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Decision costs in legislative bargaining: An experimental analysis

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Decision costs in legislative bargaining: an experimental analysis

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Abstract

We conduct an experiment to assess the effects of different decision rules on the costs of decision making in a multilateral bargaining situation. Specifically, we compare the amount of costly delay observed in an experimental bargaining game under majority and unanimity rule. Our main finding is that individual subjects are more likely to reject offers under unanimity rule. This increased rejection rate, as well as the requirement that all subjects agree, leads to more costly delay. This result provides empirical support for a classic argument in favor of less-than-unanimity decision rules put forth by Buchanan and Tullock (1962).

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1 Introduction

What proportion of a decision making body should be required to agree in order to arrive at a collective decision? In their classic work, *The Calculus of Consent*, Buchanan and Tullock (1962) argued that an important factor to consider in this context concerns the expected costs of reaching agreement under different rules. While requiring unanimous consent protects individual members from adverse decisions, this rule may be associated with larger costs of reaching agreement than others, such as simple majority rule. According to Buchanan and Tullock, rational individuals may prefer to use less-than-unanimity decision rules in order to reduce these expected "decision costs". Their argument is reviewed in more detail in next.

The goal of the present paper is to compare the costs of reaching agreement under majority and unanimity rule in the context of an experimental bargaining game. Subjects in our experiment were asked to agree on a division of a monetary amount among three players. The rules of the game (explained in detail in section 3) specify that bargaining proceeds over several rounds. Failure to agree in a given round causes the available "pie" to shrink by a certain amount. Thus, delay in bargaining is costly.

We investigate the extent of such costly delays under majority and unanimity rule. Our main finding is that individual subjects are more likely to reject offers under unanimity rule. This increased rejection rate, as well as the requirement that all subjects agree, leads to more costly delay. Thus, unanimity rule is associated with higher costs of reaching agreement. On the other hand, unanimity rule tends to produce more equal distributions, and all players receive a positive share of the available surplus. These results provide empirical support for the existence of the tradeoff assumed in Buchanan and Tullock's seminal analysis.

The remainder of the paper is organized as follows. Section 2 presents Buchanan and Tullock's argument in more detail. Section 3 describes our experimental design and relates it to previous experimental literature. We present a model of our experimental game and describes our hypotheses. Results are presented in Section 4, and Section 5 concludes.

2 Decision rules and decision costs

Buchanan and Tullock (1962) consider a rational, self interested individual who chooses a decision rule to be used by a decision making body such as a committee. The rule will be used to decide on collective activities within some previously defined realm of collective action.[1] The choice of decision rule is made in a constitutional stage during which the individual finds himself behind a veil of uncertainty. This means that he does not know precisely what his position on future issues will be, and believes himself equally likely to occupy any position within the relevant society. It is assumed that the individual seeks to choose the rule that maximizes his expected utility from this constitutional perspective.

Buchanan and Tullock argue that the individual should consider two categories of "costs" to be expected under each decision rule. The first category includes costs resulting from collective decisions that change the status quo in a manner that runs counter to his own interests. The authors refer to these as "external costs." If the decision rule specifies that *any single* member of the society can unilaterally make a decision, the expected harm that such decisions will impose on the individual is maximized. On the other hand, if unanimous agreement is required for all decisions, no harm can be imposed on him. Thus, the expected external costs of future decisions are decreasing in the size of the majority required for agreement, reaching zero when unanimous agreement is required (See figure 1, reproduced from Buchanan and Tullock (1962: 70)).

[1] It is important to emphasize that the analysis assumes the existence of additional constraints on collective actions that may be decided upon. Buchanan and Tullock emphasize that the preferred decision rule is likely to depend on these constraints, i.e. it will differ depending on the kind of decision making body and the range of activities it has the power to undertake.

FIGURE 1 ABOUT HERE

Absent further considerations, this argument would imply that the use of unanimity rule maximizes the individual's expected utility from future decisions. The reason is that (a) this rule guarantees that *only* Pareto improving collective actions will be undertaken, and in fact (b) *all* Pareto improving actions can, in principle, be unanimously agreed upon. It follows that no opportunities for mutually beneficial agreements would be left unused.[2]

This conclusion would rest, however, on the assumption that unanimous agreement, if possible in principle, will in fact be achieved *at no cost*. This would seem to require that any collective action that in principle could achieve unanimous support is in some way automatically proposed and voted on without requiring any active investment of time or other resources by any of the participants. Buchanan and Tullock emphasize that this line of reasoning neglects the importance of the *process* necessary to prepare and agree on mutually beneficial proposals.

The process of proposing and voting on proposals is bound to involve costs not only for logistical reasons. Another consideration emphasized by Buchanan and Tullock is that each opportunity to engage in an efficient project implies the existence of a surplus that can be distributed in any number of ways. Thus, each such opportunity raises a kind of "pie-splitting" problem, and each member will seek to secure as large a share of the available surplus as possible. According to Buchanan and

[2]Guttman (1998) objects to Buchanan and Tullock's argument on the grounds that unanimity rule may prevent "efficient" projects (collective actions) from being undertaken. Specifically, a proposal to conduct a project which promises large benefits to a majority at a small cost to a minority would fail, even if the project increases "aggregate surplus." Guttman argues correctly that a rational (and risk neutral) individual who believes himself equally likely to occupy any position in society would prefer, on expected utility grounds, that all such "efficient" projects be undertaken. What Guttman's argument neglects, however, is the fact that the "efficiency" of such projects immediately implies that there must exist some proposal to undertake it (e.g. one which includes a compensation to the minority) which could, at least in principle, achieve unanimous support.

Tullock, this leads the members of a decision making body to invest resources (e.g. time) in otherwise unproductive bargaining activities. They hypothesize that these wasteful investments in bargaining will tend to grow as the decision rule becomes more inclusive (1962: 68-69).

This hypothesized relationship is illustrated in figure 2. When any single member of the society can make a decision, no bargaining is required, and the costs of decision making are minimized. In the extreme case of unanimity, each individual member has the power to veto any decision. This introduces a kind of hold-up problem: each member may withhold agreement in order to force others to make concessions. This maximizes each individual's incentive to invest in bargaining and therefore decision costs are maximized.

FIGURE 2 ABOUT HERE

To the extent that more inclusive decision rules increase the likelihood that individuals will withhold agreement, they will be associated with greater "decision costs" due to delays, haggling, etc. A rational individual will perceive a trade off between the reduction in "external costs" associated with more inclusive decision rules and the resulting increase in "decisions costs". For this reason, she may prefer to use less-than-unanimity rules.

In our view, Buchanan and Tullock's argument is based on important *empirical* hypotheses concerning the behavior of individuals in different institutional contexts. Specifically, they hypothesize that unanimity rule motivates individual members to withhold agreement and invest in wasteful bargaining activities.

Absent further evidence, it is a priori not obvious that this should be the case. Granted, if individual group members were equally likely to consent to a given proposal under both rules, unanimous consent would less often occur than majority consent. One might therefore argue that unanumity rule logically implies larger decision costs. However, this argument neglects the fact that both the proposals being made and the likelihood with which an individual gives her consent may depend on the decision rule being used. In particular, it is at least conceivable that an individual would be more likely to consent to a given proposal under unanimity than under majority rule, perhaps to avoid decisively causing the proposal to fail. If so, the probability that a proposal passes may be the same as (or larger than) it is under majority rule.

In contrast, Buchanan and Tullock hypothesize that individual group members will in fact be *less likely* to give their consent to a given proposal under unanimity rule. Their argument is that, by giving each member a veto, unanimity rule maximizes incentives to "act tough" and bargain for a larger share of the surplus created by an efficient action. If true, this "increased toughness" effect of unanimity rule would imply additional decision costs over and beyond those which are implied by the statistical calculation outlined above. The goal of the present paper is to experimentally investigate this claim in a controlled laboratory setting.

3 Experimental Design

Following an established experimental literature on multilateral bargaining, we base our experimental design on the classic legislative bargaining game introduced by Baron and Ferejohn (Baron and Ferejohn 1989). The Baron-Ferejohn (henceforth BF) game is an extension of the Rubinstein bargaining model to the case of more than two players.

3.1 The Baron Ferejohn Game

At the beginning of the game, a certain surplus is available to be divided among the players. The game consists of a potentially infinite number of bargaining rounds. In each round, one player is randomly chosen to propose a division of the currently available pie. If a simple majority accepts the proposal, the game ends and each player receives his allocated amount. If not, the pie shrinks by a certain factor and a new round begins. Thus, the costs of bargaining consist of the lost surplus if agreement is not reached in a given round.

The main theoretical predictions of interest in our context are the following (see Section 4 for details). First, proposers form minimum winning coalitions, allocating positive payoffs only to the number of subjects required for agreement. Second, the distribution of proposals within a winning coalition is unequal, favoring the proposer. Third, the first proposal is immediately accepted. Baron and Ferejohn (1989) also derive hypotheses concerning the different behavior under closed vs. open amendment rules. These hypotheses are not directly related to our paper and will therefore not be discussed here.

The main hypothesis we wish to test in this paper concerns the differences in behavior under majority vs. unanimity rule. In particular, we want to test Buchanan and Tullock's argument that unanimity rule protects individuals from external costs imposed on them by others while leading to increased decision costs in the form of delays.

Note that in the BF game, no external costs can actually be imposed on an individual participant even under simple majority rule. That is, only non-negative amounts can be allocated. Still, if we consider the share an individual can expect to receive under unanimity as a benchmark, majority rule implies the risk of incurring an opportunity cost if one is excluded from a winning coalition. Thus, unanimity rule ensures that no individual can be forced to accept less than a given (e.g. equal) share, but it introduces the danger of costly delay.

3.2 Previous Literature

Previous experimental studies have tested these and other predictions of the Baron-Ferejohn game. The first experimental paper on the subject was McKelvey (1991). In this experiment, groups of three bargained over a distribution of odds for a chance to win a monetary prize. Failure to agree led to a loss of 5% of the stake.[3] He finds

[3]This method of payment is used to induce risk neutrality.

that coalition partners received larger shares than predicted by theory, and proposals passed more often than predicted. (That is, proposals off the predicted equilibrium path which would be rejected according to the predicted equilibrium strategies were in fact accepted.) Fréchette et al (2003) use groups of five with a discount factor of 0.8 (i.e. 20% of the pie is lost when a proposal fails), repeating the game 15 times. Consistent with theory, they find that proposers form minimum winning coalitions and proposals pass immediately. However, distributions within the winning coalition are more equal than predicted. Fréchette et al (2005a) use groups of three and compare discount factors 0.5 and 1, repeating 10 times. (Note that $\delta = 1$ implies that bargaining costs consist only of the time that subjects spend in the laboratory until agreement is reached.) They find that first round proposals are more likely to fail when the pie does not shrink. Fréchette et al (2005b) use groups of 5 and no discounting. Fréchette (2009) proposes a learning model to account for the data in Fréchette et al (2003). Diermeier and Morton (2005) use groups of three and play a finite horizon version (5 rounds) with no discounting, repeated 18 times. They find that proposers allocate more money to other players than predicted, and a significant percentage of first round proposals above the theoretical continuation value are rejected. Diermeier and Gailmard (2006) introduce different reservation values into the game.

The paper most closely related to our own is Kagel at al. (2010). These authors use groups of three, with discount factors 0.95 and 0.5. The focus of their analysis is the effect of introducing a "veto player" into the interaction. As the term suggests, this player (who may be a proposer or a responder) has the right to block any decision that is passed by a majority. This modification is closely related to our use of unanimity rule, as unanimity rule effectively means that every member of the group is a veto player. A key difference between this approach and ours is that veto power is asymmetric in Kagel et al's context. Accordingly, their focus is on the extent to which veto players can successfully convert this asymmetry in power into a more favorable bargaining outcome. One of their main results is that veto players indeed receive larger shares, both as proposers and as non-proposers. Another result of interest in our context is that introducing a veto player results in greater delay and therefore less efficient outcomes.

We build on this existing literature by introducing unanimity rule in the Baron-Ferejohn framework. Thus, we contribute to the previous experimental literature by comparing behavior under majority and unanimity rule. In addition, our main goal is to test the Buchanan-Tullock hypothesis stating that unanimity rule leads to more investment in costly bargaining. Specifically, we focus on differences in the frequency of rejections under the two rules. Section 3 describes our experimental game in detail and formulates the hypotheses to be tested.

3.3 Model and Benchmark Hypotheses

Our experimental design is based on the Baron-Ferejohn bargaining model introduced above. Specifically, we implement the following bargaining game involving three players, henceforth labeled A, B, and C. The game consists of a potentially infinite number of bargaining "rounds."[4] In each round, one player is chosen at random to propose a distribution (x_A, x_B, x_C) of the currently available "pie". Here, x_A denotes the share of the pie allocated to player A, etc. All players are then informed of this proposal and vote either yes or no. Under majority rule, the proposal is passed if at least 2 players vote yes. Unanimity requires that all three players vote yes. If the proposal passes, the game ends and the players receive their allocated shares. If the proposal fails, the game moves to the next round and a new player is chosen to make a proposal. This delay is associated with a cost because the pie shrinks to δ times its previous size each time a round ends without agreement. (In the experiment, the pie is initially worth 20 GBP and shrinks by a factor of 10% at the end of each round, i.e. $\delta = 0.9$.)

[4]The experimental version is actually a finite game. As will become clear, this does not affect the analysis and benchmark solution derived here.

We derive a symmetric stationary subgame perfect equilibrium of the game. Denote the size of the pie in round t by $P_t = \delta^t \cdot P$. Let v_t be the expected continuation payoff if the proposal is rejected in round t. (Note that this value is the same for all players in a symmetric equilibrium.) Assuming that players vote "yes" when indifferent between accepting and rejecting, the proposer in round t must give a share worth v_t to another player in order to secure her vote. Under majority rule, the best he can do is to give this amount to one of the other players and keep $P_t - v_t$ for himself. Under unanimity, he must give v_t to both of the other players and keeps $P_t - 2v_t$. In each case, the entire pie will be distributed, and the proposal will be accepted. Since each player is equally likely to receive any given share of tomorrow's pie, the expected continuation payoff after round t is $v_t = \frac{1}{3}P_{t+1} = \frac{\delta}{3}P_t$. It follows that under majority (unanimity) rule, the proposer offers a share $\frac{\delta}{3}$ to one (both) of the other players and keeps the remainder for himself, and this proposal is passed. (Under majority rule, the player excluded from the coalition can vote either yes or no.) In particular, this is true for round one, implying that the equilibrium involves no delay in bargaining under both majority and unanimity rule. If instead we assume that players vote "no" when indifferent between accepting and rejecting, the proposer must raise his offers by the smallest available increment. In our context, this is 1% of the available pie. This analysis leads us to formulate the following benchmark hypotheses.

Hypothesis 1 *Under simple majority rule, the first proposer offers a share $\frac{\delta}{3}$ (30% in our case) or $\frac{\delta}{3} + \epsilon$ (31%) to one other subject and keeps the remaining 70% or 69% for himself. This proposal is immediately passed. (Either the proposer and the included subject or all three subjects vote yes.)*

Hypothesis 2 *Under unanimity rule, the first proposer offers a share $\frac{\delta}{3}$ (30%) or $\frac{\delta}{3} + \epsilon$ (31%) to both of the other subjects and keeps the remaining 40% or 38% for himself. This proposal is immediately passed.*

3.4 Predicted treatment effect

Comparing hypotheses 2 and 3, we see that the baseline solution predicts a treatment effect when we compare simple majority and unanimity rule. In particular, we expect that the size of the coalition receiving positive amounts is 2 in the first case and 3 in the second. Second, we expect that the distribution within the coalition is highly unequal in the first condition and approximately equal in the second.

Our main hypothesis concerns *delay*, which is actually not predicted in the theoretical benchmark. We hypothesize that unanimity rule will more often lead to proposals being rejected. More precisely, we conjecture that any individual participant is more likely to reject a given proposal if unanimity rule is in effect than under majority rule. As explained above, the reason is that unanimity rule creates incentives for subjects to "act tough" in order to get a larger share of the pie, while majority rule creates incentives to be "modest" in order to be included in a minimum winning coalition.

Hypothesis 3 *Non-proposers are more likely to reject a given proposal under unanimity rule than under majority rule. More specifically, let the proposer's share be x_P and consider a responder being offered a share x_R. Then, controlling for x_P and x_R, the responder is more likely to reject a proposal under unanimity rule than under majority rule.*

Note that hypothesis 3 is stronger than the related (and equally important) idea that a given proposal may be more likely to *pass* under majority rule. The latter statement would be true even if the individual likelihood of rejection were the same under both rules, simply because two subjects are more likely to accept than are three. Evidence to support hypothesis 3 would therefore indicate an *additional* source of decision costs, over and beyond that which is directly implied by the tougher requirement that all subjects agree. We interpret Buchanan and Tullock's argument as referring to this additional cost, which results from an increased tendency to bargain for a larger share of the surplus.

3.5 Experimental Procedures

The experiment was programmed using the software z-Tree (Fischbacher 2007). The participants were undergraduate and graduate students from different disciplines at a large UK university. Participants were recruited using the online recruitment system ORSEE (Greiner 2004). Participants were not informed about the purpose of the experiment. Each subjects were allowed to participate only once. For each treatment there were 2 sessions involving 12 subjects per session.

We used the strategy method (Selten 1967) to record both proposers' and voters' behavior. Every participant in a group made a proposal, and each proposal was voted on. Finally, one proposal was randomly chosen to be counted. If the chosen proposal passed, bargaining ended. If it failed, the pie shrunk and a new round of bargaining began. Bargaining also ended if the amount remaining to be distributed fell below 2 GBP. After each round of bargaining, subjects received feedback that consisted of the three submitted proposals, the number of participants that accepted/rejected each proposal, whether the proposals had been passed, as well as which proposal had been randomly selected for votes to count.

Each session consisted of 16 periods, one practice period and 15 cash periods. Subjects were randomly re-matched before each period. At the end of the experiment, one of the 15 cash periods was randomly selected to be paid. Their total earnings in the experiment consisted of the amount allocated to them in the period chosen for payment and a 4 GBP participation fee. Sessions lasted 1 hour on average. Instructions are reproduced in the supplemental material.

4 Results

The data comprise 4 experimental sessions involving a total of 48 subjects. Each session lasted for 15 periods. Half of these decisions were made in the majority condition and half in the unanimity condition.

Depending on the proposal selected to be voted on, the length of a period is in part a random occurrence. As a consequence, we do not have many observations for second and later rounds, despite the fact that many first round proposals do in fact fail. Following the previous literature, the analysis will therefore focus on behavior in round 1 only. Given that each subject makes a first round proposal in each of the 15 periods, we have a total of $4 \cdot 12 \cdot 15 = 720$ proposals. Each proposal is voted on by all three members of the group, giving us a total of $3 \cdot 720 = 2160$ voting decisions made in round 1. Our analysis of voting behavior will focus on the 1440 decisions made by non-proposers.[5]

4.1 Rate of passage

Figure 3 reports the proportion of proposals which pass in round 1. Pooling the data from all 15 periods, 87% of proposals are passed in the first round under majority rule.[6] Under unanimity, only 70% of proposals are passed in round 1. There are no trends in the acceptance rate over the course of the experiment. The difference in passage rates between majority and unanimity rules is significant at 5% level ($Z = 2.0475$, $p = 0.0406$).[7]

This result provides initial support for the conjecture that there is more delay and therefore the decision cost is higher under unanimity rule than under majority rule. Below we test the even stronger prediction, posited in hypothesis 3, of a higher

[5]Due to a program glitch, 12 proposals and 27 voting decisions were not recorded. As a consequence, our empirical analysis uses only 684 proposal and 1386 non-proposer voting decision observations. The program error was not noticeable to subjects and did not affect the progress of the experiment.

[6]This high rate of passage is in line with results reported in the literature. For instance, Frechette et al (2005a) find a 89% acceptance rate in round 1 for inexperienced subjects and $\delta = 0.5$.

[7]We use a two-group test of proportion that uses the result of the vote in a period as the unit of observation. This test may overestimate the significance level because it assumes independence of sample observations. As a robustness check, we replicate this result using a linear regression model and controlling for the period ($p = 0.043$).

propensity to reject offers under unanimity at the individual level. Before turning to this hypothesis, we present evidence on the types of proposals made under the different rules.

FIGURE 3 ABOUT HERE

4.2 Types of Proposals

Figure 4 plots the share proposers demand in round 1. Under the unanimity rule, 99% of proposers demand shares within the range 31% to 40%. Only 11% of proposer's demands are, however, at the equilibrium prediction of 38% to 40%. Thus, proposals under unanimity rule are less favorable to the proposer than predicted by the theory.

Under majority rule, less than one fourth of the decisions fall in the 31% to 40% range, and there are peaks at 50% and 60%. Thus, it appears that proposers typically propose minimum winning coalitions. However, very few proposers demand the predicted share; less than 5% of proposers demand more than 68%.

Under both rules, we find patterns very similar to those reported on in previous literature. Proposers demand a higher share than they allocate to non-proposers, but the difference is still far from the equilibrium prediction.

Next, we look at the differences between unanimity and majority rule. Using a random effect linear regression, and controlling for the period, proposer's demands in the unanimity and majority conditions are statistically different at any conventional significance level.

FIGURE 4 ABOUT HERE

These differences between the rules emerge over time. Under majority, it takes a few periods for proposers to learn to demand a higher share of the pie. Figure 5 plots the period average share the proposer demands for herself in round 1. The difference between the average proposer's demand in period 1 and the average proposer's demand in period 15 is more than 15%. In contrast, we do not observe a similar change in proposer's demands under unanimity.

FIGURE 6 ABOUT HERE

That proposers learn under majority is also obvious when we look at the type of offers they make to non-proposers. Figure 6 shows the proportion of proposers offering 0 to one of the non-proposers, as well as the proportion of roughly equal splits,[8] in the 15 periods. Interestingly, approximately half of the proposals in period 1 are three-way equal splits and only one out of five allocates 0 to one of the non-proposers. In the last 10 periods, more than 75% of proposals include a zero-offer and the proportion of three-way equal splits is consistently below 15%. Thus, it looks as though many subjects were initially inclined to propose equal splits and learned over time to form minimum winning coalitions.

FIGURE 6 ABOUT HERE

In sum, under majority rule most proposals are of minimum winning coalitions. The participant not included in the coalition receives a zero-offer (78% of the offers in the last 10 rounds), and the two coalition members receive a more equal share than predicted. The average share of a non-proposer coalition member in proposals that include a zero-offer is 42%. Thus, proposers approximately demand 60% for themselves, which is slightly less than the equilibrium prediction of 69% or 70%.

Proposals under unanimity are closer to the equilibrium prediction. They are all approximately equal splits. Although consistent with the equilibrium analysis, this result may also be due to fairness considerations. Interestingly, however, it appears that "fairness survives" only in the context where it also corresponds to equilibrium play.

[8] Here we consider proposals where two subjects receive 33% and one subject receives either 33% or 34%.

4.3 Rejection patterns at the individual level

We now turn to our main hypothesis, which concerns the likelihood that an individual voter rejects a given offer under the different rules. This measure is more informative about expected decision costs than looking at the amount of delay observed, as the latter measure depends on which proposals are randomly chosen to be voted on. Since we used the strategy method, we have information on the likelihood of rejection of all first round offers, irrespective of whether they are chosen to be voted on or not.

Figure 7 shows votes of non-proposers, by shares offered, in round 1. According to the theoretical prediction, the expected share of a non-proposer is the same under majority and unanimity rule, and it is the same in every single period. Thus, non-proposers should theoretically accept offers above 30% or 31%. This is indeed what we find in our data. Under both rules, 90% of non-proposers accept offers above 31%. Using a random effect probit model, we compare acceptance rates for offers above this level. We find no differences between the rules when we control for the proposer's share, the subject's own share, and the period (see regression 1 in table 1).

FIGURE 7 ABOUT HERE

In contrast, we do see a significant difference in the rates of acceptance of offers at or below the theoretical continuation value. When offers are smaller than or equal to 31%, and controlling for the same set of variables, we find a higher propensity to reject an offer under unanimity than under majority (see regression 2 in table 1). More specifically, 100% of the offers below the equilibrium level and 64% of the offers at the equilibrium level are rejected under unanimity. Under majority, only 92% and 48% of offers below or at the equilibrium level are rejected, respectively. We also study the difference in the rates of rejection at exactly the equilibrium level and find the same result. Participants reject an offer at the equilibrium level significantly more often under unanimity than under majority (see regression 3 in table 1).

TABLE 1 ABOUT HERE

4.4 Summary of Results

We find that under majority rule proposals consist of a minimum winning coalition and are accepted without delay most of the time. This is in line with Baron and Ferejohn's original predictions under closed rule. We also find a deviation from their predictions that has been replicated several times in the literature: distributions within the coalition are more equal than predicted. Therefore, we can only partly accept hypothesis 1.

When unanimous consent is required, proposals are all approximately equal splits. All three members of a group receive a positive amount and proposers do not fully exploit their advantageous position. Results under unanimity are closer to the equilibrium predictions, and we cannot reject hypothesis 2. However, this result is also consistent with "fairness" motivations.[9]

Our main hypothesis concerned delay under both rules. At an aggregate level, we show that proposals under unanimity rule are rejected more often than under majority rule and, therefore, there are more delays under unanimity. We additionally show that non-proposers are more likely to reject an offer under unanimity rule than under majority rule if the offer is not above their continuation value. Under unanimity, most of non-proposers exert their veto power to turn down proposals that do not offer them more than their expected value in the next bargaining round.

[9] As noted above, it is interesting that behavior consistent with "fairness" survives only in the setting where the "fair" proposal is also close to the equilibrium prediction. A possible interpretation is that subjects have learned, outside of the laboratory, that "fairness" is an advantageous strategy in social interaction. This hypothesis is initially applied under both treatment conditions. The treatment differences in behavior emerge as subjects in the majority treatment revise their initial hypothesis. Thus it is possible that subjects in the unanimity treatment continue to act on proximate "fairness" motives, while the decision rule and the associated incentives may ultimately explain why those motives survive.

5 Conclusion

The goal of this paper was to experimentally investigate the relationship between decision rules on the costs of decision making in a multilateral bargaining situation. Our research question is motivated by Buchanan and Tullock's (1962) classic argument in support of less-than-unanimity rules in collective decision making. Their argument is based on the hypothesis that individual investments in wasteful bargaining activities will increase as the majority required for collective agreement increases. When compared to simple majority rule, unanimity rule may therefore be associated with inefficient delays. Although unanimity rule protects each member of a decision making body against adverse decisions, a rational individual may therefore prefer to use a less demanding decision rule. We investigate the hypothesized relationship between decision rules and decision making costs in the context of the Baron-Ferejohn legislative bargaining game.

Our results provides support for the existence of a tradeoff of the kind hypothesized by Buchanan and Tullock. Unanimity rule indeed protects individuals from adverse decisions in the sense that proposals are consistently more "fair" than under majority rule. Under majority rule, subjects are exposed to a significant risk of being excluded entirely from a winning coalition and leaving the experiment with only the show-up fee. This risk was effectively absent under unanimity rule, where almost all proposals give at least 30% of the available pie to each member of the group. However, this increased "security" comes at a price in terms of efficiency. Thus, we find that a sigificantly smaller proportion of proposals is passed in the first round under unanimity rule. In fact, we find support for the even stronger hypothesis that individual members are more likely to reject a given share of the pie under unanimity rule than under majority rule.

The latter pattern in particular appears to provide support for the hypothesis underlying Buchanan and Tullock's argument. It appears that unanimity rule motivates subjects to be more "bullish" in their bargaining behavior. This is particularly evident when we look at proposals at or below the theoretical continuation value of 31%. These offers are significantly more likely to be rejected under unanimity rule.

The primary goal of the experimental analysis was to test a behavioral hypothesis, and not necessarily to provide or test theories as to the underlying psychological or strategic mechanisms responsible. None the less, we are inclined to interpret this pattern as follows. Under majority rule, rejecting a given share of the pie is associated with the risk of being excluded entirely from future proposals. Therefore rejection is potentially very costly. This risk of being entirely excluded is absent under unanimity rule. Therefore subjects are more likely to reject, expecting correctly that they will receive a more attractive offer in the following round.[10]

A limitation of our approach lies in the fact that the interaction is extremely structured and the actions available to subjects are severely limited. This makes the situation somewhat unnatural when compared to "real world" situations to which Buchanan and Tullock's argument was meant to apply. Such doubts regarding external validity apply to much of experimental research in economics and political science. The advantage of such structured environments lies in the fact that we can clearly formulate hypotheses in terms of quantifiable behavioral patterns (e.g. rejection rates). The disadvantage is that we exclude elements of what Buchanan and Tullock may have meant by "investments in costly bargaining." Bargaining activities in real-world legislatures include, for example, verbal exchanges between members, meetings with lobby organizations and voters, etc. In our context, the only means by which subjects could engage in costly bargaining was to reject a given proposal. Future research in planning includes attempts to introduce communication into the interaction. For example, subjects may be given the opportunity to state "demands" prior to bargaining. We expect that such opportunities are likely to lead

[10]We explore this conjecture using the only 22 observations under unanimity where a non-proposer voted against a proposal, and that proposal was randomly selected to be implemented. In the first round, the average rejected proposal was 28%. In the second round, participants that rejected an offer in the first round were offered 32% on average.

to *more* delay under unanimity rule.

A second issue worth exploring in our context concerns the effect of group size on decision cost, as well as the interaction of this effect with the decision rule. Buchanan and Tullock conjecture that, in addition to the effect of the decision rule, the costs of decision making increase with the overall size of the decision making body itself. These factors, together, lead them to conclude that unanimity rule may be appropriate in small groups, while less stringent rules may be preferred in larger groups. Ongoing research tests this hypothesis in our context by increasing the group size and otherwise keeping the experimental setup constant.

To conclude, the experiment reported on in this paper provides support for Buchanan and Tullock's (1962) classic argument in support of less-than-unanimity decision rules. In particular, we have shown that while unanimity rule protects individuals from adverse collective decisions, it leads to increased delay as subjects more often reject proposals in an attempt to gain larger shares of the available surplus.

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Figures and Tables

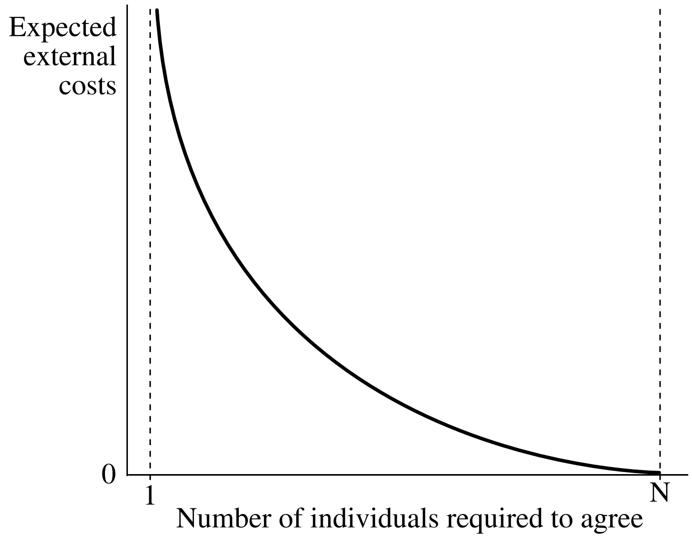

Figure 1: Decision rule and external costs (based on Buchanan and Tullock 1962)

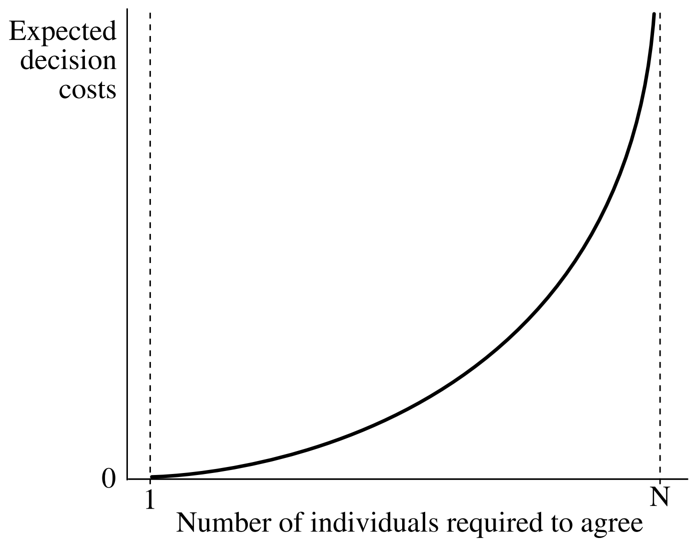

Figure 2: Decision rule and decision costs (based on Buchanan and Tullock 1962)

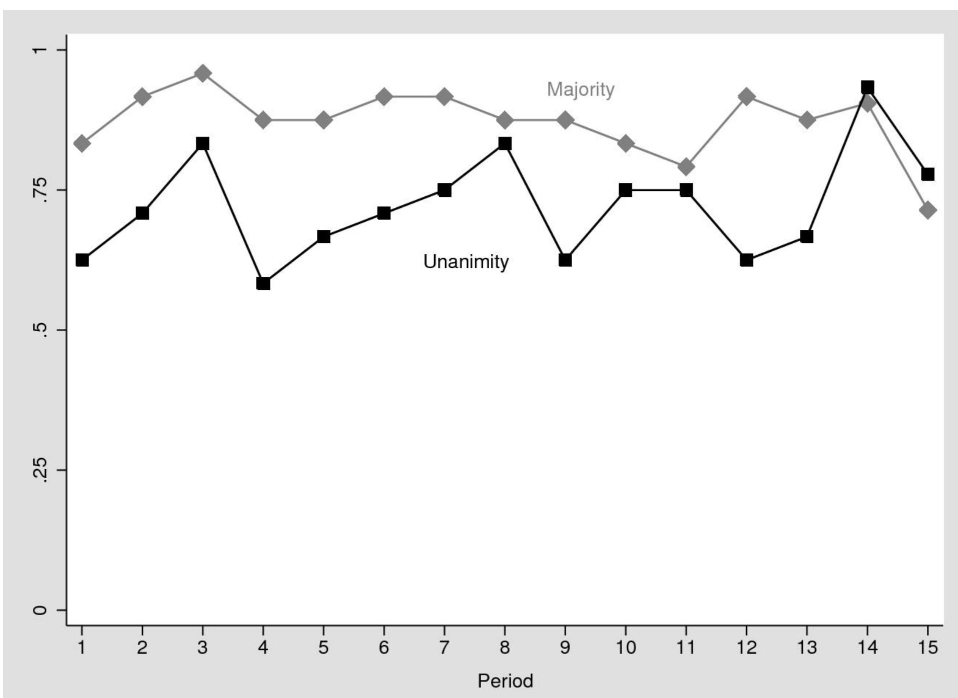

Figure 3: Proportion of Proposals Passed in Round 1

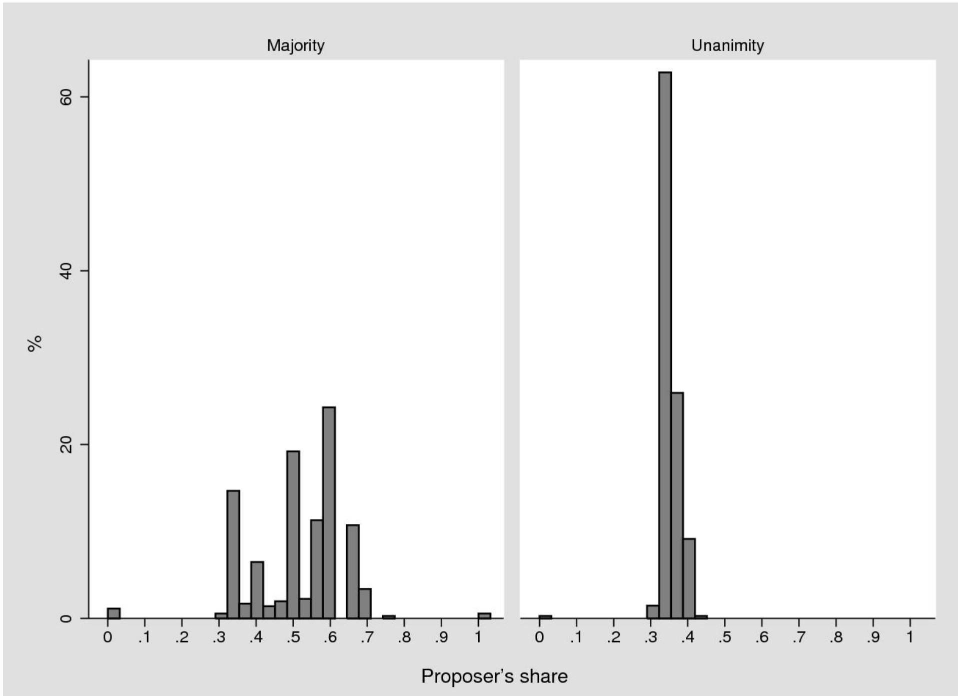

Figure 4: Proposer's Share Demanded in round 1

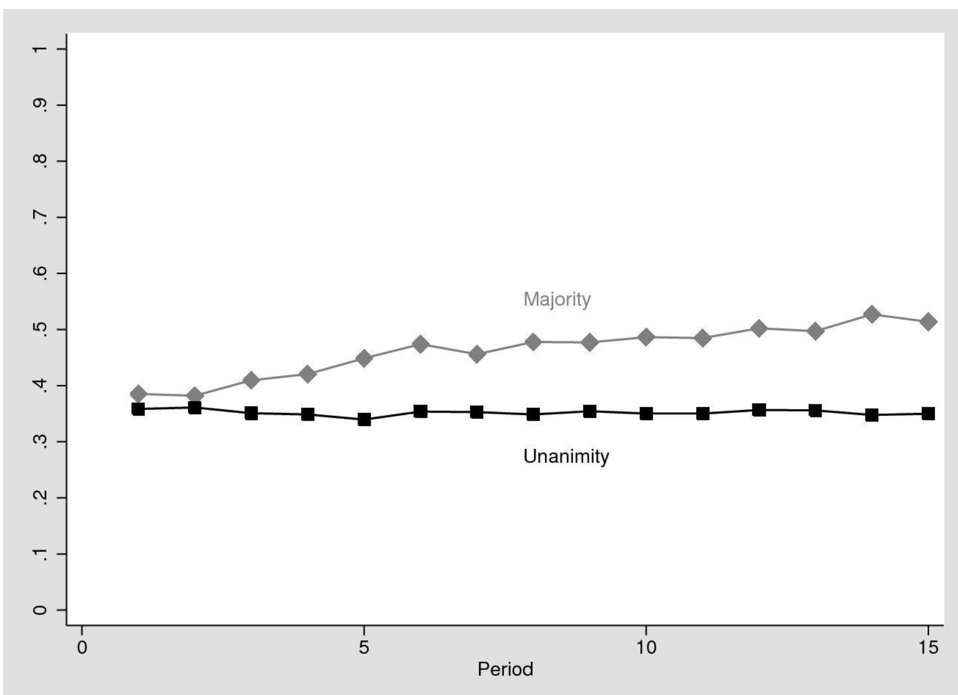

Figure 5: Average Share the Proposer Takes for Him- or Herself in round 1

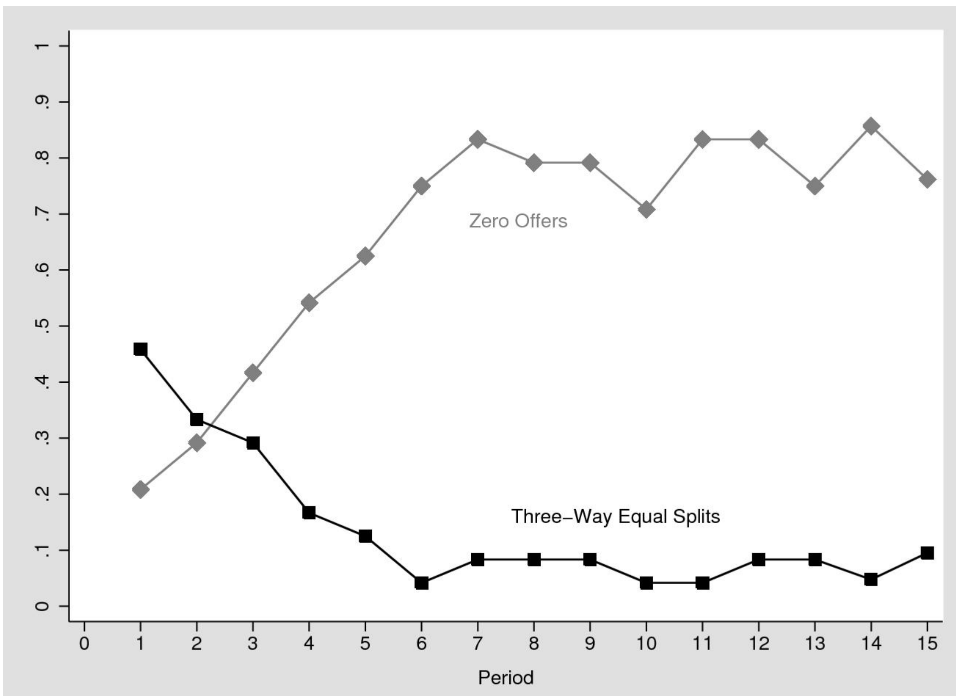

Figure 6: Proportion of Subjects Playing the Zero-offer and Equal-Split Strategies in round 1 under Majority

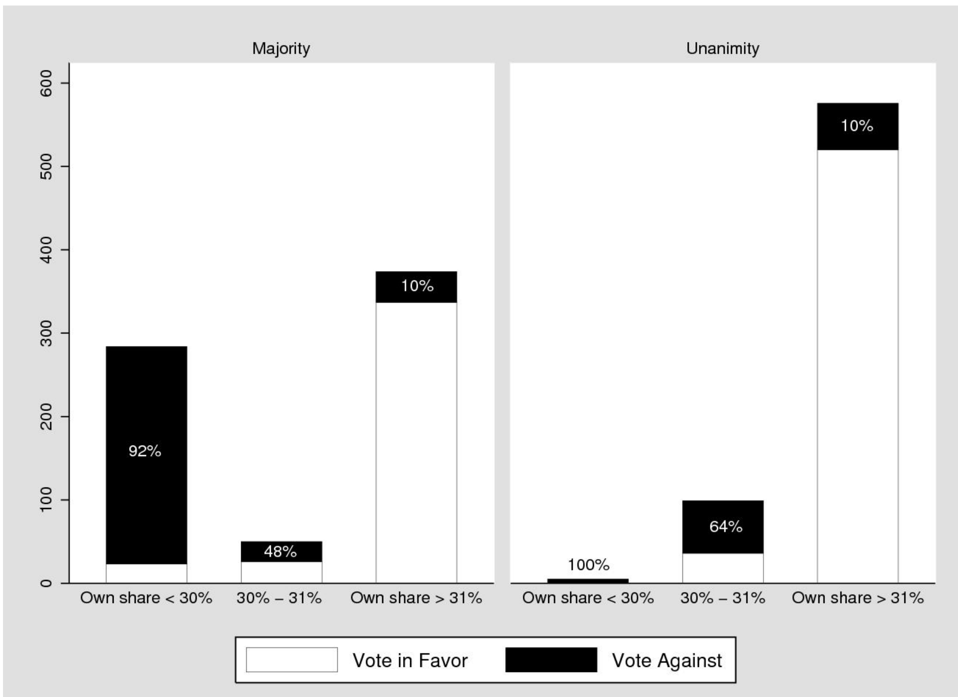

Figure 7: Accepted and Rejected Offers in round 1

	(1)	(2)	(3)
	$Ownshare > 31\%$	$Ownshare \leq 31\%$	$Ownshare \in \{30, 31\}$
Unanimity	0.177	-1.136	-1.148
	(0.298)	(0.492)**	(0.509)**
Proposer's share	-1.456	-4.750	-4.422
	(0.973)	(1.389)***	(1.841)
Own share	5.587	8.047	
	(1.956)***	(1.312)***	
Period	0.021	0.058	0.074
	(0.016)	(0.028)**	(0.034)**
Constant	-.0171	-0.632	1.666
	(0.739)	(1.782)	(0.883)
Observations	948	438	149
Number of subjects	48	48	43

*** $p < 0.01$ ** $p < 0.05$ * $p < 0.1$

Table 1: Random Effect Probit Estimates of the Voting Decision (Standard Errors in Parentheses)