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Voting as a Public Bad: Theoretical and Experimental Results on Voting Costs

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Introduction

Decision making in any collectivity is costly. When voting, members bear information costs for evaluation competing proposals, they bear opportunity costs for the time taken to conduct a ballot, and they bear the administrative costs for tabulating and registering the outcome. Although many of these costs seem trivial in small settings, in large part this is due to adopting particular institutions to minimize those costs. In large-scale settings or where appropriate institutions are absent, the decision costs of voting can become quite high. Regarding voting as a costly activity becomes even more problematic when the collectivity operates under majority rule and an equilibrium outcome fails to exist (McKelvey, 1979; Schofield, 1978; Cox, 1987). Under such a setting every majority has alternatives it prefers to the status quo. The general instability of majority rule processes can lead to an endless agenda cycle. While many scholars have concerned themselves with the problems of indeterminacy in majority rule decision processes few have considered a related problem -- the problem of high decision costs incurred as a result of taking large numbers of votes.

In settings lacking a preference-induced equilibrium the agenda can stretch to great length implying high transaction costs. Open agenda procedures provide decision makers maximum freedom to propose changes. With no majority stable point, the number of votes may be unbounded. If voting is costly, members have an incentive to limit the number of votes. One frequently used mechanism for reducing the costs of voting is by delegating agenda control to some subset of the membership. By relying on an agenda setter, members reduce both the administrative and information costs for voting. However, they do so at the expense of their own freedom to alter the agenda. Buchanan and Tullock (1962) characterize this classic decision problem as "The Calculus of Consent" in which individuals decide between decision making mechanisms by considering the tradeoff between *external costs* and *decision making costs.* In this paper we consider whether rational actors in two different decision-making institutions respond differently in terms of the number of costly votes taken and whether this difference results in an overall improvement for players in terms of total utility.

As we develop, the net result of costly voting is the dissipation of rents from decision making. In the absence of institutional devices to curb voting over alternatives, actors choose to keep voting. If every voter bears the costs to voting, yet any individual may call a vote, then voting is transformed into a collective bad. Taking on the characteristics of a social dilemma, voting under an open agenda quickly leads to the deterioration of gains to be had from making a decision. In the next section of this paper we explore some of the formal characteristics of costly voting. In the subsequent section we turn to laboratory experimental methods to test a number of our theoretical conjectures. We conclude, rather pessimistically, that open agenda processes are destructive when voting is costly. Hence, in the absence of institutional mechanisms to bear many of the costs of voting, voting can be considered a public bad.

Definitions and Assumptions.

Let $N = \{1,2,...,n\}$ be the n-membered (odd) set of decision makers charged with selecting a single alternative, x, from a compact, convex policy space $X \subseteq R^m$. Each member $i \in N$ has a strictly quasi-concave binary preference relation (Type One preferences). Utility declines as a function of distance away from i's ideal point, x^i, so that *the set of alternatives preferred to x by player i* is defined as $P_i(x) = \{ x' \in X \mid \|x^i - x'\| < \|x^i - x\| \}$.

For simple majority rule games we define the *set of winning coalitions* in N as $S = \{S_1, S_2, \ldots, S_k\}$ where $S_j \in S$ if and only if $|S_j| > \frac{n}{2}$. An alternative, x', is *socially preferred* if it is preferred by all members of any $S_j \in S$ or $x' \in \boldsymbol{P}_j(x)$ where $\boldsymbol{P}_j(x) = \bigcap_{i \in S_j} P_i(x)$. The set of all socially preferred alternatives is defined as the win set of x or W(x) =

$\bigcup_{S_j \in S} P_j(x)$. We define the existing policy, or the status quo, as x^o. We define *an agenda setter*, $k \subset N$, as the member(s) granted any special agenda control in the game. If an agenda setter is present, then $k \in S_j$ for all $S_j \in S$.

We assume that taking a vote imposes costs on all members of the collectivity and define these voting costs as $c^i(x)$. For simplicity, we assume that $c^i(x) = c^j(x)$ for all $i,j \in N$ and that $c(x) = c(x^*)$ for all $x, x^* \in X$ and thus, consider a constant costs of c for any vote. We measure c in terms of utility.

We define an open access agenda procedure as one which allows any individual i to call a vote on a particular alternative, x^*, which requires each member to choose either x^o or x^*. We contrast this open mechanism with an agenda control system that awards a single agenda setting unit, V_k, access to the agenda. Under this rule, only V_k can call a vote between the status quo and a proposed alternative. Moreover, we assume that $|V_k| < |S_j| \; \forall \; S_j \in S$.

The Logic of Open Agendas

When individuals are brought together in a majority rule decision making setting with an open agenda process, each must evaluate the set of winning alternatives to determine whether an alternative would improve his/her utility by an amount sufficient to compensate for the costs of that decision. Each individual, i, has an incentive to propose an alternative to the status quo x^o as long as there is an $x^* \in W(x^o)$ where $u^i(x^*) - c > u^i(x^o)$. We define the set of i's cost-induced preferred set as $P_i^c(x^o)$. Player i will choose that alternative from the intersection of $P_i^c(x^o)$ and $W(x^o)$ which maximizes his payoff. We only consider those alternatives within the win set of x^o since a losing proposal results in a payoff of $u(x^o) - c$ which is strictly less than $u(x^o)$, the utility of no vote, for any $c > 0$. Certainly, when the status quo is located within a radius of c from x^i no change will produce a better outcome for i since the costs of the vote exceed any potential gain from continued movement. Moreover, if all points in the win set lie outside $P_i^c(x^o)$, then i will have no incentive to propose additional changes.

However, the actions of other players seeking to obtain a new status quo, x', where $u^i(x') < u^i(x^o)$, may force i to consider preemptive actions as well. Faced with an optimal status quo in the face of costs, i will not call an additional amendment but will seek to end the decision process at that point by calling for adjournment. However, unless a majority agrees to adjourn, the process continues. Unless the costs of calling a vote are sufficiently high so that $\bigcup_{i \in N}(P_i^c(x^o) \cap W(x^o)) = \varnothing$, for all $i \in N$, a vote will be called by some player and the decision process will continue. We can contrast this with previous results regarding the effects of costly agenda access (Herzberg and Wilson, 1990). When costs are assessed for a change in the status quo, the decision process is stable at x^o whenever the $W(x^o) \subseteq C(x^o)$. When costs are assessed on all individuals for calling the vote, the decision between costs only affects the individuals decision on calling the vote, but does not affect the actual vote decision. To see this consider the three person example shown in Figure 1. With costs equal to **c**, $W(x^o) \subseteq C(x^o)$. The process which links cost to the voting decision produces a stable outcome at x^o since no majority favors any move when they have to assume the costs of such action. When costs are assessed for calling the vote, this precedes the voting decision. In this case, players 2 and 3 both prefer alternatives to x^o by an amount exceeding **c**. In particular, the points x' and x*, maximize 2's and 3's utility within the set of winning alternatives and each results in a higher utility for its proposer than x^o-**c**. Since the costs are already imposed prior to the vote, a majority will prefer any alternative in $W(x^o)$ to x^o. By definition of $W(x^o)$, for every $x' \in W(x^o)$, $u(x') > u(x^o)$ for some S_j. Therefore, $u(x') - c > u(x^o) - c$, for some $S_j \in S$ and the move to x' will be made. Only if costs are high enough so that they cover all potential proposals from x^o will no move be made. In this examples, costs would have to equal z to prevent a vote from being called.

<Figure 1 About Here>

From the point x^o, majorities prefer any movement into one of the three petals shown in light shading. Of these many majority preferred alternatives we can identify those 3 alternatives which represent the maximum payoff for each player. The point x_2, for example, is closer to player 2's ideal than any other point in $W(x^o)$ and, therefore, represents the highest utility to player 2 of all winning alternatives. If we assume that each player calls a vote so as to maximize his payoff, three votes would be called -- x_2, x_3, x_1.

For almost all preference configurations and any x^o, there exist majority preferred movements from x^o suggesting votes will be called. If we assume that members make the decision to call a vote independently of one another, then an open agenda procedure creates a situation similar to a common property dilemma. Every member faces the costs of each vote whether he chooses to call a vote or not so that the costs are paid if any member chooses this action. Faced with the prospect of paying c whether he prefers the move or not changes the players' calculation. As long as all players are not located at or within a radius of c from the same ideal point, i can assume that someone else will propose a vote that is less than optimal for him. Thus, the only way he can hope to obtain the optimal response to x^o is to call a vote himself. To see this consider the following matrix representation:

	Call a vote	Don't call Vote
Call a Vote	$\alpha 1(u(x^*)-c) + \alpha 2(u(x'')-c)$	$u(x^*) - c$
Don't Call Vote	$u(x'') - c$	$u(x^o)$

Where $u(x^*) > u(x'')$ and and $\alpha 1$ and $\alpha 2$ are the probabilities that the respective vote is taken. By definition, $u(x^*) - c > u(x^o)$ so if the other player does not call a vote then i should call one. If the other player does call a vote as we would expect her to do under most conditions, then by i calling a vote on his maximal alternative he will improve his utility over not calling a vote as long as the expected loss from not calling the vote, [u(x*) - u(x")], exceeds c. Thus, if a player expects another player to propose an alternative that is worse for him than the costs of a vote, it is in his interest to call the vote. In the example shown in Figure 1, player 2 considers calling a vote at X_2. The decision tree for one stage in this three person example is shown in Figure 2. Working back through the tree, the dominance of calling a vote as a strategy used by every player becomes obvious. Unless vote costs exceed the maximum gain possible for any player, a vote will be called.

<Figure 2 About Here>

For most conditions, calling a vote is strictly dominant since each vote need only exceed the current payoff by the cost of a single vote. The result, however, is that members take more than one vote and the sum of costs over all votes may exceed the potential gain over the status quo for all players. In other words, acting independently, players will call more votes than is collectively rational and the consequence is that every player is left worse off. All potential payoffs from improving policy over existing policy are eaten up by the decision costs required to obtain these gains. If we consider the votes called in the example in Figure 2, we see that each player other than the player calling the vote prefers the status quo. However, once a vote is called and actors have borne the cost, they will vote for proposed change. The consequence is that with any of these votes, a majority is left worse off under an open (costly) agenda procedure.

Such is the tragedy of the commons, individuals unable to limit each others use of a valuable resource will overuse an nonreplenishable resource until the resource is destroyed. In response to such doom and gloom conclusions analysts have argued for alternative mechanisms that constrain use and limit access. Often these "solutions" take the form of a single governmental regulator. In a collective choice arena, one comparable mechanism is a monopoly agenda setter.

Agenda Setting Power

By awarding a single committee, ^{V}k, the power to call votes, the logic holds that the total number of votes called declines. To see this once again consider the example from Figure 1. Assume that player 2 is now awarded monopoly agenda setting power. Then, the only vote to be called in a single decision stage is x2. Thus, the payoffs to all players are the same: u(x2) - c. Since X2 is winning, the decision results in a positive payoff for a majority of players and costs are limited. The overuse of the valued resource is avoided, but not without other costs. As discussed earlier, decision costs are just one of the considerations in an individual's calculus over alternative decision settings.

One major cost associated with reliance on a monopoly agenda setter is that the final outcome favors the agenda setter. In particular, McKelvey (1976) has shown that when no preference induced equilibrium exists, an agenda exists that can produce any outcome — including the agenda setter's ideal. Thus, when a monopoly agenda setter is assigned in the absence of a preference-induced equilibrium outcome, the agenda setter's ideal becomes the expected outcome of the game. Depending on where the agenda setter's ideal policy is located relative to other players, the price non-agenda setting members pay in terms of policy outcomes can be substantial. If the agenda setter is representative of the larger group, members may feel that the outcomes produced do not diverge dramatically from any other outcome that might be produced through an alternative agenda mechanism and the resources saved is justified.

Alternatively, an extreme agenda setter can impose extremely high costs in terms of bias on the final outcome. Moreover, the more extreme the agenda setter's ideal, the longer the agenda required to achieve that outcome and, thus, the higher the costs of voting. In judging the relative value of the monopoly agenda setting institution versus the open agenda process we must consider how the agenda setting power will be assigned, what the potential biases this implies in expected payoffs, and the number of votes saved by depending on the monopoly mechanism rather than the open procedures.

Using a decision calculus patterned after Buchanan and Tullock's (1962) we can evaluate the relative merits of these two competing agenda procedures. As noted, the two major costs which enter into the evaluation of any constitutional arrangement are external costs, those costs associated with someone's ability to impose decision outcomes on an individual, and decision making costs, the costs required to reach a collective decision. As the decision process is opened up giving each individual more control over the final outcome, external costs are reduced. However, decision costs increase since coalitions become more difficult to form, more votes are needed and more information is required. Alternatively, limiting the process reduces the decision costs, but increases the likelihood that an outcome is reached that harms one or more group members.

A similar logic applies to our agenda mechanism. To avoid overusing voting, we limit the power to call a vote to a single individual. Decision making costs are lower under this mechanism than they would be under any alternative mechanism that awarded power to more than one individual. However, the limits on access imply that members lose some control over obtaining preferred outcomes. In the face of a monopoly agenda setter, an outcome preferred by all i, $i \neq k$, is still not winning. The degree to which external costs are burdensome depends in part on how the agenda setter is selected. If agenda control is assigned to a particular member, then all other members know they will never benefit from the advantages of possessing this control and all non-agenda setting members would likely oppose this arrangement. However, if this agenda power is assigned using a random mechanism so that each member has an equal chance of being the agenda setter then the external costs decline and the institution might be justified. Take, for example, the five person decision setting drawn from our experimental treatment as represented in Figure 3. Members are configured in a star configurations with ideal points represented as x^A to x^E respectively and agenda power is assigned to player E. Given that no preference-induced equilibrium exists for this particular configuration, the predicted outcome is simply x^E. The payoff for each of the five players using the payoff function from Table 1 is: $4.02,

$.97, $.87, $2.26, and $25.00, respectively. Certainly player E is advantaged in the decision over all others and if one individual was permanently assigned to this position, the gains to others would be quite low. With each position randomly assigned, however, every player in advance of the actual assignment has the same expectation. They can each expect to fill each of these five positions with probability of .20. The expected utility for each player with this particular utility structure is $6.62, a value very close to the group's social optimum in terms of payoff. However, the variance between member's payoffs at this point is close to its maximum as well. As long as such a mechanism is fairly assigned, members may find that the potential loss due to control over the agenda is compensated by the potential gains that come from being able to fill the agenda setting position.[1] While members may favor an agenda process such as this in advance, once in place, non-agenda members are likely to evaluate this mechanism as imposing higher external costs than the open access agenda mechanism.

<Figure 3 About Here>

Similarly, a monopoly agenda setting mechanism can be valued in terms of its reduced decision making costs. Members need not consider many votes on competing alternatives for each decision and the payoffs they receive from the final outcome are not eaten away by the resource costs used in reaching that decision. In equilibrium members will structure a decision-making setting so that the tradeoff between these costs — one's gain in external costs is balanced by a loss in decision costs — optimizes their payoff. It is impossible in this context to explore all of the various alternative mechanisms that might be used to reduce vote costs by limiting the number of votes, but we can compare the two extreme mechanisms outlined here — the open agenda process and the monopoly agenda setter.

[1] Certainly, one way that legislatures have dealt with this problem is to divide agenda control and award benefits on a smaller scale to all individuals by appointments to committees.

We conjecture that in nonequilibrium decision settings, the open agenda process will lead to such a large number of votes (and consequently high costs) that the payoffs for non-agenda setting members will be lower than under the monopoly agenda setting institution. While non-agenda members will lose in terms of policy utility, they will gain in reduced decision costs. Thus, several conclusions emerge. First, the number of votes taken will be lower under a monopoly agenda setting institution than under an open agenda process. Second, outcomes under the monopoly agenda setting institution will be biased in favor of the agenda setter relative to the outcomes produced by the open agenda procedure. Finally, when voting is costly, the tradeoff in terms of lost utility from bias in favor of the agenda setter will be offset by the saved decision costs under the monopoly agenda setting arrangement.

It is often impossible to test such conjectures in natural settings since the rule structures are usually far more complex than the model assumes and thus, results are complicated by the effects of rules beyond those under scrutiny. To get around this problem, we turn to an empirical test using a series of five-person laboratory experiments.

Experimental Design

General Features.

The experimental design used here is based on 5-person committee experiments conducted by Fiorina and Plott (1978), McKelvey, Ordeshook and Winer (1978) and Herzberg and Wilson (1990).[2] Subjects were recruited through advertisements posted around the campus at a large midwestern University. Subjects volunteered to participate at a particular time and date, and experiments were filled on a first-call basis. All participation in these experiments took place at computer terminals which were physically separated.

[2]Unlike the committee experiments by Fiorina and Plott (1978) and McKelvey, Ordeshook and Winer (1978) which were conducted in face-to-face settings, these experiments used computer controlled settings to mediate all player interaction. The experiments were conducted on Macintosh computers connected over a local area network. Source code for these computer programs is available from the second author.

Players could not see one another's terminals and their identities were randomized and kept anonymous during the experiments. This minimized the possibility that groups of players successfully colluded using pre-arranged coalition strategies.

Prior to beginning the experiment, individuals participated in a computer exercise for which they earned money. Subjects were told the exercise was unrelated to the experiment and simply designed to help familiarize them with the computer. In the exercise an individual picked a point from a line numbered from 0 to 100. The computer then picked a point from the line and the subject was paid an amount based on the closeness of their guess to that of the computer. The computer's selection was based on a random draw from a normal distribution. Subjects were given, for each point, the likelihood the computer would select that point. Subjects continued guessing until they had earned at least $3.00. This exercise was included for two reasons. First it was designed to help familiarize the subjects with using the "mouse" which was their sole interface with the computer. Second, in some of the experimental manipulations subjects could lose money. Consequently, this exercise served as a means for earning an endowment. Other researchers have shown that having a subject earn, rather than be granted, an endowment has an impact on their subsequent behavior in experimental settings (Hoffman and Spitzer, 1985).

Once past this exercise, participants were given instructions designed to familiarize them with the experiment and test their comprehension.[3] Upon completing these instructions, individuals participated in a practice period for which they were not paid. During practice, participants were urged to try all the options until they were familiar with the experiment. Participants were cautioned that once they completed the practice session their earnings solely depended on the collective choice that was reached.

[3]These instructions are available from the authors upon request.

In the experiment, participants were to collectively choose an alternative from a two-dimensional policy space. Alternatives were represented as Cartesian coordinates from orthogonal dimensions labelled X and Y. This setting is closely related to the models presented above using compact, convex multidimensional policy spaces since participants choose from a dense two-dimensional space made up of 300 x 300 points. All experiments used an open agenda procedure in which proposing alternatives, voting, and adjourning was governed under a modified version of *Robert's Rules of Order.* At the outset of the experiment a fixed status quo was introduced by the experimenter. Any subject could place a proposal on the floor and once proposed it remained there throughout the decision period. A vote to amend the status quo was not considered unless a proposal was "seconded" by another member. This had the effect of reducing the number of votes in these experiments and fits well with standard parliamentary procedure. Once a proposal was seconded, a vote was called between the amendment and the status quo. All amendments were treated as an amendment in the nature of a substitute. If a simple majority of the committee (three out of five) voted in favor of retaining the status quo, the experiment continued, with the floor open to new amendments. If a majority voted for the amendment it became the (amended) status quo, and the floor was opened to amendments to this new status quo. The experiment continued in this fashion until a subject made a motion to adjourn the committee meeting. If a simple majority voted to adjourn, then that decision period came to an end and subjects were paid their value for the current status quo. If a majority voted against adjournment, the experiment continued, with the floor open to further amendments to the status quo. It was up to a majority of the committee to decide when to end the decision period.

Each individual was assigned an ideal point in this two-dimensional space and was given a preference function. In these experiments, member preferences are represented as circles, with utility decreasing with distance from the member's ideal point. The utility functions across experimental designs are summarized in Table 1. By using an abstract policy space (made up of X and Y axes) and by inducing player's valuation for points in the space, we sought to avoid problems associated with participants adopting different subjective valuations for the policy space. All calculations for a subject were handled by the micro-computer. The computer terminal displayed the alternative space, the member's ideal point, representative indifference curves, and the ideal points of all other members (but not their utility functions). The current status quo, as well as all proposals currently on the floor were also represented on this alternative space. In addition, members had before them menus from which they could select a number of actions.

<Table 1 About Here>

In these experiments, subjects participated in three distinct periods, with each period constituting a distinct decision. All subjects were told the number of periods in which they would participate. The first was always a "practice" period, in which subjects were not paid. Instead, they were urged to use this period to learn the underlying mechanism behind the institution and to ask questions of the experimenter if they were unclear about how to use the equipment. The first period was always without costs and subjects were placed in a preference configuration they would not see in the remaining two periods. In both the second and third periods, subjects were paid for the final choice by the committee. Their money was tallied (and included the amount earned in the initial exercise) and they were paid at the conclusion of the experiment.[4] Between each period subjects were given new instructions, by the computer, detailing the design and manipulation for the subsequent period.

[4]Under some experimental manipulations subjects ended the experiment by owing the experimenter money. Such subjects were paid $2.00. It was not announced beforehand that subjects would be paid a minimal amount for participating. Instead, the instructions quite clearly stated that the sole amount subjects would earn was what they earned in the experiment. Clearly, when a subject's earnings are negative, several crucial assumptions about induced valuation are violated, including dominance and saliency (Smith, 1982). However, in several cases, the initial endowment for subjects would have had to have been in excess of $15.00 for those subjects to have broken even. From observing the experiments and listening to comments from subjects afterward, even when subjects had large losses (particularly in the second period), they still thought they could make money in the last period. There is every indication that subjects continued to take their task seriously even when they were facing negative payoffs.

Experimental Manipulations.

In these experiments two different preference configurations were used and within each configuration different experimental manipulations were imposed. The first, the *star preference configuration*, has individuals arrayed nearly symmetrically around the center of the alternative space. This configuration is identical to that used in Herzberg and Wilson (1990) and has the property that under this forward moving, simple majority rule voting mechanism, there is no preference-induced equilibrium. The second configuration, a *core preference configuration*, has a preference-induced equilibrium located at player A's ideal point. Table 1 lists the ideal points and utility functions of all players in all experimental designs.

Two experimental manipulations were used. The first imposed costs for calling a vote and the second granted agenda setting powers. The first experimental manipulation varied the costliness in making a vote in three ways. The control setting was one in which no costs were imposed on subjects for calling a vote. The second setting was one in which subjects were charged $.15 for each vote called. The final setting charged subjects $.30 for each vote that was taken. Under this three-level experimental manipulation, subjects were informed prior to beginning the period exactly what their costs would be for calling a vote. It was made clear to them that, no matter who called a vote, everyone in the group would be charged for voting. Moreover, before calling a vote, subjects were reminded of the cost attached to calling a vote (this was omitted where no costs were assessed for calling a vote). No distinction was made in these experiments between votes on an amendment and votes on adjournment. The same cost was applied to both types of votes.

The second manipulation varied the presence of an agenda setter. Under the control setting, no subject had power to set the agenda. This is consistent with an open agenda, forward moving amending process used in other experiments (see Fiorina and Plott, 1978; Wilson 1986). The second setting selected a single member (member E under the star preference configuration) to be the agenda setter. This meant that while any subject could place a proposal on the floor, only the agenda setter was able to call a vote. Unlike experiments without an agenda setter, the agenda setter was able to call a vote on her own proposals. Moreover, the agenda setter was the only subject able to call a vote to adjourn.

All groups were randomly assigned to preference configurations and manipulations.[5] The manipulations differed across configurations. Experiments with a star preference configuration have a 3x2 factorial design. This means that all three levels of voting costs were crossed with the two different levels of agenda setting. In experiments with core preferences only an open agenda setting was used and only two levels of voting costs were used. Here we examined committees with no costs and $.30 costs for calling a vote. Since our designs differ between the star preference and core preference configurations, we treat each separately in subsequent analysis.

Predictions.

Our theoretical discussions in the first section yield clear predictions for our experimental manipulations. Where costs are present any vote generates negative externalities. Yet no individual has an incentive to cut back on calling a vote. This is especially true under settings in which members have a star preference configuration, since there exists no preference-induced equilibrium. Therefore, there always exist majority rule cycles leading anywhere in the alternative space. Under the core preference configuration, some individual has an incentive to continue calling a vote until reaching the equilibria. In the face of costs our predictions are twofold. First, there will be no difference between settings with voting costs and those without costs. Although subjects are facing a game

[5]Two of the experimental series are taken from earlier experiments run under a different design. These experiments were conducted three weeks prior to beginning the experiments reported here. The experiments we use are part of our control group settings. The first are experiments under the star preference configuration with no agenda setter and no voting costs. The second group are under the core preference configuration with not agenda setter or costs. We have no reason to expect an history effects for these experiments.

with the characteristics of a commons dilemma, no actor has an incentive to unilaterally withhold calling a vote. Second, where subjects are assessed costs for each vote called, they will dissipate all rents from the committee setting. This is the spatial voting equivalent to the non-replenishable commons problem, where the product of uncoordinated individual action is to destroy whatever gains might exist.

In contrast to these strong (pessimistic) predictions, there are several additional predictions worth exploring. As a benchmark, economists often consider outcomes that maximize the social gain.[6] For experiments with a star preference configuration the point (279,180) uniquely maximizes the group payoff. However, this point is player C's ideal point, with that player gaining $25.00 and the remaining players obtaining between $.86 and $3.37. A competing notion is an outcome that minimizes the variance for individual payoffs. This point is given by (147,157) and ensures that all subjects earn at least $4.15. Under the core preference configuration, the social maximum is given by the point (120,125) and the minimized variance point is given by (128,148). The former point is equivalent to the preference-induced equilibria and is subject A's ideal point. The latter point ensures that each subject gains are least $5.14. Both the social maximum and minimized variance points under each preference configuration represent benchmarks against what "reasonable" earnings might look like. However, it is unlikely that either a point representing a social maximum or a point that minimizes the difference between individual payoffs will be selected in these settings. Since the experiment is based on a strictly non-cooperative model, there are no opportunities for actors to coordinate their actions. Moreover, finding such outcomes requires that actors simultaneously solve 5 non-

[6] In the public goods literature, such an outcome is the Lindahl optimum. It has the property that it is reached by a strictly dominated strategy, yet it yields a pareto superior outcome. For a reasonable discussion of such game theoretic foundations, see Friedman, 1986. The problem with finding an equivalent concept in a spatial setting is that the pareto optimal set of outcomes is quite large. Even the minimum winning coalition pareto sets are quite large. Instead we consider variants of the social maximum and minimum variance payoffs to the group.

linear equations. This is a difficult task and is compounded by the fact that subjects do not know the exact shape of other member's utility functions.

To this point we have not considered the predictions from our second set of manipulations. Given our theoretical discussion in the first part of this paper we predict that subjects will uniformly take fewer votes in the presence of an agenda setter. Moreover, standard models of agenda setting predict that when an agenda setter is present, that individual will be substantially empowered. Outcomes, then, should favor such a player. The fact that agenda setting power is predicted to decrease the number of votes also points to the possibility that non-agenda setters are left better off in the presence of voting costs and an agenda setter, then where an agenda setter is absent.

This discussion gives rise to several hypotheses:

H1: The number of votes taken across cost levels will not differ, ceteris paribus.

H2: The presence of an agenda setter will decrease the number of votes taken, ceteris paribus.

H3: Outcomes under an agenda setter will favor the agenda setter. However, in the presence of costs, non-agenda setters will be left better off than where no one has exclusive agenda setting powers.

H4: In the presence of voting costs, actors dissipate their own potential gains from collective decision making.

Analysis

Because our experimental designs differ by type of preference configuration, we analyze these results separately. Table 2 lists outcomes by preference type and experimental manipulation.

<Table 2 About Hero

Star Preferences.

The first experiment used a "star-like" configuration of preferences. Here actors are nearly symmetrically arrayed around a center point in the two-dimensional alternative space. Such a preference configuration is similar to that used in several other settings by Herzberg and Wilson (1987; 1990) and has no preference-induced equilibrium. Since this design incorporates a full 3x2 factorial design, the most straightforward test is an ANOVA. The primary experimental manipulation concerns the negative externalities stemming from voting. Our principle dependent variable is the total number of votes called in the experiment. Since each vote called incurs a cost, this is a useful proxy measure of the costs borne by the subjects. Our first model tests the main experimental manipulations, plus their interaction. The ANOVA estimates are given in Table 3.[7] The results clearly show that the number of votes taken, irrespective of manipulation, are the same. This strongly reinforces our prediction that subjects would not cut back as to the number of votes that they called. When an agenda setter is included, the number of votes is decreased, and this main effect approaches statistical significance at the .05 level. This manipulation supports our prediction that the presence of an agenda setter reduces the costs borne by committee members. The interaction term between manipulations is not significant, indicating that agenda setting in the face of costs did not amount to any residual savings in the number of votes over and above that gained under the main effect.

<Table 3 About Hero

On closer examination of the data it was apparent that our assumption that decisions were made independently by period was incorrect. Subjects were very much affected by the ordering of the manipulations. In part this is explained by subjects first confronting a period in which they bear substantial costs for continuing in the experiment. At the

[7]The analysis here and in subsequent discussions excludes one data point In experiment CV28:3 subjects ended the period after less than 30 seconds. They chose to remain at the status quo, (280,280) even though a majority clearly had an incentive in making a movement to some other alternative. This group also ended early in the first period, spending less than three minutes in a setting for which there was a Core. They failed to arrive at this equilibrium, although three of the players made in excess of $6.00. These same three players also voted to adjourn at the status quo in the subsequent period. In this instance, two of the three again earned in excess of $6.00. For no apparent reason the third player voted in favor of adjournment, although he earned only $.43 for this point. There was no obvious pattern to this behavior. Our estimates were made with and without this point In all instance the direction of the relationships remain the same, although significance levels vary. For purposes of discussion we have chosen to exclude this data point.

subsequent period they are much more likely to stop quickly, having learned the effect of continually calling new (costly) votes. These estimates are also given in Table 3 and include only the main effects (all interaction terms are insignificant). From this estimate the ordering of the manipulations plus the agenda setter have effects consistent with our predictions. Moreover, regardless of costs, there are no statistical differences among treatments as to the number of votes taken. The results under estimate 2 in Table 3 provide fundamental support to our theoretical conjecture that in the face of costs, subjects are in a commons dilemma. However, by adding an agenda setter the number of votes decreases, as does the costs borne by subjects.

Are subjects in fact better off with an agenda setter in the face of costs? Figures 4, 5, and 6 plot outcomes by size of costs for experiments with and without an agenda setter. Visually it is clear that the presence of an agenda setter has a powerful effect on differentiating outcomes. While not all outcomes under an agenda setter appear at member E's position, outcomes are certainly closer to that subject's ideal point than outcomes without an agenda setter. This holds regardless of the size of the costs. The spread of agenda setting outcomes away from member E's position are mostly a function of agenda setters uncertainty as to the extent of their power. In several experiments the agenda setter was able to immediately move the status quo to her ideal point However, the agenda setter was then unable to get a majority to adjourn at that point. Most agenda setters then brought an alternative to a vote which was further out from their ideal point Such motions easily passed and the agenda setter then found it difficult to find an agenda path returning closer to their ideal point.[8]

<Figure 4,5 and 6 About Hero

[8]To make such a movement most agenda setters would have had to call a vote quite far removed from their ideal point. Such a motion would have represented a sophisticated move. However, no subject tried this. It is understandable given subject's unfamiliarity with the mechanism and the fact that sophistication is not often observed even in the most favorable circumstances (see Herzberg and Wilson, 1988).

Did including an agenda setter markedly improve the payoffs to non-agenda setters in settings with costs? By inspection of figures 4, 5, and 6, the agenda setter did substantially better than other subjects. To get at this question we compared the summed final payoffs to non-agenda setters, A,B,C, and D (and their counterparts in costly voting experiments without an agenda setter) under different treatments. These estimates are given in Table 4 and only include experiments where costs were present[9] The only effect statistically significant at the .05 level relates to the level of cost. As expected, subjects make less when costs are higher. This follows from the fact that as expected we did not find any difference as to the number of votes taken across cost treatments. The effect of an agenda setter is not quite what we predicted. Statistically there is no significant main effect for the agenda setter. However, in part this is due to the larger variance of the high cost condition. Figure 7 illustrates the distribution of earnings for non-agenda setters (and their counterparts) in costly voting experiments. Under each pairing, when an agenda setter was present, subjects not only were disadvantaged by the bias from the power of the agenda setter but also bore the costs of extended voting across proposals. The presence of an agenda setter generally results in a net decrease in payoffs to actors, regardless of costs.

<Table 4 About Hero

One conjecture we offered, that an agenda setter provides a way out of a common dilemma, is not supported. In large part this is due to the intransigence of subjects. Non-agenda setters were willing to bear costs by refusing to adjourn on an outcome they regard as far from their interest. Generally intransigence in the face of an agenda setter works. The agenda setter often pushes herself to move outward from her ideal point Hence we observe a pattern of outcomes that extend outward from the agenda setter's ideal point. However, while such a member is willing to compromise a bit, with the consequence that

[9]In these estimates an outlier under a high cost, no agenda setting was excluded (experiment CV??). In this experiment members A3,C, and D collectively owed the experimenter in excess of $49.00. The effect of this outlier is to dramatically skew the distribution for that treatment and weakened a weak relationship reported in Table 4. However, this experiment period so completely dissipated rents that there was no chance for subjects to earn money for the experiment

the total number of votes taken is lessened, still the other subjects are at a severe disadvantage relative to an open agenda setting.

Core Preferences

The final set of experiments incorporates a preference configuration in which a preference-induced equilibrium exists. Under these preferences, the alternative, x^A, is both attractive and retentive. This leaves this outcome as a reasonable prediction. For these experiments we examined only the effects of no voting costs and high ($.30) voting costs on outcomes. The outcomes for these experiments are listed on Table 2. As well, Figure 8 displays these outcomes for both manipulations. There is little dispersion under these outcomes. Under both manipulations the outcomes cluster around the Core. However, the question remains whether subjects are more likely to stop the voting more quickly under costly voting than where there are no costs.

<Figure 8 About Here>

The results from an ANOVA with only main effects for presence of costs and period clearly shows no difference as to the number of votes across manipulations (see Table 5). Again this indicates that even under high costs, subjects are taking as many votes as in a setting where they bear no costs. The period effects are insignificant. As an aside we note that there are no differences as to the number of votes taken under experiments with Core preferences and Star preferences (the mean of the former is 17.7 votes and the latter is 17.8 votes).

<Table 5 About Hero

Conclusion

We began this examination assuming that every vote in a collective choice decision setting imposes costs on the collectivity. These costs affect the decision calculus of individuals faced with reaching collective decisions. Moreover, because these costs operate collectively, members do not internalize the full level of these costs into their individual decision calculus. The result is an overproduction of decision opportunities and higher decision making costs for all members. When individuals in a collectivity make decisions independently of one another and each values a collectively provided resource ~ access to the agenda — the consequence is a dissipation of utility from the collective decision. Thus, under an open agenda process, members will continue to call costly votes until all potential gain has been eroded.

One way that individuals limit the costs imposed by decision making is to limit the number of decisions that are taken. This can be done in a number of ways, but a primary method is to award agenda setting power to a subset of the collectivity. By awarding an individual or committee exclusive control over the agenda, votes previously called by non-agenda members will not be raised and decision costs will be reduced. The difficulty with this way of reducing decision making costs is that it creates new costs in the form of bias in favor of the agenda setter. The question we ask in this paper is whether the tradeoff in reduced decision making costs justifies the anticipated utility loss from awarding monopoly agenda control and whether that tradeoff is affected by level of cost.

We suggested that members under an open agenda setting would propose numerous votes each without reference to the costs imposed unless costs were so high that no move would result in greater utility for any member. Thus, the number of votes under an open mechanism would not be sensitive to most levels of decision costs. Alternatively, a monopoly agenda setting institution would be marked by far fewer votes and thus, lower decision costs. While non-agenda members might not like the final policy outcome as well, their overall utility calculation when decision costs were accounted for would be higher. To test this proposition we examined a series of five-person laboratory committees. One set operated under an open agenda procedure comparable to *Robert's Rules of Order.* The second set of experiments awarded a single player agenda control and all votes over amendments and adjournment decisions originated with the agenda setter. In each institutional arrangement we considered three levels of cost — $0.00, $.15, and $.30 per vote taken.

These experiments clearly show the extent to which actors will dissipate any gains from decision making. Rather than halt voting and settling on an outcome approaching the expect value for the game, individuals continued to call votes that made themselves and the committee worse off in the long run. Even in a setting in which an equilibrium outcome existed, still committee members called a large number of votes before adjourning.

Other results were surprising. While the presence of an agenda setter reduced the overall number of votes taken, the difference was minor and could not compensate for the high costs in policy bias produced by monopoly control. Thus, non-agenda setting members were worse off even when decision costs were taken into account. One reason for this result is that agenda setters did not provide significant time and resource savings.

What are we to make of these results? Certainly, one factor accounting for these results is the position of the agenda setter relative to other members. The agenda setter assigned monopoly control in these games was not close to any of the other members.[10] When the agenda setter is unrepresentative, the costs in terms of policy bias will be quite high and even high decision costs will not be compensated for by loss of this control. Alternatively, members may seek to award some form of competing agenda control to more than one member. Competing agenda setters would lead to a larger number of votes than would be expected under the monopoly setting, but not as many as the fully open setting. Moreover, with access to competing agenda setters, members loss of policy control is diminished.

[10] The star preference configuration used to test the agenda setting conjectures does not provide a centrally located member who might reflect the position of the larger group, but such a possibility might exist in a larger group or one more closely distributed in the space.

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Table 1

Parameters Used in Experiments

Star Preferences.

Member	*Ideal Points*	*Max. Value*	*Loss Rate (γ)*
A	(22,214)	\$25.00	-.013
B	(171,290)	\$25.00	-.013
C	(279,180)	\$25.00	-.013
D	(225,43)	\$25.00	-.013
E	(43,75)	\$25.00	-.013

Status Quo = (280,280)

Core Preferences

Member	*Ideal Points*	*Max. Value*	*Loss Rate (γ)*
A	(120,125)	\$15.00	-.018
B	(34,168)	\$19.00	-.013
C	(242,247)	\$25.00	-.011
D	(222,74)	\$19.00	-.013
E	(30,35)	\$19.00	-.013

Status Quo = (175,265)

Utility for any $\mathbf{X}$ and for the ith's member's ideal point, $\mathbf{X}_i$, is given by:

$$U_i = (\text{Max. Value}) * \exp(\gamma * (\|\mathbf{X} - \mathbf{X}_i\|))$$

Table 2

Experiment Outcomes By Manipulation

Star Preferences

No Costs/No Agenda Setter

Experiment	Period	Outcome	Total Votes
cv22	2	(176,191)	27
cv22	3	(225,43)	2
cv23	2	(204,180)	33
cv24	2	(172,210)	21
cv25	2	(190,167)	73
cv26	2	(34,173)	12
cv27	3	(173,198)	50
cv28	3	(280,280)	1

No Costs/Agenda Setter

Experiment	Period	Outcome	Total Votes
cv3	3	(66,99)	7
cv4	3	(51,81)	11
cv5	2	(141,132)	48
cv6	2	(56,127)	20
cv7	3	(54,83)	7
cv10	2	(43,75)	6
cv13	3	(97,113)	5

$.15 Costs/No Agenda Setter

Experiment	Period	Outcome	Total Votes
cv2	2	(157,124)	23
cv9	2	(89,209)	5
cv14	3	(135,133)	16
cv16	3	(119,165)	2
cv17	3	(153,160)	3
cv19	3	(168,149)	14
cv20	2	(160,124)	23

$.15 Costs/Agenda Setter

Experiment	Period	Outcome	Total Votes
cv3	2	(50,88)	8
cv4	2	(51,88)	28
cv11	3	(55,74)	16
cv12	3	(95,154)	8
cv13	2	(108,103)	8
cv19	2	(54,75)	5
cv20	3	(94,105)	10

Table 2 Continued

$.30 Costs/No Agenda Setter

Experiment	Period	Outcome	Total Votes
cv2	3	(155,147)	12
cv10	3	(171,282)	5
cv15	2	(207,216)	13
cv15	3	(154,122)	2
cv14	2	(55,175)	35
cv17	2	(167,118)	56
cv18	3	(172,291)	42

$.30 Costs/Agenda Setter

Experiment	Period	Outcome	Total Votes
cv5	3	(122,134)	9
cv6	3	(62,78)	7
cv8	2	(43,75)	18
cv8	3	(43,75)	3
cv14	2	(103,111)	19
cv18	2	(66,86)	16
cv21	2	(142,178)	19

Core Preferences

No Costs/No Agenda Setter

Experiment	Period	Outcome	Total Votes
cv29	3	(125,124)	26
cv30	3	(123,75)	6
cv31	2	(156,135)	16
cv32	3	(138,147)	3
cv34	2	(120,129)	13
cv34	3	(124,150)	6

$.30 Costs/No Agenda Setter

Experiment	Period	Outcome	Total Votes
cv1	3	(122,111)	17
cv7	2	(106,89)	3
cv9	3	(133,130)	18
cv11	2	(120,124)	26
cv12	2	(112,106)	2
cv21	3	(46,130)	7

Table 3

ANOVA Estimates for Star Preference Configuration Experiments

Estimate 1: Main Experimental Effects and Interaction Only

Variable	*SS*	*DF*	*MS*	*F*	*p*
Cost	841.29	2	420.64	1.76	0.186
Setter	868.60	1	868.60	3.64	0.064
Cost*Setter	451.48	2	225.74	0.95	0.398
Error	8585.71	36	238.49		

Estimate 2: Main Experimental Effects Plus Period (No Interactions)

Variable	*SS*	*DF*	*MS*	*F*	*p*
Cost	725.96	2	362.98	1.75	0.188
Setter	868.60	1	868.60	4.19	0.048
Period	1369.34	1	1369.34	6.608	0.014
Error	7667.85	37	207.24		

Table 4

Gains to Non-Agenda Setting Players

Variable	*SS*	*DF*	*MS*	*F*	*p*
Cost	59.85	2	29.93	2.00	0.150
Setter	865.19	1	865.19	57.74	0.000
Period	8.96	1	8.96	0.60	0.444
Error	554.44	37	14.98		

Table 5

Gains to Non-Agenda Setting Players

Variable	*SS*	*DF*	*MS*	*F*	*p*
Cost	285.36	1	285.36	0.54	0.478
Period	444.19	1	444.19	0.85	0.379
Error	5248.36	10	524.83		

Figure 1:
Proposed Alternatives For Costly 3-person Majority Voting Game

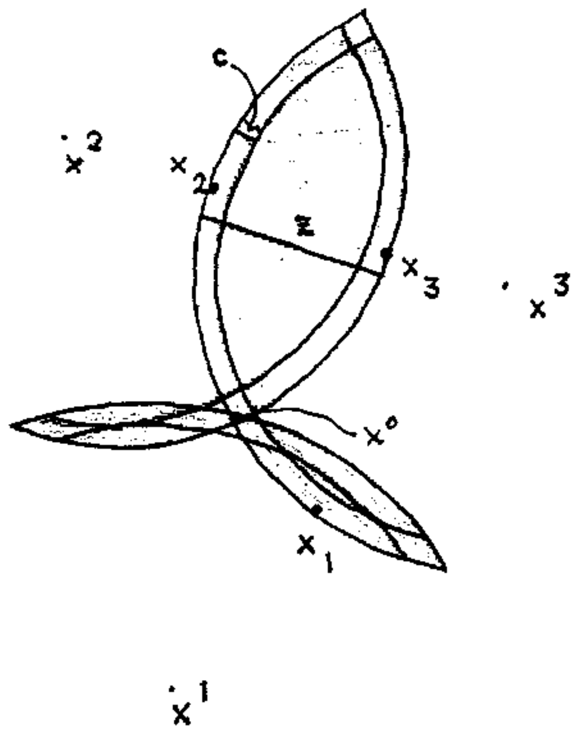

Figure 2

Game Tree: Payoffs to Player 1

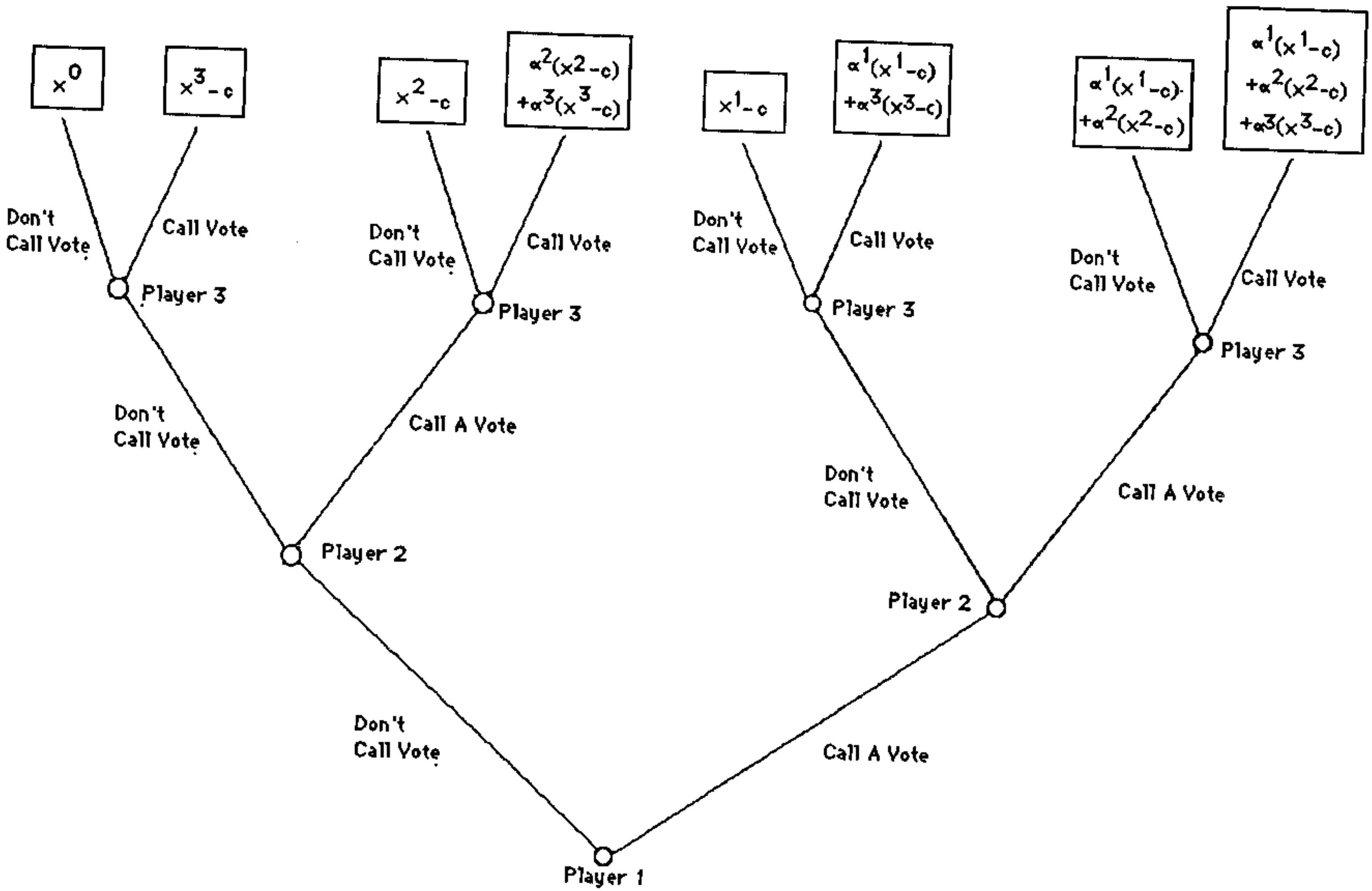

Figure 3

Five Person Example in Two Dimensions

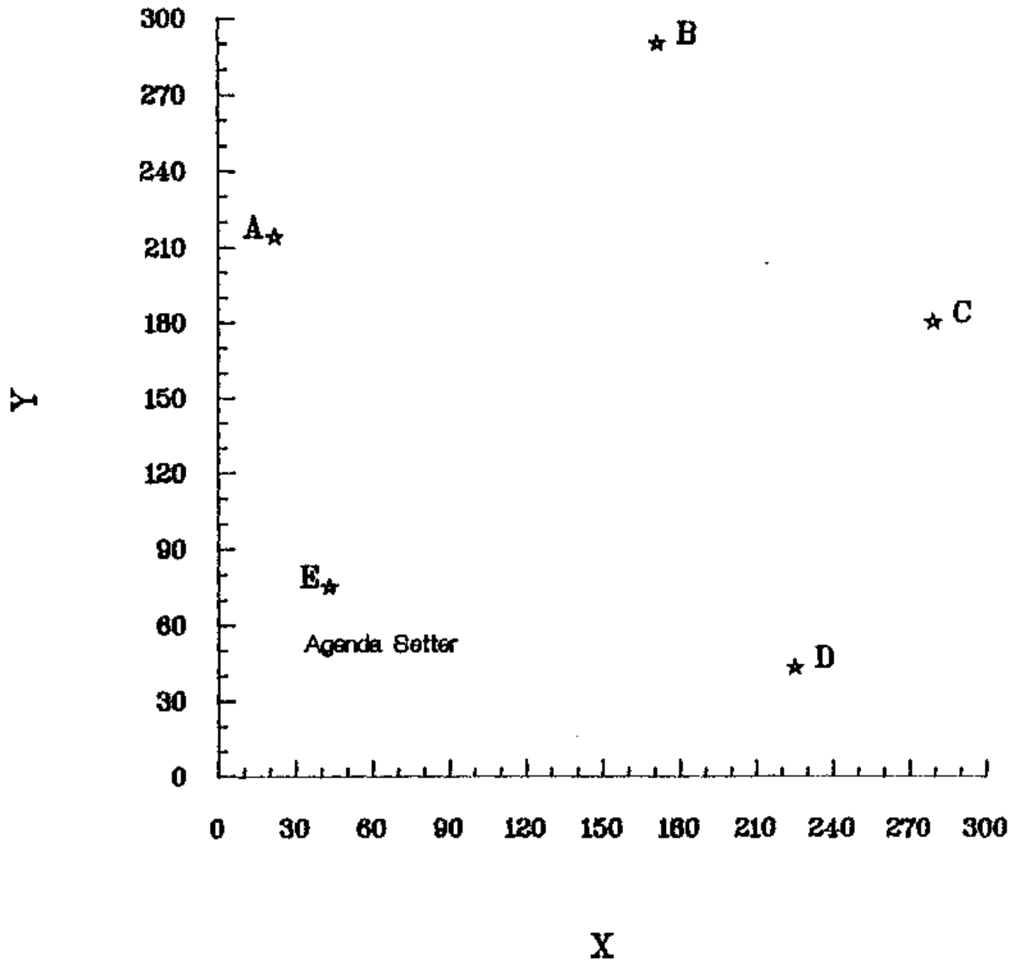

Figure 4

Outcomes Under No Costs

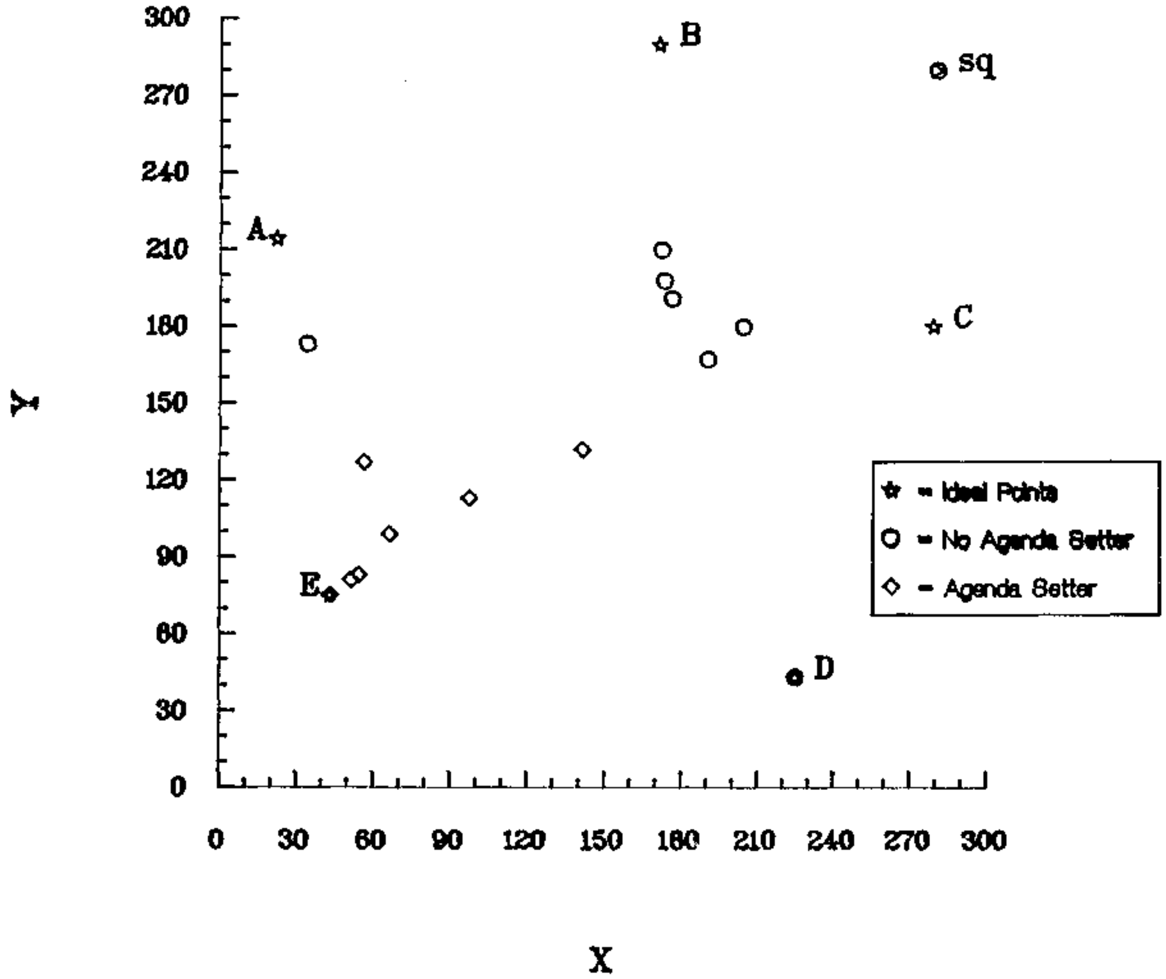

Figure 5

Outcomes Under $.15 Costs

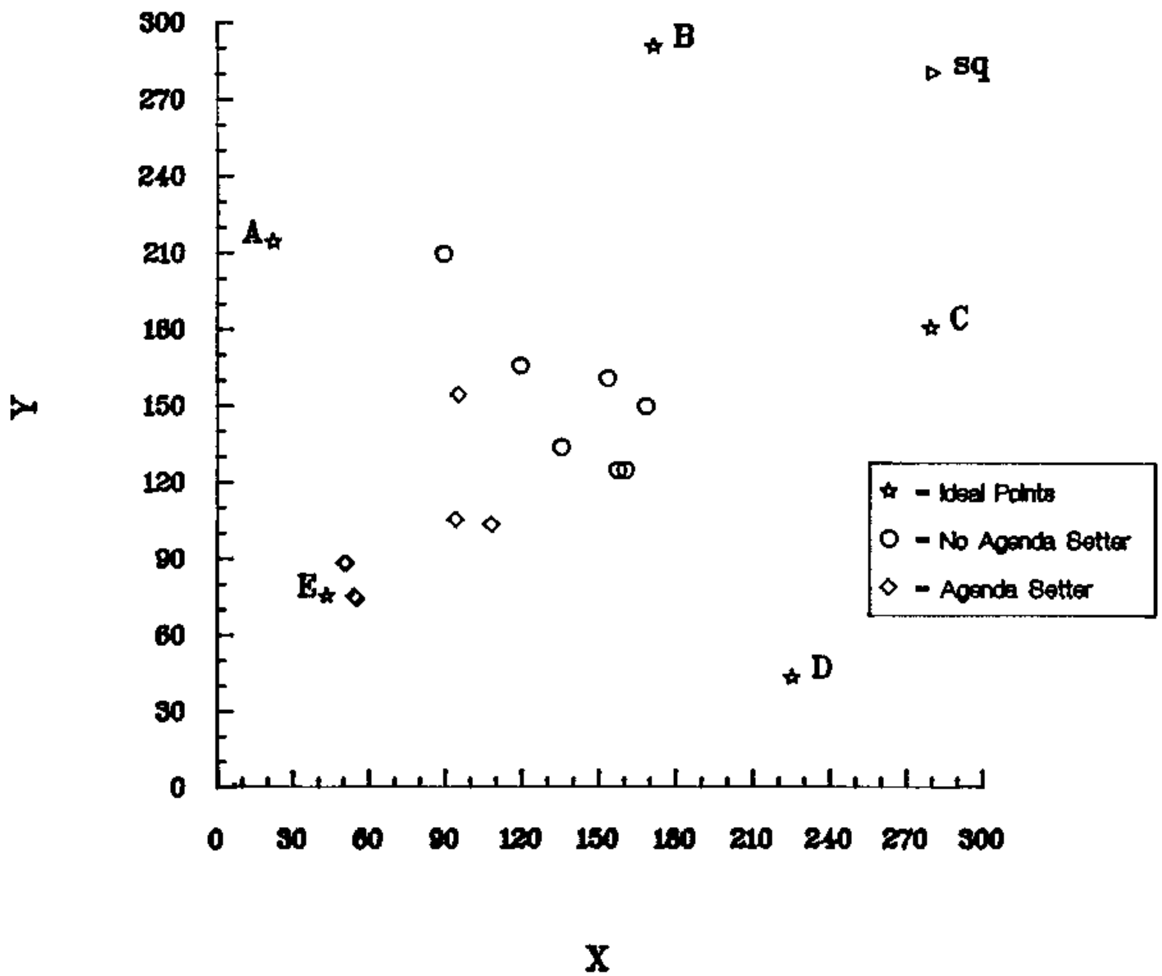

Figure 6

Outcomes Under $.30 Costs

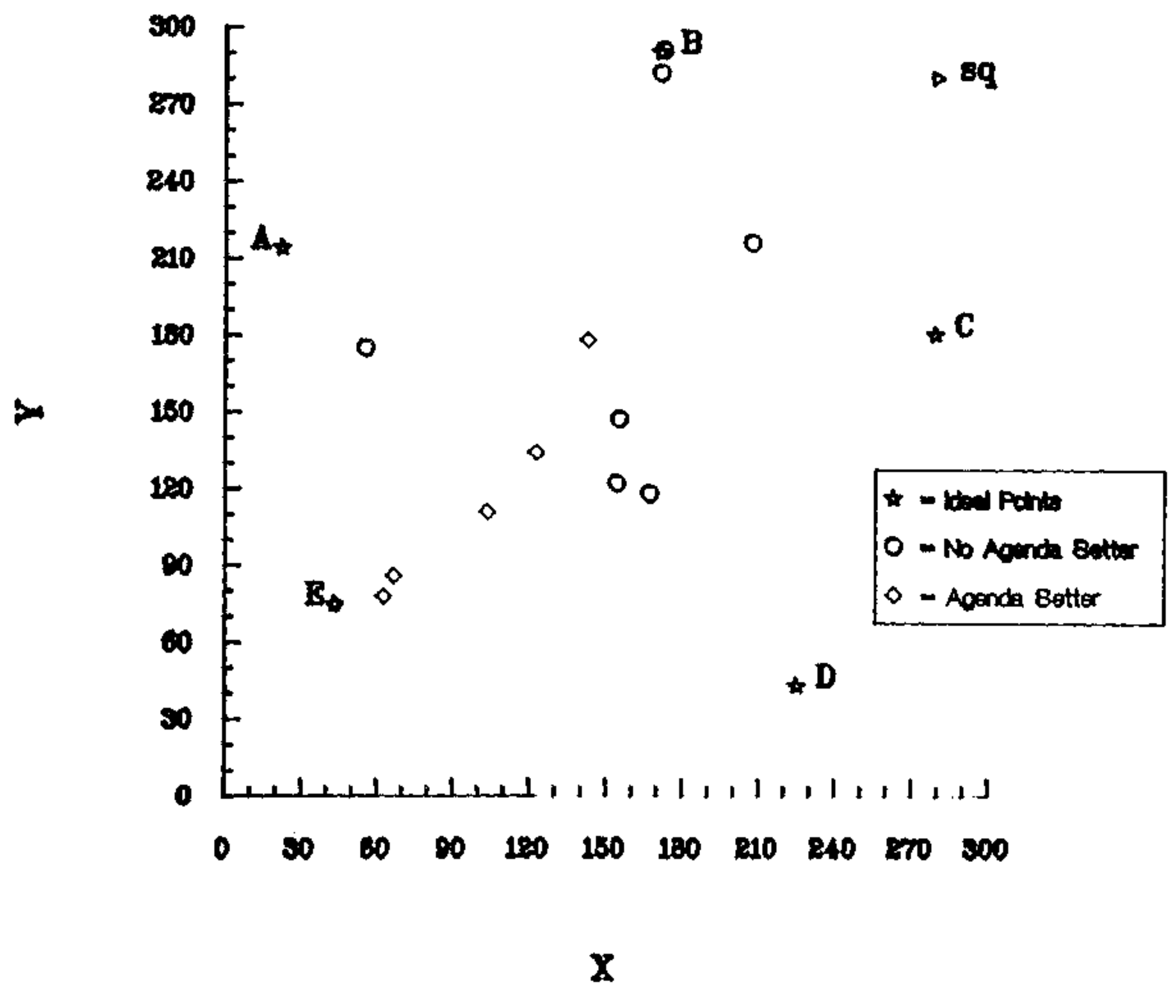

Figure 7

Distribution of Earnings for Non-Agenda Setters by Manipulation

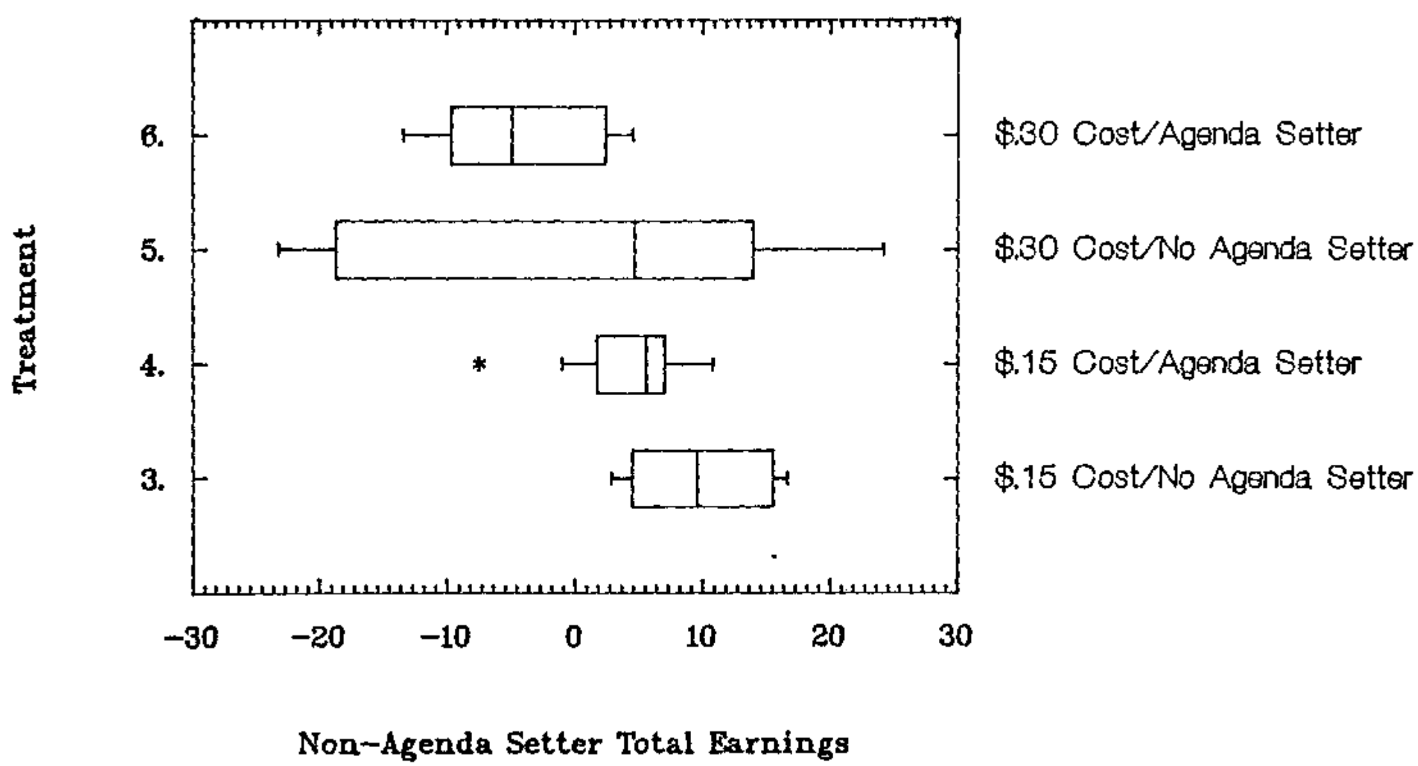

Figure 8

Outcomes With a Core