Bargaining in Legislatures: An Experimental Investigation of Open versus Closed Amendment Rules

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Abstract

We investigate the differential effects of open versus closed amendment rules within the framework of a distributive model of legislative bargaining. The data show that there are longer delays in distributing benefits and a more egalitarian distribution of benefits under the open amendment rule, the proposer gets a larger share of the benefits than coalition members under both rules, and play converges towards minimal winning coalitions under the closed amendment rule. However, there are important quantitative differences between the theoretical model underlying the experiment (Baron and Ferejohn 1989) and data as the frequency of minimal winning coalitions is much greater under the closed rule (the theory predicts minimal winning coalitions under both rules for our parameter values) and the distribution of benefits between coalition members is much more egalitarian than predicted. The latter are consistent with findings from shrinking pie bilateral bargaining game experiments in economics, which we relate our results to.

Introduction

One of the fundamental questions legislatures deal with is how to allocate government resources between constituencies which have different and sometimes conflicting preferences. The formal rules under which this legislative bargaining process takes place are universally recognized to play a major role in the budget allocation process, both within the specialized standing committees assigned to draft legislation and within the parent legislature itself. Although no legislative bargaining model can fully capture the complex nature of this bargaining process, at a minimum it is important to distinguish between situations where a proposal can be amended many times before being brought to a vote (open amendment rule) and situations where the agenda setter exercises greater control and manages to bring unamended proposals to the floor (closed amendment rule).

A good deal of theoretical and empirical work has been devoted to understanding the basis for legislatures ceding substantial authority to specialized standing committees and to the impact of the amendment rules these committees adopt on legislative outcomes. One branch of the literature involves distributive models of the bargaining process, which postulate that legislative processes are organized in such a way as to facilitate rent-extraction. As a result committees are usually composed of members who have the most to gain from the committees actions, with the rules under which legislation is brought to the floor having a substantial impact on the extent of this rent extraction.

The question posed in the experiment reported here is do these legislative rules - open versus closed amendment rules - of and by themselves have the impact that the literature suggests? Do closed amendment rules favor minimum winning coalitions with proposers obtaining greater benefits than open amendment rules? Do open amendment rules facilitate a more widespread and egalitarian distribution of benefits, and lead to greater delays in the legislative bargaining process? Answers to these questions are of growing practical importance as recent years have seen a sharp increase in the application of some sort of restrictive amendment rules attached to legislation in the United States Congress.[1] Answers to these questions have significant implications for the efficiency of the legislative bargaining process. For example, Baron (1991) argues that open amendment rules tend to limit inefficient pork barrel legislation compared to closed amendment rules. Substantially further afield, and much broader in its implications, Alesina and Perotti (1996) argue that open versus closed amendment rules have implications for whether or not national governments will have balanced budgets, along with the overall composition of those budgets.

Experiments provide a direct and powerful tool for investigating the differential effect of open versus closed amendment rules. In the laboratory we are able to create a controlled environment in which the only difference between treatments is the amendment rule in place. Our experiment is conducted within the framework of the Baron-Ferejohn (1989) model of legislative bargaining, which yields strong qualitative and quantitative differences contingent on the amendment rule adopted. We implement the model in terms of a "divide the dollar" game with majority rule and an infinite time horizon.

The present paper is, to our knowledge, the first experimental comparison of open versus closed amendment rules in the legislative bargaining process. Although there have been other experimental investigations of the Baron-Ferejohn model, these have both involved strictly closed amendment rule procedures (McKelvey 1991; Diermeier and Morton, 2000). We compare our results, where appropriate, with results from these other experiments in the main body of the text.

Theoretical Model and Predictions

The Baron-Ferejohn (1989) (hereafter BF) model is intended to reflect, in a stylized manner, the sequential nature of proposal making, amending, and voting in legislative settings, modeling it as a noncooperative, multisession game. The legislature consists of (1) n members each representing a legislative district, (2) a recognition rule that determines the standing proposal in each round of the election, (3) an amendment rule, and (4) a voting rule. "Members" can be thought of as either individuals or unified blocks of legislators who have the same preferences.

The legislature allocates a fixed quantity of divisible benefits among legislative districts according to majority rule, with no side payments. Each member is assumed to have risk-neutral preferences that depend only on the benefits allocated to their district. Preferences and legislative rules are assumed to be common knowledge, with all actions observable, so that the model involves perfect information.

In our experiment we employ a random recognition rule, with each legislator having an equally likely chance of having her proposal recognized and voted on. BF recognize that random recognition rules are not generally observed in real legislatures, but employ it in their benchmark model since (i) some rule must be employed, and (ii) under the random recognition rule proposer power is the same for all members, so that it serves as a benchmark against which to assess more complicated recognition rules.

At the beginning of an election each member i has a probability $p_i = 1/n$ of being recognized, and if recognized makes a proposal specifying how benefits will be distributed. A proposal x^i is a distribution $x^i = \left(x_1^i, \ldots, x_n^i\right)$ such that $\sum_{j=1}^{n} x_j^i \leq 1$ where x_j^i is the share that i allocates to voter j. This proposal is then the motion on the floor. The status quo corresponds to no allocation of benefits, $x = (0, ..., 0)$.

Under a closed amendment rule the motion is voted on immediately. If the proposal is approved the legislature adjourns. If not, the legislature moves to the next round and the process repeats itself. This process repeats itself until a proposed distribution receives a majority vote.

Under an open amendment rule another member $j \neq i$ is recognized with probability $p_j = \frac{1}{n-1}$, who may either amend the proposal or move the previous question. Moving the previous question brings the proposal on the floor to an immediate vote.[2] If the proposed distribution is approved the legislature adjourns; if it is rejected, the legislature moves to the next round and the process repeats itself.

An amendment involves a substitute distribution of benefits. BF consider a simple open rule allowing no more than one amendment at a time on the floor. If an amendment is offered, there is a runoff election between the amendment and the standing proposal. If the amendment fails, the proposal remains on the floor and the next round begins with further opportunity for amendment or moving the previous question. If the amendment wins the runoff election, it becomes the standing proposal and the next round begins with further opportunity for amendment or moving the previous question. This process repeats itself until a proposed distribution receives a majority vote.

If members fail to vote for a proposal which give them a sufficiently large positive share of the benefits they run the risk that in the next round a proposal will be passed allocating no benefits, or smaller benefits, to their district. If the proposed share is at least as large as can be expected from future rounds, members vote in favor of the proposal. Otherwise they vote against it. Because the legislature may not distribute benefits in the first round, time preferences may play a role in voting. BF assume that members have a common discount factor $\delta \leq 1$, which reflects the political imperative from re-election concerns to distribute benefits sooner rather than later. Alternatively, δ may represent the probability that a member will not be reelected to office in the next round. In the experiment we employ a discount factor $\delta = .8$ and $n = 5$.

There are multiple Nash equilibria for this game and multiple subgame perfect Nash equilibria. The solution concept that generates unique predictions for the game is that of stationary subgame perfect Nash equilibria (SSPE). This is a refinement of subgame perfection for which the strategies are time independent. BF argue that non-stationary equilibria involve overly complex (history dependent) strategies, whereas the unique SSPE is supported by relatively simply strategies. Table 1 provides the point predictions for the SSPE with our parameter values for a legislative session that continues indefinitely until a final allocation of benefits is achieved. **[Table 1 approximately here]**

The closed rule always predicts a minimal winning coalition. Shares of coalition members are determined by the proposer providing payments just equal to the expected value of rejecting the proposed distribution rather than coalition partners taking their chances in later rounds of being the proposer and, if not, being excluded from the winning coalition. Under the SSPE benefits are always allocated in the first round.

Under the open rule, and our parameters values, the model also predicts a minimal winning coalition. Non-coalition members, if recognized in the seconding/amendment process will, of course, amend the proposal. Hence the 50% probability that the proposal will be accepted in round 1. However, given the discount rate and the number of legislators, it does not pay, in an expected value sense, for the proposer to try and buy off these votes. The share of benefits that coalition members receive is larger than under the closed rule since rejection of a proposal is less costly (in expected value), as should they be excluded from future coalitions voters have a chance to amend these later proposals.

Experimental Design: Experiment 1

Five subjects were recruited for each experimental session. The amendment rule remained constant within a given experimental session, but differed between sessions (four closed rule and four open rule sessions).[3] To minimize the possibility of repeated play game effects, at the start of each election each of the five "legislators" were randomly assigned a new subject number, which was known only to that legislator, and changed across elections (but not between rounds of a given election). The number of elections (fifteen) was announced at the start of each session.

Procedures were as follows: First all subjects filled out a proposal form for allocating the $25.00. After these forms were collected, a roll of a five sided die determined the standing proposal. This proposal, along with the subject number of the proposer, was posted on the blackboard so that prior to the voting, subjects saw the amount of money allocated to themselves and to every other voter.

In closed rule sessions each subject immediately voted on the proposed allocation. If a simple majority accepted the proposal the payoff was implemented and the election ended. If the proposal was rejected, the process repeated itself *after* applying the discount rate of .8 to the total benefits. (Discounting was done by the experimenters, with the total amount of money to be allocated in the next round posted on the blackboard.) Voting results were posted on the blackboard underneath each proposal. These consisted of the total number of votes for and against the proposal, but not the votes of individual electors. The blackboard contained information for each of the last several elections.

In open rule sessions, after a proposal was selected, each legislator completed a form either seconding or amending the proposal. If amending a proposal voters were required to propose an alternative distribution of the benefits provided. Although "seconding" forms were collected from everyone (to preserve the identity of the proposer) a roll of a four sided die determined which legislator, other than the proposer, would be recognized. If the proposal was seconded, an election was held following the same procedures as in the closed rule sessions. If the proposal was amended, the amendment was posted on the blackboard along with the original proposal, and a runoff election was held. The winner of the runoff election became the standing proposal in the next round of the election. Benefits following a runoff election were subject to discounting, so that following a runoff dollar amounts of the standing proposal were multiplied by .8, with the total amount to be allocated posted as well. Election in open rule sessions continued in this way until a proposal was seconded and approved by a simple majority.

Subjects were recruited through announcements in undergraduate classes and advertisements in student newspapers at the University of Pittsburgh and Carnegie-Mellon University. This resulted in recruiting a broad cross section of graduate and undergraduate students from both campuses. At the end of each experimental session four elections were randomly selected, with subjects paid the sum of their earnings in these four elections. Subjects also received a participation fee of $5.

In each session an additional subject was recruited to roll the dice to help assure subjects that the outcomes were indeed randomly determined. This subject received a fixed fee of fifteen dollars. Practice elections were held first to familiarize subjects with the procedures and accounting rules. All experimental sessions were conducted using pencil and paper. Copies of the instructions are posted on the web site http://www.econ.ohio-state.edu/kagel/fklinstructions.pdf.

Results from Experiment 1

We report results in terms of a series of conclusions. This is followed by the data supporting the conclusions reached.

Conclusion 1 *Once voters gain some experience with the procedures, all proposals are accepted without delay under the closed amendment rule, and are accepted with delays under the open amendment rule, as the theory predicts. However, delays are less frequent than predicted under the open rule.*

[**Figure 1 approximately here**] Figure 1 reports the frequency with which proposals were accepted in round 1. This occurs in 96.4% (53/55) of the closed rule elections, close to the 100% the theory predicts, the 2 rejections both occurring early in a session. The open rule, on the other hand, exhibits failures to accept in round 1 throughout, with the failure rate averaging 25.5% (14/55) over all elections and 13.3% (2/15) over the last 5 elections. These differences between open and closed rules are significant at the 1% level ($Z = 3.245$) over all elections, and are significant over the last 5 elections as well ($Z = 1.464$, $p < .10$).[4] Nevertheless, the failure rate under the open amendment rule was much lower than the predicted 50%. As will be shown, the proximate cause for this is that supermajorities were the norm in these elections.

Conclusion 2 *Play begins with supermajorities under both closed and open amendment rules. With experience, play converges towards minimal winning coalitions under the closed amendment rule, but supermajorities remain the norm under the open rule.*

[Figure 2 approximately here] Figure 2 provides Kernel density estimates of the sum of the two lowest offers in round 1 for the first and last five elections.[5] Distributions are remarkably similar in the first five elections, with a single prominent peak near the $10 level in both cases representing a near egalitarian distribution of shares across voters. However, clear differences between treatments have emerged by the last five elections. Under the closed rule there is now a prominent peak near the $0 level, as the theory predicts, and a much smaller peak around the $10 level. In contrast, under the open rule there is a single prominent peak spanning the $6-$10 range. As a result the average sum of the two lowest offers over the last five elections is $3.29 under the closed rule versus $7.06 under the open rule ($p < .05$, Mann-Whitney test).

These different outcomes in the last five elections are supported by substantially different strategies for allocating the two lowest shares. These can be classified into the following three simple categories: (1) The double zero (DZ) strategy, where the sum of two lowest offers is less than or equal to $2.00 (e.g., an offer of $9, $7.50, $7.50, $0, $1). Clearly, the $1 share in this example is similar to a $0 share, since voters receiving such shares always rejected them; see Figure 5 below. This strategy is employed in 65.3% (49/75) of the last five elections under the closed rule versus 4.0% (3/75) under the open rule. Further, a breakdown of offers within the DZ category shows that 51% (25/49) of them gave exactly two zeros to two voters, with 96% (47/49) of them giving at least one zero to one voter and $1 or less to another voter. (2) A single zero (SZ) strategy where one voter is allocated one dollar or less. This occurred almost exclusively under the open rule: 44.0% (33/75) for all open rule offers in the last five elections versus 4.0% (3/75) of closed rule offers. (Of the SZ offers under the open rule, 66.7% (22/33) provided zero to one player.) (3) An equal split (ES) strategy giving all voters at least $4 in round 1. This occurred 29.3% (22/75) of the time under the closed rule compared to 40.0% (30/75) under the open rule in the last five elections (54.6% (12/22) of these offering perfectly equal splits under the closed rule; 23.3% (7/30) under the open rule).

Conclusion 3 *Proposers' take starts out nearly the same under both amendment rules. However, proposers' take grows substantially under the closed amendment rule, averaging between $9-$10 in the last five elections. This growth under the closed rule results from the increased frequency of minimal winning coalitions. In contrast, there is an immediate decline in proposers' take under the open rule, with allocations quickly converging on the $6-$7 level, and staying there.*

[**Figure 3 approximately here**] Figure 3 shows the share that proposers allocated to themselves in round 1. Notice that both the open and closed rules start with virtually the same share for the proposer in elections 1 and 2. There is substantial and continuous growth in the average share proposers give themselves under the closed rule. But there is an immediate decline in average proposers' share under the open rule with shares stabilizing at the $6-$7 level after the second election. The null hypothesis that proposers allocate the same amount to themselves under open and closed rules is soundly rejected in the last five elections ($p < .01$, Mann-Whitney test).

The growth in the average share proposers take for themselves under the closed rule results directly from the increased frequency with which they follow the

DZ strategy, which grows more or less continuously averaging 11.1% (4/36) in the first two elections and 73.3% (22/30) in the last two elections. In contrast, the share proposers take for themselves, conditional on playing the DZ strategy remains essentially the same, around $10, from election five on (see Figure 4). This results in the steady growth in the share proposers take for themselves, reported in Figure 3. **[Figure 4 approximately here]**

Conclusion 4 *Proposer's receive a uniformly larger share of the benefits than coalition members under both closed and open amendment rules so that we can reject a null hypothesis of an equal proportionate distribution between proposers and other coalition members under both amendment rules. Nevertheless, proposer's take well below the SSPE prediction in both cases.*

Looking at accepted offers, under the closed rule the proposer takes on average $8.30 for herself, while the *next highest* average share is $6.62. Under the open rule the average take by the proposer is $6.21, while the *next highest* average share is $5.47. In both cases, using a sign test (Snedecor and Cochran, 1980), the null hypothesis that the median of the differences between the proposer's share and the share offered to anyone else is zero can be rejected at the 1% level.

Conclusion 5 *Voting patterns show a clear bifurcation, with round 1 shares below $4 always rejected under both rules, and shares at or above $5 almost always accepted. Regressions show that subjects vote primarily on the basis of their own share of the benefits, with minimal concern for the shares of the least well off, and for their share compared to the proposer's take.*

[Figure 5 approximately here] Figure 5 shows votes, by shares offered, in round 1, excluding the votes of proposers themselves. Under the closed rule shares of less than \$4.00 are always voted against (66/66). Votes change rather dramatically for offers of \$4.00-\$4.99 with 69.4% (25/36) of these offers accepted, and virtually all offers greater than or equal to \$5.00 accepted (113/118). There is a similar pattern under the open rule with all offers less than \$4.00 rejected (17/17), 91.3% (42/46) of all \$4.00-\$4.99 offers accepted, and all offers greater than or equal to \$5.00 accepted (101/101).

Table 2 reports estimates of the following voting equation:

$$vote_{it} = 1\left\{\beta_0 + \beta_1 s_{it} + \beta_2 PS_{it} + \beta_3 DZ_{it} + \alpha_i + \nu_{it} \geq 0\right\} \tag{1}$$

where $1\{\cdot\}$ is an indicator function that takes value 1 if the left hand side of the inequality inside the brackets is greater than or equal to zero and 0 otherwise. Explanatory variables include own share (s_{it}), DZ an indicator variable taking value one if the DZ strategy is on the floor, and the share the proposer takes (PS). (Since the DZ strategy did not take the floor in the open rule an indicator variable for SZ is included.) The equation is estimated using a random effects probit, with a one way subject error component for all rounds. The sign of the coefficient (presented in Table 2) for own share is positive, large in value relative to the other coefficients, and statistically significant in both treatments. The coefficients for both the DZ and SZ strategies, and for proposers share (PS), do not achieve statistical significance. The implication is that subjects are primarily voting out of concern for their own share of the benefits with limited concern for the shares of the least well off and for proposer's share.[6] **[Table 2 approximately here]**

Conclusion 6 *Seconding and amending patterns in the open rule sessions followed the voting pattern reported in Figure 5. Further, when proposing amendments, the two worst off voters typically receive increased shares.*

Any time a voter was allocated a share of less than $4 they chose to amend the round 1 proposal (35/35 cases). In contrast, in 45.0% (9/20) of the cases where a voter was allocated $4.00, they voted to second the motion, and offers greater than $4.00 and less than $5.00 were almost always seconded (94.3% of all cases; 33/35), as were offers of more than $5 (seconded 98% of the time; 100/102).[7] Further, when proposing amendments, in all but one instance, amenders offered the two worst off subjects improved shares (typically, themselves and one other subject). Subjects were not immediately successful in creating amendments that would win a runoff election: in the first five elections only 53.3% offered improved shares to at least two other voters beside themselves. However, they learned to create more successful amendments with improved shares offered to at least two other voters 84.2% of the time in the last five elections.

Discussion of Results from Experiment 1

The results of Exp. 1 provide clear qualitative support for the BF model as (1) proposals pass without delay under closed amendment rules, but there are delays under the open rule as voters left out of the coalition amend the standing proposal, (2) there is a more equal distribution of benefits among coalition members under the open compared to closed amendment rule, and (3) proposers get a significantly larger share of the benefits than coalition members (and substantially larger shares than the average "legislator") under both amendment rules.[8] Further, there is convergence towards minimal winning coalitions under the closed amendment rule, as the SSPE predicts.

There are, however, major quantitative deviations from the SSPE. These are two-fold: First, for our parameter values, under the open rule the SSPE predicts a minimal winning coalition. This did not occur. Rather, play converged on supermajority coalitions. As a result, round 1 proposals were seconded and passed with a greater frequency than predicted in open rule sessions. Second, within the closed rule sessions, there was a much more equal distribution of shares among coalition members than the theory predicts, even conditioning on DZ allocations.[9]

These quantitative deviations from the SSPE are entirely consistent with deviations from subgame perfect equilibrium outcomes observed in bilateral bargaining game experiments. The main insight from this literature is that responders in bilateral bargaining games have some minimal threshold for the share of the pie that they are willing to accept, which is typically well above the subgame perfect equilibrium prediction, and that they consistently reject offers below this threshold. For example, in the ultimatum game responders consistently reject offers below 30-40% of the pie, even thought the subgame perfect equilibrium prediction calls for accepting any allocation short of zero.[10] In anticipation of such responses proposers offer a substantial share of the pie, with median returns to responders of around 40% of the pie (see Roth, 1995 for a review of this literature).[11]

Similar results occur in our game: responders typically reject offers below $5, and proposers, anticipating this, typically fail to ask for anything approaching the SSPE. As a result, under the open amendment rule it actually pays (in an expected value sense) to play the even split (ES) and the single zero (SZ) strategies as opposed to the double zero (DZ) strategy, *conditional on what proposers were actually asking for*: The average return for proposers under the ES and SZ strategies was \$6.14 and \$6.12, respectively. This compares to an expected return from the DZ strategy of \$5.03 using the average share that DZ proposers asked for under the open rule (\$8.48), or \$6.03 using the average share that DZ proposers asked for in the last 5 elections under the closed rule (\$10.37).[12] Thus, conditional on what proposers felt comfortable asking for, there was little chance for the DZ strategy to emerge naturally under the open rule.[13]

These more equal shares between coalition members (relative to the SSPE predicted outcome) are also consistent with the deviations from subgame perfection reported in bilateral bargaining game experiments. However, minimal winning coalitions still tend to emerge under closed amendment rules as proposers learn to give zero, and have impunity from the two voters excluded from the coalition. Further, coalition members have few compulsions about voting against such proposals as long as their share of the pie is sufficiently large. This last result is information about tastes for “fairness” which obviously cannot be discovered from bilateral bargaining game experiments.[14]

One question that Exp. 1 leaves open is why proposer shares do not converge closer to the SSPE in the closed rule sessions. Looking at voting records it is clear that (i) zero shares to non-coalition members do not significantly jeopardize the chances for a proposal passing and (ii) based on votes for \$5.00 shares, the expected payoff (in round 1) for a \$15, \$5, \$5 proposal is \$13.38. The latter is reasonably close to the SSPE, and is considerably higher than the mean proposer share of \$10.37 for DZ proposals in the last five elections. Yet there are virtually no proposals of \$15, \$5, \$5 in the last five elections.[15]

Given the large adjustments in behavior under the closed rule it may well be that with more elections play would move closer to the SSPE. Further, it is clear that it is a lot easier, and less risky, for a proposer to recognize that they can give zero shares to a minority of voters under the closed rule than to fine tune shares within a minimal winning coalition. Exp. 2 explores these possibilities.

Experimental Design: Experiment 2

Two basic changes were made in the procedures for Exp. 2 in an effort to see if play would converge closer to the SSPE under the closed rule. First, the number of elections was increased from 15 to 25 to give play more time to evolve. Second, we attempted to speed up the learning/adjustment process as follows: Each experimental session employed six subjects, five student "legislators", as before, and a sixth legislator, an economics graduate student, who, it was announced, "has been instructed to make proposals and to vote according to a computer algorithm." The computer algorithm called for maximizing the proposer's share from the following two alternatives: (i) a proposal of (\$10, \$8.00, \$7.00, \$0, \$0, with the proposer's amount listed first)[16] or (ii) take the highest proposal passed to date, add \$2 to the proposer's share, give equal shares to two coalition members, and zero shares to the two non-coalition members.[17] As a voter, the graduate student approved any proposal that gave her a share at least as large as the SSPE (0.16) and voted against any smaller share. The nature of the computer's strategy, and who the graduate student was, were *not* announced.[18] With the "computer" in the mix we stood a good chance of having proposals reach the floor that came closer to the SSPE than any proposal in Exp. 1. The fate of such proposals, whether they were accepted or rejected, and if accepted, whether other voters would make similar or more extreme proposals, should provide insight into the likelihood of play ever converging, on its own, to the shares predicted within minimal winning coalitions under the SSPE.

Payments were made for six elections, selected at random at the end of the session. As before an additional subject was recruited to act as dice roller for all random decisions. Three sessions were conducted using inexperienced subjects drawn from the same subject population as Exp. 1.

Results of Experiment 2

The main results from Exp. 2 can be summarized as follows:

1. After the first five elections, 85% (51/60) of all proposals were passed in round 1 in Exp. 2 compared to 100% (35/35) in Exp. 1. These rejections were largely the result of "computer" generated proposals at (or close to) the SSPE (three such cases with DZ allocations and $4 or $4.50 allocations to coalition members), and a number of cases (four) where subjects' own proposals gave more to the proposer than had typically been observed in Exp. 1.

2. The growth in the proportion of DZ proposals closely matches the pattern

reported in Exp. 1, with no significant differences between the two experiments in any consecutive set of three elections.[19] However, the proportion of DZ strategies continued to grow after election 15, averaging 78.4% (29/37) in the last three elections compared to 71.1% (32/45) in the last three elections in Exp. 1. Although this difference is not statistically significant, there was a large increase in the percentage of strict DZ allocations (giving \$0 to two voters) from 42.2% (19/45) in the last three elections in Exp. 1 to 75.7% (28/37) in Exp. 2 ($Z = -3.05$, $p < .01$). The ES strategy declines continuously in Exp 2 and has essentially vanished by election 13. In contrast, the ES strategy never dropped below 20% in Exp. 1, and is significantly higher in elections 13-15 compared to the same elections in Exp. 2 (26.7% (12/45) vs 0% (0/37); $Z = 3.44$, $p < .01$).

3. The amount the proposer takes grows steadily in Exp. 2 with virtually the same growth pattern as in Exp. 1.[20] However, share proposed to self continues to grow in Exp. 2 so that in round 1 of the last three elections it averaged \$12.05 compared to \$9.22 in Exp. 1 ($p < .01$, Mann-Whitney test).

4. Voting patterns are quite similar to those reported in Exp. 1, with all shares less than \$4 rejected in both cases, and almost all shares of \$5 or more accepted (95.8% (113/118) in Exp. 1 versus 93.6% (117/125) in Exp. 2). Estimates from the voting equation (1) for Exp. 2 reported in the last column of Table 2 show that own share is the dominant factor influencing voting for or against a proposal (accounting for 92% of the variance explained in the data), with proposers' share having a negative, and statistically significant, impact on the probability of voting for a proposal ($p < .10$). [21] Pooling the closed rule data from Exp. 1 with the data from Exp. 2, and adding a dummy variable to the voting

equation (1) to distinguish between the two data sets, indicates that we can *not* reject a null hypothesis that voting patterns are the same at anything approaching conventional significance levels.[22] We do note, however, that in the three elections in Exp. 2 in which the computer proposed the SSPE allocation or close to it, *none* of the coalition members voted in favor of the proposed allocations.

Conclusion 7 *Exp. 2 shows somewhat closer conformity to the SSPE than Exp. 1 in that proposers take larger shares and there is increased frequency of DZ (and strict DZ) allocations, and virtual elimination of ES allocations. However, proposed allocations are still substantially more equal than the SSPE predicts, and in the three elections closest to the SSPE allocation, coalition members* ***all*** *rejected the small shares provided.*

Discussion of Results from Experiment 2

The rejections of $4.00-$4.50 shares in Exp. 2 associated with the SSPE (or near SSPE) allocations implies that play has little if any chance of converging to the SSPE on its own, as these proposals have essentially no chance of receiving a majority vote. As such it is highly unlikely that they would be proposed often enough to get voters to accept such small shares (see, for example, Roth and Erev, 1995). This still leaves the possibility of convergence close to the SSPE; e.g., a $15, $5, $5 allocation. This proposal was offered three times by the computer and passed in all cases. Further, based on votes for $5 shares observed in Exp. 2, this proposal has an expected return to the proposer (in round 1) of $14.63, with around a 98% chance of passing. But here too we observed no spontaneous proposals of this sort so that it remains an open question if even more experience would result in such proposals emerging.

What is left unexplained from Exp. 2 is the relative role of more elections versus the "computer" proposals in pushing play closer to the SSPE. Over the first fifteen elections there are minimal differences in the frequency of DZ play and in shares proposers take for themselves between the two experiments, so the existence of the computer proposals appears to have had no effect on these dimensions. Where the computer proposals may have had an effect is in the near complete elimination of ES (equal split) proposals by election 13 in Exp. 2, compared to a sizable remanent (26.7%) in Exp. 1.[23] What, if any role, the near complete elimination of ES proposals played in the adjustments over the last ten elections in Exp. 2 is unknown. But it may have sped up these adjustments.

Conclusions

The question underlying our experiment is whether the amendment process - open versus closed amendment rules - can of and by itself have the impact on legislative outcomes that the literature suggests? That is, does a closed amendment rule favor minimum winning coalitions with proposers obtaining greater benefits than an open amendment rule? Do open amendment rules facilitate a more widespread and egalitarian distribution of benefits, and lead to greater delays in the legislative bargaining process?

Results from Experiment 1 show that the amendment rules have the impact the literature suggests as proposals under a closed amendment rule are more likely to pass immediately than under an open rule, and the share of benefits the proposer takes is substantially greater under the closed rule. Further, under both amendment rules proposers obtain a larger share of the benefits than do others' allocated benefits, resulting in decisive rejection of a model where benefits are proportional to relative vote shares within the winning coalition (Gamson 1961).[24] Proposer power is a central implication of distributive models of the legislative bargaining process, such as the Baron-Ferejohn model, that underlies our experimental design.

There are, however, important quantitative differences between our results and the Baron-Ferejohn model underlying the experiment. For our parameter values the theory predicts minimal winning coalitions under open amendment rules. Instead we observe super majorities which, at least as a proximate cause, can be attributed to proposers' reluctance to ask for a large enough share that it pays to brave the 50% probability that their proposals will be amended. Instead proposers achieve higher expected returns from the more egalitarian distributions offered. In closed rule elections we observe a more egalitarian distribution of benefits among coalition members than the SSPE predicts. However, under the closed rule proposers have impunity from voting behavior of noncoalition members, and the additional resources that such impunity provides can be used to both increase proposer's share and to provide greater shares for coalition members. The latter increases the chances of the proposal being accepted. As a result proposers receive a much larger share in the closed rule elections, as the Baron-Ferejohn model predicts, with the institutional forces postulated as responsible for these differences playing a major role. Only the details of how these institutional forces play themselves out differ from the theory's characterization under the SSPE refinement.

Experiment 2 was designed to better understand the reasons why the distribution of benefits within winning coalitions was consistently more egalitarian than predicted under the closed amendment rule. To do this we increased the number of elections and introduced a "computer" player designed to eventually propose the SSPE. There is continued learning/adjustments in proposals in the extra elections, with behavior at the end of the experiment closer to the SSPE (i.e., increased frequency of minimal winning coalitions and larger benefits to proposers) than in Experiment 1. However, the results also indicate that there are fundamental barriers to achieving the SSPE as coalition members consistently reject the small share of benefits the theory predicts.

There are obvious connections between our results and the large experimental literature on shrinking-pie bilateral bargaining games (including the ultimatum game; Roth, 1995 surveys the experimental literature). In the latter, play consistently deviates from the subgame perfect equilibrium in favor of a more equal distribution of benefits between bargainers. This in turn has led to the development of a literature designed to explain these deviations in terms of arguments other than own income in agents' utility function, something commonly referred to as "fairness" considerations (see, for example, Fehr and Schmidt 1999; Bolton and Ockenfels 2000; Charness and Rabin 2000, to cite a few of the more prominent attempts to systematically organize the experimental data).[25]

Fairness considerations appear to play an important role in our game as well, with subjects primarily concerned about receiving their "fair" share of any given allocation. One prominent focal point for the minimum acceptable share in our game would be $1/n$, or \$5 in round 1 (Bolton and Ockenfels, 2000). In contrast, calculating the continuation value of the game as required under the SSPE is no doubt beyond the abilities of most of our subjects. Indeed, subjects appear to rely on this minimal "fair" allocation, as shares much below \$5 are routinely rejected in round 1, while shares at or above \$5 are usually accepted under both closed and open amendment rules. As such, under the closed rule subjects frequently reject offers at or slightly above the continuation value (\$4), while in the open rule subjects always accept \$5 offers even though these are *below* the continuation value (\$6).[26] Thus, a fundamental barrier to achieving the SSPE under the closed rule is that the rule of thumb voters rely on for their minimal "fair" share is greater than the SSPE for coalition partners. By the same token, one explanation for why play comes as close as it does to the SSPE in Experiment 2 is that the rule of thumb underlying votes is reasonably close to the continuation value of the SSPE. As a result, we would predict that factors that reduce the continuation value of the game relative to the $1/n$ focal point (for example, increasing the discount rate), or that complicate the game so that a simple focal point no longer exists (such as unequal recognition probabilities or unequal voting shares), will result in greater deviations from the SSPE.

One prominent feature of our results related to the fairness literature in economics is the frequency of the double zero (DZ) allocations in the closed amendment rule elections and the acceptance of these allocations. Clearly there is a strategic component to these DZ allocations as, provided coalition members get *their* "fair" share, they can be implemented with impunity, while simultaneously increasing the proposer's share. With these DZ allocations, both proposers and coalition members largely ignore the shares of the two worst off voters, contrary to the conclusions others have reached (see, for example, Charness and Rabin 2000).

Although experiments provide the investigator with the opportunity to conduct direct qualitative and quantitative tests of theories where, unlike with field data, the institutional assumptions of the model are satisfied by construction, they too suffer from well known limitations. Central among these is the use of undergraduate students in the role of decision makers, subjects who are unlikely to be as sophisticated as experienced politicians, the target population for applications of the theory. In addition, the amount of money at stake in laboratory experiments is trivial compared to the money at stake in real legislative bargaining situations, so that choices may not be taken as seriously, and subjects act absent the advice of expert staff consultants that real politicians have at their disposal. These issues threaten the external validity, or generalizability, of experimental results. Further, while the best experiments faithfully implement the theory, real political situations are typically much more complicated, with multiple, oftentimes competing, forces at work that are typically abstracted away from in modeling choices. To the extent that the model in question fails to capture certain essential institutional elements of the target situation, the experimental implementation of the model is incapable of uncovering or accounting for these missing institutional forces.

Although there is no guaranteed solution to the first of these limitations (the problem of external validity), to the extent that a given model works well in the laboratory or fails there, it shifts the burden of proof for those who would dispute the results to show that distinctly different forces are likely to be at work outside the laboratory. Further, once one has made such a case, it often points the way to further experiments designed to follow up on the hypothesized explanation. With respect to the second limitation, failure to account for institutional forces at work in the target institutional setting, the solution is to model the factors in question and to bring the revised model into the laboratory to conduct further tests.

In terms of external validity we do note one striking parallel between our results and apparent deviations from the Baron-Ferejohn model identified in field data. The general consensus from studies of coalition governments using cross country data is that the distribution of ministerial positions between coalition partners is more evenly distributed, relative to the number of votes each coalition member contributes, than the Baron-Ferejohn model implies, as in the latter the prime minister's party (the proposer) should have a disproportionate share of cabinet positions (Warwick and Druckman 2001). While there are many alternative explanations for this deviation from the predicted outcome in field data (e.g., repeated play game elements and the fact that the formateur is likely to be constrained with respect to the ideological positions of coalition partners), the tendency for ex post allocations to be more evenly distributed than predicted is consistent with the results of the present experiment and a host of bilateral bargaining game experiments as well.

Further probes of the external validity of the results reported here could involve employing different subject populations, particularly those with more experience and expertise with budget allocation problems of the sort studied here. For example, one might anticipate that with political science undergraduates, or at least graduate students, that minimal winning coalitions would develop more rapidly under closed amendment rule procedures, as this option may be more transparent to them as a consequence of their studies. However, it is not clear that allocations within winning coalitions, or the size of winning coalitions under the open rule, would differ substantially as there is abundant evidence from bilateral bargaining games in modern industrialized societies that subjects are reluctant to accept any share much below the $1/n$ threshold (see Roth et al. 1991). Similarly, it would be interesting to see how professional politicians would behave in an experiment of this sort. Here it is not at all clear what would be observed. On the one hand professionals should be well attuned to the strategic possibilities inherent in the different amendment rules. On the other hand, professionals too are likely to be subject, at least to some extent, to the same behavioral forces that underlie bilateral bargaining games and the multilateral bargaining game reported on here. Answers to these and other questions form the agenda for future research.

Notes

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[1]Rules for considering legislation in the House of Representatives have changed from primarily simple open rules in the mid-1970s to frequently restrictive and complex rules by the mid-1980s; 15% of the bills in the 95th Congress (1977-78)

were subject to restrictive rules, with this proportion increasing steadily over the years so that by 1991-92 66% of the bills were subject to some sort of restrictive amendment rules (Sinclair 1995).

[2]BF note that ending the amendment process once a motion has been seconded differs somewhat from typical congressional usage, but employ this representation as a simplifying device.

[3]The first session in each treatment had 10 elections. It being immediately obvious that play was still evolving by election 10 we extended all subsequent sessions to 15 elections.

[4]These tests use election as the unit of observation. The remaining tests reported use average amount offered by subject as the unit of observation. One-tailed tests are reported when the theory predicts a difference between treatments, two-tailed tests when there are no predicted differences.

[5]All computations and estimations are performed using Stata 7. Kernel density estimates are obtained using the kdensity command and random-effects probits are estimated using the xtprobit command.

[6]Limiting the analysis to round 1 votes, PS is negative and statistically significant at the 10% level in the closed rule. (In round 1 of the open rule there exists a perfect fit with all shares greater than .16 accepted, so that the normality assumption underlying the probit regression is not satisfied.) The results are robust to alternative specifications such as replacing DZ (or SZ) and PS with a summary measure of inequality such as the effective number of parties (enpv); i.e., whenever PS or DZ is statistically significant enpv is, and if neither are significant neither is enpv. The disaggregated measures of inequality help to pinpoint the

precise inequality factors at work.

[7]Voting patterns closely follow amendment patterns with all those who seconded a proposal voting in favor of it, and 95.1% of amenders voting against a proposal if it was seconded.

[8]Diermeier and Morton (2000) examine allocations under a closed amendment rule in a finitely lived legislature, with members having unequal recognition probabilities and unequal vote shares. They report finding no evidence of proposer power, including one treatment with very equal vote shares (34/99; 33/99, 32/99). We have substantially more observations than they do to identify proposer power, and the experimental designs are very different. This makes reconciling their results with ours problematic without further experimentation.

[9]McKelvey (1991) also finds a more equal distribution of benefits between coalition partners than the BF model predicts under closed amendment rule procedures. In his experiment there are three voters choosing between three or four predetermined allocations, resulting in a mixed strategy equilibrium.

[10]In the ultimatum game a proposer has a fixed sum of money to allocate between herself and the responder. If the proposed allocation is accepted, it is binding. If it is rejected, both players receive nothing. The unique subgame-perfect equilibrium prediction for this game (under the assumption that bargainers only seek to maximize own income) is that the proposers will receive all the money (or almost all of it if payoffs are discrete). These experiments typically employ stakes similar to those used here. However, the results extend to much higher stakes experiments as well (see, for example, Slonim and Roth 1999).

[11]Dictator game experiments, in which player 2 has no opportunity to reject 1's

offer, result in a wholesale reduction in offers to player 2 (Forsythe et al. 1994), ruling out altruism to explain these results.

[12]These counterfactual computations assume that (i) an amendment, once it is proposed, always beats the proposal on the floor, (ii) any proposal, once it is seconded, will be passed, (iii) a DZ amendment always completely excludes the previous proposer (which is what amenders did), and (iv) only a DZ amendment can beat a DZ proposal. This last assumption is the most restrictive, but it helps make the computations manageable, and is based on the assumption that the amender must provide at least one member of the original coalition a superior payoff to win their vote.

[13]For the the open rule it is also probably much more salient that there is a 50% chance of one's proposal failing under the DZ strategy, and getting zero, compared to a 25% chance under the SZ strategy and 0% chance under the ES strategy.

[14]This lack of concern for players receiving minimal or zero shares, provided own share is large enough, has been reported for three person ultimatum games (Güth and VanDamme 1998).

[15]These proposals are reasonably secure as well,with an 87% probability of passing. In contrast, the expected (round 1) payoff to a proposer under the SSPE is \$7.76, as \$4 shares are much more likely to be rejected.

[16]Alternative (i) was chosen from the more extreme, but common set of values observed in Exp. 1, in order not to give the "computer's" strategy away and to avoid possible demand induced effects. Post experiment questioning of subjects indicated that they were unable to successfully identify the computer's proposals. The introduction of the "computer's" strategy formally eliminates the SSPE.

However, given that behavior is subject to a strong trial and error adjustment process, we have introduced changes that should push behavior closer to the SSPE, which is what Exp. 2 is designed to achieve.

[17]If the computer's proposal was rejected once, it was repeated. If it was rejected twice the proposer added \$1 (instead of \$2) to the highest proposal passed to date.

[18]The graduate student was paid a flat fee for helping, was a classmate of the experimenters who would not stand out from other participants, and was willing and able to help out. No one inquired regarding who was following the computer algorithm, what they were paid, or what the algorithm was.

[19]Mann-Whitney tests where the unit of observation is subject value data for three consecutive elections (i.e., elections 1-3, 4-6).

[20]Outside of elections 4-6, when proposers ask for a higher share in Exp. 2, there are no significant differences between the two in any consecutive set of three elections.

[21]In contrast, looking at round 1 votes, DZ is negative and statistically significant ($p < .10$) and PS is negative but becomes statistically insignificant. These two variables are highly colinear. These results are computed excluding one outlier subject. Including that subject affects the result by leaving only own share and the constant as statistically significant regressors.

[22]This holds for round 1 data and is robust to all the specifications employed.

[23]One question raised by Exp. 2 is that perhaps subjects' awareness of the computer's presence fundamentally altered their behavior. Although we have no direct evidence on this point, Winter and Zamir (1999) report results from an ultimatum game experiment in which a significant proportion of the subject

population was played by computers making relatively unequal offers as well as accepting such offers. They report minimal differences between treatments where subjects were told of the computers and their strategy versus when they were not told. The minimal differences in proposer behavior over the first 15 elections in Exp. 1 and 2, and the similarities in voting patterns between the two experiments, suggests no systematic effect on behavior here as well.

[24]This simple proportionality rule - Gamson's Law - has some empirical support in field data (Gamson 1961; Browne and Franklin 1973; Browne and Fendreis 1980; Schofield and Laver 1985; Laver and Schofield 1990). Proportionality in field data is readily explained by a different underlying game structure than Baron-Ferejohn or perhaps, by repeated play elements.

[25]There is also a learning literature designed to explain these outcomes (see, for example, Roth and Erev 1995).

[26]The latter cannot be explained by the large number of equal share proposals offered since, if anything, this should result in a higher continuation value. Similarly, risk aversion cannot explain these differences as under the open amendment rule voters act as if they are risk averse, accepting smaller shares than the continuation value, and in the closed amendment rule they act as if the are risk loving, often rejecting shares at the continuation value.

References

Alesina, Alberto & Roberto Perotti. 1996. "Fiscal Discipline and the Budget Process." *The American Economic Review* 86(2):401–407.

Baron, David P. 1991. "Majoritarian Incentives, Pork Barrel Programs, and Procedural Control." *American Journal of Political Science* 35(1):57–90.

Baron, David P. & John A. Ferejohn. 1989. "Bargaining in Legislatures." *American Political Science Review* 83(4):1181–1206.

Bolton, Gary E. & Axel Ockenfels. 2000. "ERC: A Theory of Equity, Reciprocity, and Competition." *The American Economic Review* 90(1):166–193.

Browne, Eric C. & John P. Frendreis. 1980. "Allocating Coalition Payoffs by Conventional Norm: Assessment of the Evidence for Cabinet Coalition Situations." *American Political Science Review* 24(4):753–768.

Browne, Eric C. & Mark Franklin. 1973. "Aspects of Coalition Payoffs in European Parliamentary Democracies." *The American Political Science Review* 67(2):453–469.

Charness, Gary & Matthew Rabin. 2002. "Understanding Social Preferences with Simple Tests." *The Quarterly Journal of Economics* 17(3):817–869.

Diermeier, Daniel & Rebecca Morton. 2000. "Proportionality versus Perfectness: Experiments in Majoritarian Bargaining." mimeo.

Fehr, Ernst & Klaus M. Schmidt. 1999. "A Theory of Fairness, Competition and Cooperation." *Quarterly Journal of Economics* 114(3):817–868.

Forsythe, Robert, Joel L. Horowitz, N. E. Savin & Martin Sefton. 1994. "Fairness in Simple Bargaining Experiments." *Games and Economic Behavior* 6(3):349–369.

Gamson, William A. 1961. "A Theory of Coalition Formation." *American Sociological Review* 26(3):373–382.

Guth, Werner & Eric van Damme. 1998. "Information, Strategic Behavior and Fairness in Ultimatum Bargaining, An Experimental Study." *Journal of Mathematical Psychology* 42(2/3):227–247.

Laver, Michael & Norman J. Schofield. 1990. *Multiparty Government: The Politics of Coalition in Europe.* Oxford: Oxford University Press.

McKelvey, Richard D. 1991. *Contemporary Laboratory Research in Political Economy.* Ann Arbor: University of Michigan Press chapter An Experimental Test of a Stochastic Game Model of Committee Bargaining.

Roth, Alvin E. 1995. *Handbook of Experimental Economics.* Princeton: Princeton University Press chapter Bargaining Experiments, pp. 253–348.

Roth, Alvin E. & Ido Erev. 1995. "Learning in Extensive-Form Games: Experimental Data and Simple Dynamic Models in the Intermediate Term." *Games and Economic Behavior* 8(1):164–212.

Roth, Alvin E., Vesna Prasnikar, Masahiro Okuno-Fujiwara & Shmuel Zamir. 1991. "Bargaining and Market Behavior in Jerusalem, Ljubljana, Pittburgh, and Tokyo: An Experimental Study." *American Economic Review* 81(5):1068–1095.

Schofield, Norman J. & Michael Laver. 1985. "Bargaining Theory and Portfolio Payoffs in European Coalition Governments." *British Journal of Political Science* 15(2):143–164.

Sinclair, Barbara. 1995. *Positive Theories of Congressional Institutions.* Ann Arbor: University of Michigan Press chapter House Special Rules and the Institutional Design Controversy, pp. 235–252.

Slonim, Robert L. & Alvin E. Roth. 1999. "Learning in High Stakes Ultimatum Games: An Experiment in the Slovak Republic." *Econometrica* 66(3):569–596.

Snedecor, George W. & William G. Cochran. 1980. *Statistical Methods.* Ames, Iowa: Iowa State University Press.

Warwick, Paul V. & James N. Druckman. 2001. "Portfolio Salience and the Proportionality of Payoffs in Coalition Government." *British Journal of Political Science* 31(4):627–649.

Winter, Eyal & Shmuel Zamir. 1997. "Experimenting Ultimatum Bargaining in a Changing Environment." The Hebrew University, Center for Rationality and Interactive Decision Theory, DP 159.

Predictions	Closed Rule	Open Rule
Number of voters receiving a positive payoff besides the proposer	2	2
Number of voters receiving zero payoff	2	2
Share to the proposer ($ amount - round 1)	0.68 ($17)	0.52 ($13)
Share to coalition members ($ amount - round 1)	0.16 ($4)	0.24 ($6)
Probability of proposal being approved in the 1st round	1	0.5

Table 1: Theoretical Predictions for Stationary Subgame Equilibrium Outcome with 5 Subjects and a Discount Factor of 0.8

Independent Variable	Experiment 1 Closed	Open	Experiment 2 Computer (Closed)
share	91.398**	23.488***	21.442***
	(37.525)	(5.789)	(3.013)
PS	-19.618	-5.693	-3.126*
(Prposer's Share)	(13.659)	(5.078)	(1.623)
DZ	2.228		-0.287
(DZ strategy on floor)	(5.688)		(0.432)
SZ		-0.688	
(SZ strategy on floor)		(0.679)	
Constant	-7.948**	-0.640	-1.998**
	(3.235)	(1.447)	(0.837)
Observations	228	220	284
Number of subjects	20	20	14

***,**,* indicate statistical significance at the 1%, 5%, and 10% level respectively

Table 2: Random Effect Probit Estimates of the Voting Equation Standard errors in Parentheses.

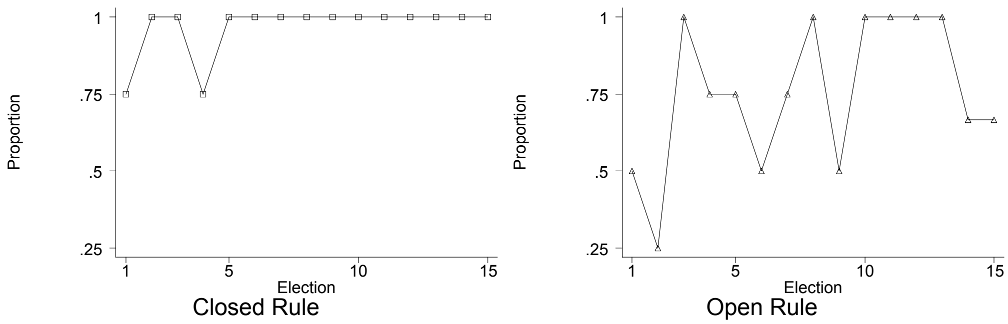

Figure 1: Proportion of Proposals Accepted in Round 1 (4 proposals per election up to election 10 and 3 from then on)

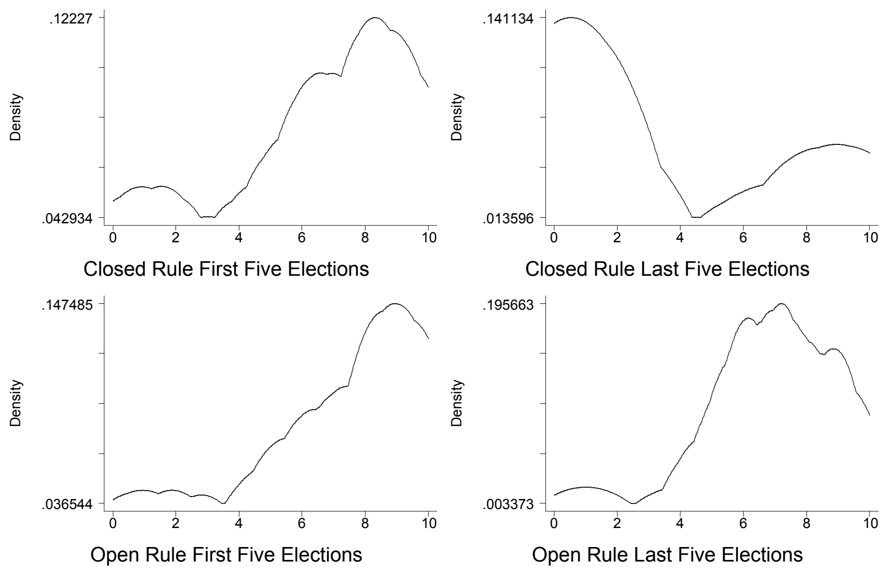

Figure 2: Kernel Density Estimates of Sum of Two Lowest Amounts Offered in Round 1 (100 observations for the first 5 elections and 80 for the last 5)

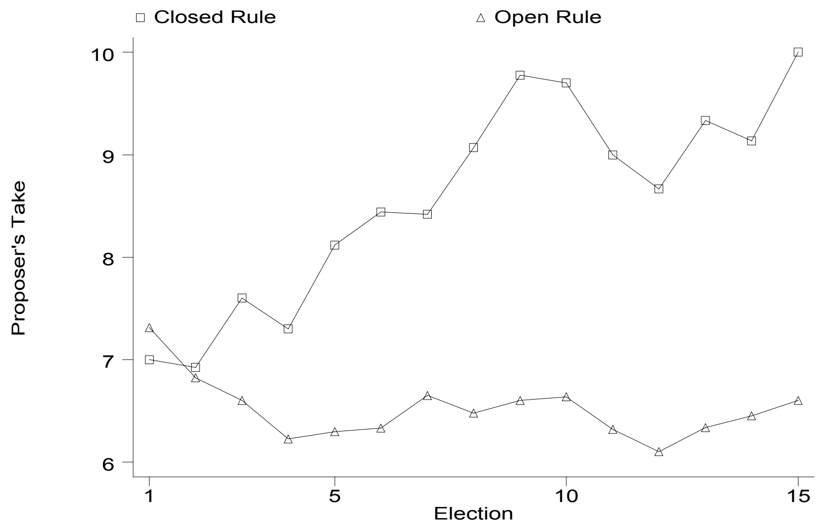

Figure 3: Amount the Proposer Takes for Herself in Round 1 (20 observations per election up to election 10 and 15 from then on)

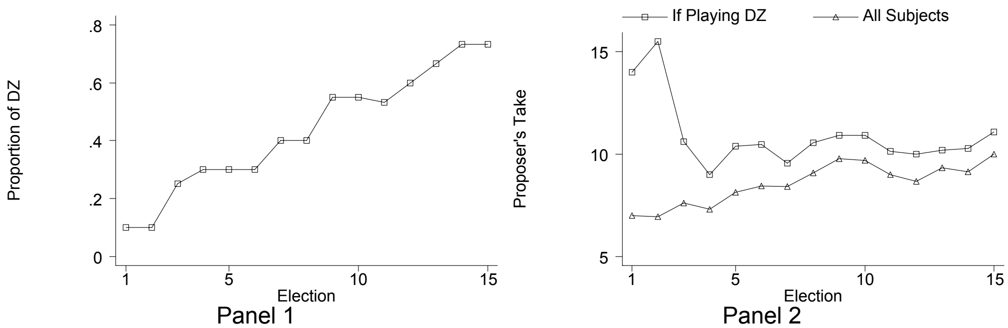

Figure 4: Closed Rule, Proportion of Subjects Playing the DZ Strategy (Panel 1) and Share They Take for Themselves (Panel 2) (20 observations per election up to election 10 and 15 from then on)

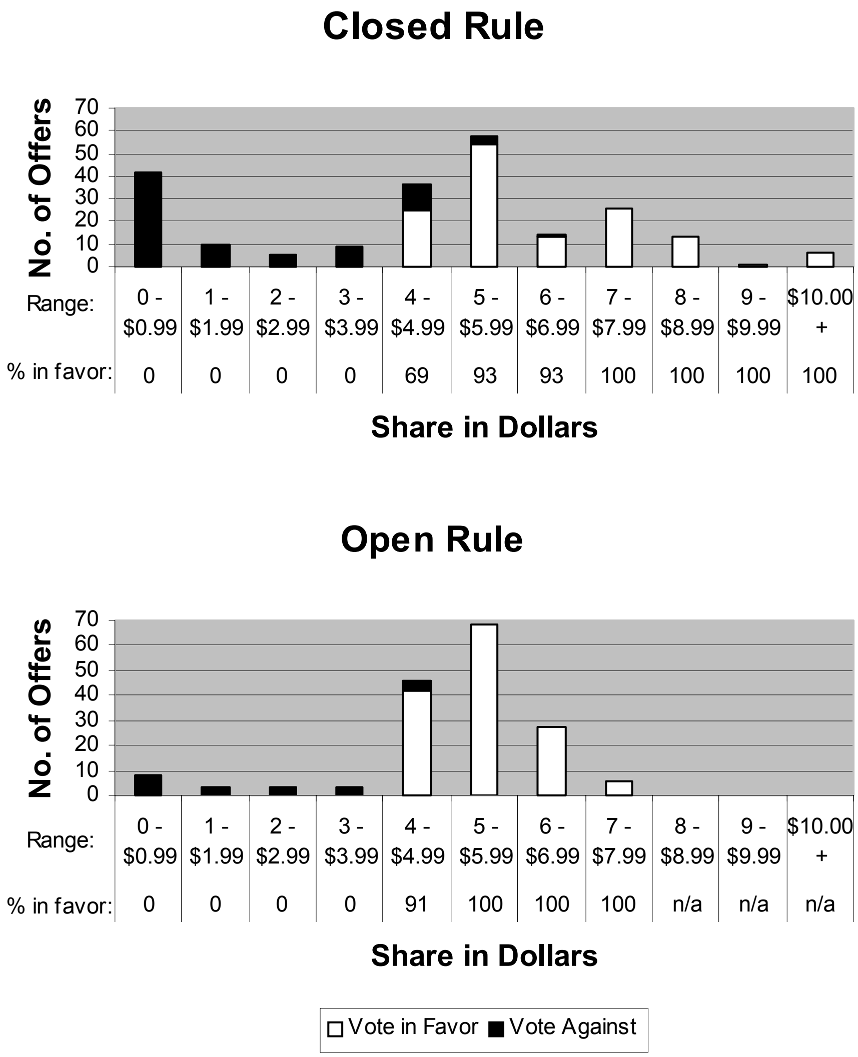

Figure 5: Accepted and Rejected Offers in Round 1