committee member A votes for the i-th contestant and let x_{iA} be the rent-seeking effort of the i-th contestant to influence this committee member. Let P_{iB}, x_{iB}, P_{iC}, and x_{iC} be similarly defined for the committee members B and C. As in Congleton (1984), I assume that the winner is determined by a simple majority voting rule. Suppose that the weights W_A, W_B, and W_C are attached to each committee member's vote, *if there is no majority vote*. That is, if the committee members vote for three *different* contestants. For example, if B voted for the i-th contestant, then one may interpret his voting weight, W_B, as the probability that the i-th contestant would be chosen as the winner from the three different contestants. Necessarily $W_A + W_B + W_C = 1$ and $0 \leq W_A, W_B, W_C \leq 1$. In the absence of a majority vote, the interpretation of the weights as probabilities is appropriate if, say 100 ballot papers are put in a box, with $100W_A$, $100W_B$, and $100W_C$ allocated to A, B, and C respectively. A ballot paper is then drawn randomly to determine the winner. I also assume that no committee member can abstain. Hence the probability, P_i, that the i-th contestant is the winner is

$$\begin{aligned} P_i = {} & P_{iA}P_{iB}P_{iC} + P_{iA}P_{iB}(1 - P_{iC}) + P_{iA}(1 - P_{iB})P_{iC} + (1 - P_{iA})P_{iB}P_{iC} \\ & + W_A(N-1)(N-2)P_{iA}P_{jB}P_{kC} + W_B(N-1)(N-2)P_{iB}P_{jA}P_{kC} \\ & + W_C(N-1)(N-2)P_{iC}P_{jA}P_{kB} \qquad (1) \end{aligned}$$

where $i \neq j \neq k$. Note that this "probability" interpretation of P_i implies the "all-or-nothing" allocation rule in section 2 of Congleton (1984).

The last three terms in (1) need some explanation. $(N-1)(N-2)$ appears in all these terms because, there are $(N-1)(N-2)$ ways that the three members of the committee can vote for three different contestants (where the i-th contestant is one of these contestants). To see this, note, for example, that when committee member A votes for the i-th contestant there are (N–1) ways that committee member B can vote for a contestant different from A's choice. Then there are now (N–2) ways that committee member C can vote for a contestant different from the choices of A and B. Hence there are (N–1)(N–2) ways of voting for three different contestants (where the i-th contestant is one of these contestants).

Using Tullock's (1980) probability function, let α, β, and γ be the parameters which capture the sensitivities of A, B, and C to rent-seeking expenditures (respectively). These parameters are positive and finite.[2] Note, for example, that $P_{iA} = (x_{iA})^{\alpha}/[(x_{iA})^{\alpha} + (N-1)(x_{jA})^{\alpha}]$ and $P_{jB} = (x_{jB})^{\beta}/[(x_{iB})^{\beta} + (N-1)(x_{jB})^{\beta}]$. There is some abuse of notation here. However this does not matter since I focus on a symmetric Cournot-Nash equilibrium, in which all the x's are equal for a given committee member. Hence a distinction between, for example, x_{jC} and x_{kC} does not matter, since in deriving the first-order conditions for the i-th contestant, I treat these terms as constants. Thereafter, they become equal in a symmetric equilibrium.

The i-th contestant chooses x_{iA}, x_{iB}, and x_{iC} to maximize

$$\pi_i = P_i V - x_{iA} - x_{iB} - x_{iC} \tag{2}$$

The first-order conditions are $\partial\pi_i/\partial x_{iA} = 0$, $\partial\pi_i/\partial x_{iB} = 0$, and $\partial\pi_i/\partial x_{iC} = 0$.[3] In a symmetric Cournot-Nash equilibrium, $x_{iA} = x_{jA} = x_A$, $x_{iB} = x_{jB} = x_B$ and $x_{iC} = x_{jC} = x_C$, for all $i \neq j$. Putting these into the first-order conditions above and solving, after some fair amount of algebra, gives

$$x_A{}^* = \alpha\{[W_A(N-1)(N-2)-(W_B+W_C)(N-2)+2(N-1)]/N^2\}\{(N-1)V/N^2\},$$
$$x_B{}^* = \beta\{[W_B(N-1)(N-2)-(W_A+W_C)(N-2)+2(N-1)]/N^2\}\{(N-1)V/N^2\}, \text{ and}$$
$$x_C{}^* = \gamma\{[W_C(N-1)(N-2)-(W_A+W_B)(N-2)+2(N-1)]/N^2\}\{(N-1)V/N^2\} \tag{3}$$

Note, from (3), that the weights do not matter when $N = 2$, since there will always be a majority vote in this case. It also follows, from (3), that the rent-seeking effort directed towards a particular committee member is increasing in his sensitivity to expenditures and the weight of his vote, and decreasing in the voting power of the other members of the committee, when $N > 2$. Thus the rent seekers balance how easy or difficult it is to influence a committee member with how influential that committee member is relative to the other members.

Since $W_A + W_B + W_C = 1$, it follows that $W_B + W_C = 1 - W_A$, $W_A + W_C = 1 - W_B$, and $W_A + W_B = 1 - W_C$. Hence we can rewrite (3) as

$$\begin{aligned} x_A{}^* &= \alpha\{[W_A(N-2)+1]/N\}\{(N-1)V/N^2\}, \\ x_B{}^* &= \beta\{[W_B(N-2)+1]/N\}\{(N-1)V/N^2\}, \text{ and} \\ x_C{}^* &= \gamma\{[W_C(N-2)+1]/N\}\{(N-1)V/N^2\} \end{aligned} \tag{3'}$$

Now if A, B, or C were *solely* responsible for awarding the rent, we know from Tullock (1980), that each contestant's effort towards A, B, or C will be $\hat{x}_A = \alpha\{(N-1)V/N^2\}$, $\hat{x}_B = \beta\{(N-1)V/N^2\}$, and $\hat{x}_C = \gamma\{(N-1)V/N^2\}$ respectively. Given that the weights are not greater than 1, it is easy to see that $\hat{x}_A > x_A*$, $\hat{x}_B > x_B*$, and $\hat{x}_C > x_C*$.

From (3′) aggregate rent-seeking expenditure, under committee administration, can be written as

$$\begin{aligned} T* \equiv N(x_A^* + x_B^* + x_C^*) &= \{[(N-2)(\alpha W_A + \beta W_B + \gamma W_C) \\ &+ (\alpha + \beta + \gamma)]/N\}[(N-1)V/N] \end{aligned} \tag{4}$$

From (4), it follows that aggregate rent-seeking expenditure is a positive function of the sum of weighted sensitivities and the sum of unweighted sensitivities, for $N > 2$. Recall that the weights do not matter when $N = 2$. Assuming that rent-seeking expenditures are socially wasteful, the optimal weight is 1, given to the committee member with the lowest sensitivity, since that minimises rent-seeking expenditures. If all the committee members have the same sensitivity, then the distribution of weights has no effect on aggregate rent-seeking expenditures.

We know, from Tullock (1980), that when a rent is awarded by a single administrator whose sensitivity to rent-seeking expenditure is captured by a parameter, say r, then aggregate rent-seeking expenditures are

$$\hat{T} = r(N-1)V/N \tag{5}$$

That is, $r \equiv \alpha$, β, or γ if committee member A, B, or C is *solely* responsible for awarding the rent (respectively). Note that when we consider the widely used constant returns version of the Tullock probability function (i.e., $\gamma = \alpha = \beta = 1$), then $T^* > \hat{T}$. That is, committee administration results in higher aggregate rent-seeking expenditures than expenditures under one-man administration, regardless of the distribution of voting powers, so long as the rent has to be awarded (i.e., $W_A + W_B + W_C = 1$). In Amegashie (1999), I examined the two-member committee version of this model. I found that when the sensitivities of the committee members are the same, aggregate rent-seeking expenditures are the same under committee administration and under one-man administration. There is probably an intuitive explanation for why the result differs under a three-member committee. I have not as yet found such an explanation. However, it suggests that the relative magnitude of expenditures under committees and one-man administration depends on the size of the committee.

Suppose that the rent will not be awarded when the committee members vote for three different contestants. That is, the committee is unable to reach a majority decision. Then there is some probability that the rent may not be awarded. In this case, the last three terms in (1) should be set to zero, since $W_A = W_B = W_C = 0$. The equilibrium aggregate rent-seeking expenditure in this case is

$$\tilde{T} = 2\theta(N - 1)^2 V/N^3 \qquad (6)$$

where $\theta \equiv (\alpha + \beta + \gamma)$.[4]

Suppose that the committee members have the same sensitivity (i.e., $\alpha = \beta = \gamma$), then $\tilde{T} > \hat{T}$, if $N^2 - 6N + 6 < 0$. This holds if $2 \leq N \leq 4$. However, this condition is only applicable for N = 3 or N = 4, because when N = 2 the committee members *cannot* vote for three different contestants. That is, the committee will always reach a majority decision when N = 2. It follows that, for N = 3 or N = 4, committee administration results in higher aggregate rent-seeking expenditures than the expenditures under one-man administration, even if there is some probability that the committee will not award the rent.

It is clear from the analysis that under committee administration, there is no tendency for rent-seeking efforts to de-escalate. Unlike the model in Congleton (1984), Cournot adjustments initially lead to an escalation of bids, and eventually these bids stabilize at an optimal level; it is not optimal to target a majority coalition (i.e., only two members of the committee), because that will not necessarily *guarantee* any contestant the prize. The absence of majoritarian cycles in my model explains why my results diverge from Congleton (1984).

3. Conclusion

In this note, I have offered some insight into rent-seeking expenditures under committee administration vis-à-vis one-man administration, when voting is probabilistic. I show that the relative size of rent-seeking expenditures depends on the relative sensitivities and/or voting powers of the committee and the single administrator. Hence, the relative magnitude of rent-seeking expenditures will depend on how decisions are made within the committee. Here I have examined an aspect of the decision-making process by focusing on the allocation of decision-making powers.

I have modified Congleton's (1984) model to explain what drives his result. Unlike Congleton (1984), my analysis suggests that, *a priori*, one cannot determine whether a rent awarded by a committee results in smaller rent-seeking expenditures compared to expenditures when a similar rent is awarded by a single administrator. I also found that committee administration may result in higher aggregate rent-seeking expenditures, even if there is some probability that the rent will not be awarded as a result of the committee's inability to reach a majority decision.

In spite of my results, Congleton's (1984) work is still important because it provides a useful starting point for thinking about the relative efficiency of committees in awarding rents. It is important to note that I have ignored the fact that a committee may have superior decision-making abilities, although it may also have higher decision making costs. Of course, since the seminal works of Kenneth Arrow, Duncan Black, James Buchanan and Gordon Tullock, there is now a wide literature on group or collective decision-making. This note may be seen as a modest contribution to that literature.

Notes

1. See, for example, Coughlin (1992) for a discussion of probabilistic voting.
2. One may interpret these parameters as being infinitely large in Congleton (1984).
3. These derivatives and subsequent solutions of the model were obtained using the mathematics software, MAPLE V Release 5. The exact expressions are not reproduced here because they are too lengthy.
4. Note that it is not possible to obtain $\tilde{T}$ from (3′) or (4) by setting $W_A = W_B = W_C = 0$, since these equations were derived by assuming that $W_A + W_B + W_C = 1$. However, $\tilde{T}$ can be obtained by setting $W_A = W_B = W_C = 0$ in (3), summing the resultant expressions and then multiplying the resultant expression by N.

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