Nominal Bargaining Power, Selection Protocol and Discounting in Legislative Bargaining*

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Abstract

The effects of changes in nominal bargaining power, the proposal selection rule and discounting in legislative bargaining outcomes are investigated. The comparative static predictions of the Baron-Ferejohn (1989) model better organize behavior than does Gamson's Law (1961). However, proposer power is not nearly as strong as predicted under Baron-Ferejohn as coalition partners refuse to take the small shares given by the continuation value of the game in favor of a behavioral focal point. Regression results similar to those employed in field data provide some support for Gamson's Law. This is largely accounted for here (and we suspect in field data as well) by the selection protocol, which recognizes voting blocks in proportion to the number of votes controlled. Discounting pushes behavior in the right direction but has a much smaller effect than predicted.

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1 Introduction

The legislative bargaining process is a central element in the allocation of public resources. It not only affects who gets what, but it can also lead to the adoption of socially inefficient programs. A full characterization of the bargaining process is bound to be quite complicated, so that any model must, of necessity, abstract from some of the features of reality. Nonetheless, modeling is central to our understanding of the bargaining process as it allows us to focus on the central forces at work and to determine the effects on bargaining outcomes of key variables such as the impatience of legislators, the voting rules employed, and the impact of unequal bargaining power between different voting blocks.

The present paper looks at the legislative bargaining process focusing on the effect of changes in nominal bargaining power and the discount rate on bargaining outcomes. The theoretical framework for the experiment is the Baron-Ferejohn (1989) model, which, without doubt, is the most frequently used formal model of legislative bargaining. The Baron-Ferejohn model has been applied to a number of situations, sometimes outside the realm of legislative bargaining per se, ranging from special interest politics (Bennedsen and Feldman 2001; Persson 1998) to social choice issues (Banks and Duggan 2000). Some of these applications deal with central issues in public economics. For instance, Baron (1991) extends the model to show how it can explain the existence of socially inefficient programs. Alesina and Perotti (1996) use insights from the model to explain the presence or absence of fiscal discipline in parliamentary democracies.

The Baron-Ferejohn model predicts substantial proposer power, which is independent of changes in the relative weights that do not affect the real relative bargaining power – we call such changes "nominal changes". This prediction of the model has been contested in empirical studies of coalition governments, where it has been argued that the data is closer to a proportional relationship between the distribution of ministerial positions among coalition members and the number of votes each coalition partner contributes, as compared to the implication of the Baron-Ferejohn model that the prime minister's party (the proposer) should have a disproportionate share of cabinet positions (Warwick and Druckman, 2001).[1] This proportional relationship between relative votes and bargaining outcomes was first suggested by Gamson (1961a), and is commonly referred to as Gamson's Law.

The present experiment compares the predictions of the Baron-Ferejohn model with Gamson's Law in a divide the dollar game with three legislative voting blocks. With three voting blocks, no one of which has a majority by itself, each voting block, regardless of its nominal bargaining power (the absolute number of votes it controls) has equal real bargaining power within the Baron-Ferejohn model, since under majority rule the legislation always requires a coalition of two out of the three voting blocks. In contrast, according to Gamson's Law there is no distinction between real and nominal bargaining power, nor is this distinction made in empirical applications of the model.[2] This is clear from Gamson's own writings as well as the empirical analysis of coalition governments supporting Gamson's Law.[3] Further, employing regressions mimicking those applied to field data, we find clear evidence favoring Gamson's Law even though the comparative static results of the experiment clearly favor the Baron-Ferejohn model. This surprising result is explained on the basis of the regression specification in conjunction with the fact that government formateur rules typically favor the party with the largest number of votes (Diermeier and Merlo, 2001).

There have been only limited experimental investigations of the Baron-Ferejohn model prior to this. McKelvey (1991) investigated the model under closed amend-

[1] Warwick and Druckman (2001) improve on the methodology of Browne and Franklin (1973) by controlling for the importance or saliency of the portfolios each party recieves. They too, however, conclude that the assignment is more or less proportional.

[2] In contrast, Morelli's (1999) demand bargaining model predicts proportionality between legislative bargaining outcomes and real (but not nominal) bargaining power.

[3] See Gamson (1961b), p. 567 "Convention" 2. Also see Browne and Franklin (1973, p.457): "But the most obvious, and probably the most important, set of resources a party brings to the government is its share of parliamentary seats, which may then be translated into votes on government policy." Browne and Franklin, as well as Warwick and Druckman, make no distinction between real and nominal bargaining power. The only exception to this is Snyder, Ting, and Ansolabehere (2003), who distinguish between real and nominal bargaining power.

ment rule procedures with three voters choosing between three or four predetermined allocations (resulting in a mixed strategy equilibrium), and with a discount rate of .95. Deviations from predicted behavior included (i) a consistent reluctance to propose alternatives in which the coalition partner got as low a payoff as predicted (which is similar to our results) and (ii) proposals were passed more often than predicted. In contrast, our experimental design implements an infinite horizon game with and without discounting, and always yields a pure strategy equilibrium with respect to coalition members' shares. (However, one of our treatments yields a mixed strategy equilibrium with respect to the frequency of inviting different size voting blocks into the coalition.) Diermeier and Morton (2000) investigate the Baron-Ferejohn model focusing on varying recognition probabilities and on the share of votes that each elector controls under closed rule procedures. Each election consisted of a finite number of rounds (5) with a zero payoff if no agreement was reached in the last round. They report that coalition member shares are proportional to the votes they control, or are more even than a simple proportionality rule predicts. In contrast, our comparative static outcomes clearly favor the Baron-Ferejohn model over proportionality (Gamson's Law).

The Frechette, Kagel and Lehrer (in press) experiment is closest in design to the present experiment. They focus on the impact of closed versus open amendment rules on legislative outcomes. There are a number of differences between the present experiment and Frechette, Kagel and Lehrer (2003). Here we employ only closed rule procedures and vary voting block size, whereas they always had equal size voting blocks. They employed discounting whereas the main treatments here employ no discounting. This last difference is potentially quite important since the key strategic factor distinguishing the multi-lateral bargaining game from the closely related bilateral bargaining games of Rubinstein (1982) and Binmore (1986) is that the multilateral bargaining game does not require a shrinking pie to generate an equilibrium. Rather, the key driving force is the exclusion of some voters from the winning coalition. This is predicted to motivate coalition members to vote for proposals even though they are getting a substantially smaller share of the pie, as otherwise they risk being excluded from the coalition in the next round of proposals (even though they also have a chance to be the proposer and to exercise proposer power). In keeping the size of the pie constant, we isolate the impact of this strategic factor. We then replicate our baseline treatment with a shrinking pie to determine the added effects of the shrinking pie. Given the close relationship between the present game and the bilateral bargaining games that have fostered the large and growing "other regarding preference" literature, our results are both informed by that literature and provide some new insights into it as well.[4]

The paper proceeds as follows. The next section develops the Baron-Ferejohn model for our experimental design, and derives the stationary subgame perfect Nash equilibrium for any selection protocol. Our experimental procedures and treatment effects are reported next, followed by the experimental results. Section 7 recaps our main findings.

2 The Bargaining Model

We consider a three-party game where any majority coalition – at least two out of three – can decide how they should share a dollar. Each party has a potentially different nominal weight, $w_i < n/2\ \forall i$, with $\sum_{i=1}^{3} w_i = n$, where $n \geq 3$ is the total number of seats in the assembly and w_i is the number of seats held by party i. Think of the dollar to be divided as the total amount of ministerial payoffs available to a coalitional government.

For any configuration of these weights, the three players always maintain *equal real bargaining power*, because $w_i < n/2\ \forall i$ guarantees that no party can determine the payoff sharing without agreement with another party.[5] We will see therefore that

[4]There are a number of procedural differences between Frechette, Kagel and Lehrer and the present experiment as well. Potentially the most important of these is that They paid off on several elections, selected at random, rather than in one election as done here. Thus, the systematic exclusion of voters from winning coalitions reported there, could be rationalized on the grounds that payoffs "will average out" between elections selected to be paid off on. No such rationalization can apply here.

[5]Using the terminology of cooperative game theory, the minimum integer homogeneous repre-

the distribution of nominal weights does not affect the distribution of equilibrium payoffs.

A complete theoretical treatment of weighted majority games is beyond the scope of this paper, let us just mention that this type of games has been at the center of cooperative game theory since Von Neumann and Morgenstern (1944), and then became the focus of noncooperative bargaining theory in the late 1980s. The closed-rule bargaining model proposed by Baron and Ferejohn (1989) is certainly the noncooperative bargaining model most used in the political science and public economics literature, and is the only model considered in this paper.

Let the three parties be the relevant three players of the bargaining game. One player is randomly selected to be the proposer; (s)he makes a proposal to another player on how to share the dollar, and if the offer is accepted the game is over. If the offer is rejected, then another random selection of a proposer is made, and so on.[6] Looking at the infinite horizon version of such an alternate-offer bargaining model, we will focus on the same solution concept used by Baron and Ferejohn, i.e., Stationary Subgame Perfect Equilibria (SSPE).

A key variable is the so called *protocol*, i.e., the probabilities with which the players are selected to be the next proposer when a proposal is rejected. Consider any protocol $\rho = \rho_1, \rho_2, \rho_3$, with $\rho_i > 0\ \forall i$ and $\sum_i \rho_i = 1$. We will derive the prediction of the theory for every ρ, but the experiments will focus on two focal protocols, the *egalitarian* one, $\rho_i = \frac{1}{3}\ \forall i$, and the *proportional* one, $\rho_i = \frac{w_i}{n}$. The first one is important because in these games with $w_i < \frac{n}{2}$ for all i the bargaining power in the absence of institutions is equal, regardless of the weights. The second protocol is important because it seems to fit the institutional norm, and Diermeier and Merlo confirm empirically that the use of this protocol is consistent with the data. Although the equilibrium is derived only for the special case of three voting blocks, it is noteworthy that this is the first paper to characterize the SSPE strategies for any selection protocol.

sentation of this game is 1,1,1.

[6]Here we will provide the explicit theoretical prediction only for the no-discounting case, and we discuss at the end of the section what changes with discounting.

Given that the three players have equal real bargaining power, it is natural to allow a proposer to mix on whom to propose. A stationary strategy for player i can be summarized by (1) the offer $\alpha_i^j \in [0,1]$ (s)he would make to player j at every node where (s)he is the proposer, and (2) the probability p_i^j that i makes the offer to j. For a responder (i.e., for a player who has been made an offer and is called to respond), the only payoff-relevant information is the offer received. Hence the stationary strategy of any player i includes the tuple $\alpha_i^j, \alpha_i^k, p_i^j$ (for when i is the proposer) and an acceptance threshold α^i, below which offers are rejected. We will use the term ex-ante equilibrium payoffs to indicate the expected payoffs associated to an equilibrium strategy profile before the identity of the first proposer is revealed.

Proposition 1 *Consider the three-player infinite horizon closed rule bargaining game without discounting described above.*

For every interior protocol ρ and for every distribution of weights w:

(I) Ex-ante payoffs: *All the SSPE of the game determine a unique egalitarian distribution of ex-ante payoffs, coinciding with the Nucleolus of the game.*

(II) Equilibrium offers: *In every SSPE, any player i recognized to make a proposal, offers $\alpha_i^j = \frac{1}{3}$ to a chosen responder j, and $\alpha_i^k = 0,\ k \neq j$, and is indifferent between the two other players when choosing the responder (j); the offer is accepted, and hence the payoff for the proposer is $\frac{2}{3}$. Moreover, in every SSPE profile, the acceptance threshold for every player i is $\alpha^i = \frac{1}{3}$.*

(III) Equilibrium probabilities with which responders are chosen: *A triplet (p_k^j, p_j^k, p_i^k) of mixing probabilities suffices (the other three are implicitly derived). Every SSPE is characterized by one such triplet, and the set of triplets corresponding to SSPE is identified by the following system:*

$$\begin{aligned}
p_k^j &\in \left[\max\left(0, \frac{1-\rho_i-2\rho_j}{1-\rho_i-\rho_j}, \frac{\rho_i-\rho_j}{1-\rho_i-\rho_j}\right), \min\left(1, \frac{\rho_i}{1-\rho_i-\rho_j}, \frac{1-2\rho_j}{1-\rho_i-\rho_j}\right)\right] \\
p_j^k &= \frac{\rho_i - p_k^j + p_k^j\rho_i + p_k^j\rho_j}{\rho_j} \\
p_i^k &= -\frac{1-\rho_i-2\rho_j - p_k^j + p_k^j\rho_i + p_k^j\rho_j}{\rho_i}
\end{aligned} \tag{1}$$

Proof: see appendix.

In every SSPE, regardless of the protocol and the nominal weights, the proposer offers $\frac{1}{3}$ to someone, and manages to keep $\frac{2}{3}$ for him(her)self. However, the set of mixing probabilities with which proposers choose responders in SSPE depends on the protocol. With the egalitarian protocol the range of such mixtures is identified by

$$\begin{aligned} p_k^j = p_i^k &\in [0,1] \\ p_j^k &= (1 - p_k^j) \end{aligned} \tag{2}$$

Equivalently, we can say that any SSPE when the protocol is egalitarian is identified by a triplet of mixing probabilities on the -45 degree line in Figure 1.

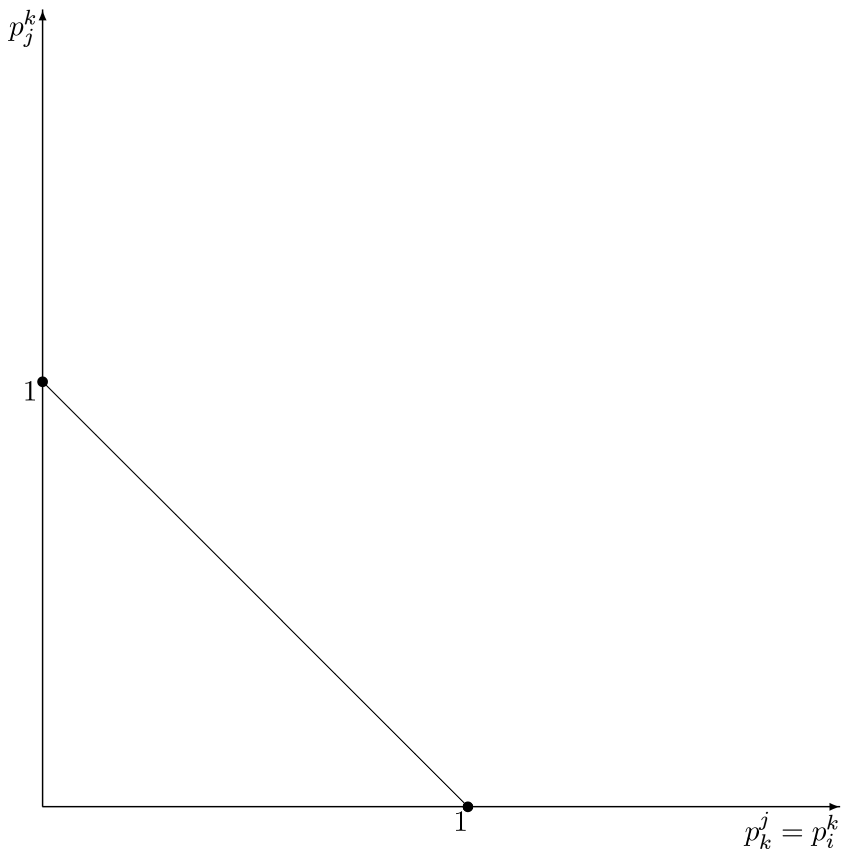

Figure 1: p_j^k as a function of $p_i^k = p_k^j$, the mixing probabilities when the protocol is egalitarian.

With the other protocol that we will consider, i.e., the proportional one, and with the specific weights of $w_i = w_j = 45, \; w_k = 9$, the system identifying the mixing probabilities is

$$\begin{aligned} p_k^j &\in [0,1] && (3) \\ p_j^k &= 1 - \frac{1}{5} p_k^j \\ p_i^k &= \frac{4}{5} + \frac{1}{5} p_k^j && (4) \end{aligned}$$

Since $w_i = w_j$, a natural benchmark is the unique symmetric SSPE profile of such probabilities, which is obtained by imposing $p_i^k = p_j^k$. Such a point prediction is $p_k^j = \frac{1}{2}, \; p_i^k = p_j^k = .9$.

Finally, we should mention that the only difference (with respect to Proposition 1) when discounting is introduced, is in terms of the proposer's power: for example, with a discount factor $\delta = 0.5$ the proposer's ex-post payoff is $\frac{5}{6}$ rather than $\frac{2}{3}$.[7] We are now ready to introduce the experimental design.

3 Experimental Design

In each election 3 subjects divided \$30 between three voting blocks, with one subject representing each voting block. Election procedures were as follows: First all subjects entered a proposal allocating the \$30. Then one proposal was randomly selected to be the standing proposal. This proposal was posted on subjects' screens giving the amounts allocated to each voting block, by subject number, along with the number of votes controlled by that subject. Proposals were voted up or down, with no opportunity for amendment. 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, if there is one, to the total benefits). Complete voting results were posted on subjects' screens, giving the amount allocated by subject number (along with the number of votes that subject

[7] For any discount rate δ, the continuation payoff of any player, if a proposal is rejected and a new proposer has to be recognized, is equal to δ times the ex-ante payoff, which is always $\frac{1}{3}$. Hence, the proposer can retain in equilibrium $1 - \delta\frac{1}{3}$, which with $\delta = 0.5$ is $\frac{5}{6}$.

controlled), whether that subject voted for or against the proposal, and whether the proposal passed or not.[8]

Experimental treatments are reported in Table 1.[9] In each election there were a total of 99 votes divided between the three voting blocks, with all the votes within a block having to be cast as a block. In the baseline treatment (equal weights and equal selection probabilities, henceforth EWES) each voter controlled 33 votes and had a 1/3 chance of their proposal being selected to be voted on. The next two treatments both involved two subjects controlling 45 votes each and one subject controlling 9 votes.[10] Note that with three voting blocks, and no block controlling a majority of the votes by itself, real bargaining power is the same for all voting blocks since a proposal must still receive votes from 2 of the 3 voting blocks to pass. What different weights do is to change nominal bargaining power.

In the UWES treatment (unequal weights and equal selection probabilities) each voting block continued to have a 1/3 probability of their proposal being recognized and voted on. Within the framework of the Baron-Ferejohn (BF) model this treatment tests if there are any framing effects, or other unanticipated effects, resulting from perceived differences in bargaining power, as there is no change in real bargaining power. Further, since recognition probabilities are the same as in the EWES treatment, BF predicts that the composition of minimal winning coalitions will be independent of voting block size (see section 2 above). In contrast, Gamson's Law, which is based on nominal bargaining power, predicts a dramatic effect on the

[8]Screens also displayed the proposed shares and votes for the last three elections as well as the proposed shares and votes for up to the past three rounds of the current election. Other general information such as the discount rate, the number of votes required for a proposal to be accepted, etc. were also displayed. Screen shots, along with instructions, are provided at the web site http://www.econ.ohio-state.edu/kagel/bf3instructions.pdf.

[9]Inclusion probability refers to the probability that a subject receives a strictly positive amount of money. In other words this is the probability that he is included in the winning coalition.

[10]In both cases, subjects weights, which were selected randomly during the dry run, remained fixed throughout the experimental session.

Treatment	Number of subjects	Predicted Share for Proposer			Inclusion Probability	
		Weight:	45 or 33	9	45 or 33	9
Equal weights, equal selection (EWES)	27 inexp., 12 exp.	Baron-Frejohn	.67	n/a	.33	n/a
		Gamson's Law	.50	n/a	.33	n/a
Unequal weight, equal selection (UWES)	27 inexp., 18 exp.	Baron-Frejohn	.67	.67	.33	.33
		Gamson's Law	.83	.17	.50	1
Unequal weight, unequal selection (UWUS)	24 inexp., 15 exp.	Baron-Frejohn	.67	.67	.55	.91
		Gamson's Law	.83	.17	.50	1
EWES with $\delta = 0.5$	30 inexp., 12 exp.	Baron-Frejohn	.83	n/a	.33	n/a
		Gamson's Law	.50	n/a	.33	n/a

Table 1: Experimental Treatment Conditions and Predictions

distribution of payoffs within any (minimal) winning coalition as well as on the composition of that coalition. More specifically shares in any given winning coalition should be proportional to the number of votes contributed to the coalition; shares of $1/2, 1/2$ in coalitions comprised of the two 45 vote blocks, and shares of $\frac{45}{54}, \frac{9}{54}$ in a coalition consisting of one 45 vote block and the 9 vote block. Further, the latter should comprise all winning coalitions, as the 45 vote block receives a larger share of the benefits when partnering with the 9 vote block versus the 45 vote block ($\frac{45}{54}$ versus $\frac{1}{2}$).[11]

In the UWUS treatment (unequal weight and unequal selection probabilities) the protocol is proportional to the number of votes each block controls. Here too BF predicts no differences in either ex-ante or ex-post shares of the different voting blocks compared to the EWES treatment. However, BF does predict that both 45 vote blocks will have a strong preference for including the 9 vote block in their proposals (anywhere between %80 and %100 of the time). Further, if we assume symmetry between the two 45 voting blocks, then the point prediction for partnering with the 9 vote block is 90%. In contrast, Gamson's Law predicts no impact from

[11]This is made clear in the following passage: "where the total payoff is held constant, he [a player choosing a coalition] will favor the *cheapest winning coalition*." Gamson (1961), p. 376.

the UWUS treatment compared to the UWES treatment.

The last treatment replicates the EWES treatment but with a discount rate of 0.5. Within the BF model proposals should continue to be passed in the first round of each election, but the discounting increases the proposer's power (as it reduces the continuation value of the game for non-proposers) so that the ex-post distribution of benefits under the SSPE is $(\frac{5}{6}, \frac{1}{6}, 0)$ (with share to the proposer listed first). Predictions under Gamson's Law are unaffected by the discount rate.

To minimize the possibility of repeated play effects, we recruited between 12 and 18 subjects per session, conducting between 4 and 6 elections simultaneously. Subjects were assigned to each "legislative" cohort randomly in each election, subject to the restriction that in elections with unequal voting blocks each cohort contained two 45 vote blocks and one 9 vote bloc. Subject numbers also changed randomly between elections (but not between rounds of a given election). Feedback from voting outcomes was limited to the legislative cohort a subject was assigned to. This feedback consisted of the proposed distribution of benefits in each round of an election, who voted for or against the distribution, and whether the distribution passed or failed along with the vote totals.

Subjects were recruited through announcements in undergraduate classes, advertisements in student newspapers, and email announcements at the Ohio State University. For each treatment, there were 2 inexperienced subject sessions and 1 experienced subject session. A total of 11 elections were held in each inexperienced subject session, 1 dry run and 10 elections for cash, with one of the cash elections selected at random to be paid off on. Subject payments from this one election were equal to the money allocated to their voting block in that election.[12] In addition, each subject received a participation fee of $8.

4 Results For $\delta = 1$ Treatments

We report results in terms of a series of conclusions, each followed by the supporting data. We begin with conclusions that apply to all three treatments.

[12]The dry run was eliminated in the experienced subject sessions.

	Elections	EWES	UWES	UWUS
Inexperienced	All	65	73	65
	Last 3	67	80	67
Experienced	All	77	85	68
	Last 3	78	78	67

Table 2: Percentage of Elections Ending in Round 1

	EWES	UWES	UWUS
Inexperienced	61	72	73
Experienced	77	90	84

Table 3: Percentage of Minimal Winning Coalitions

Conclusion 1 *A majority of proposals are accepted without delay, as the BF model predicts. However, delays persist until the end.*

Table 2 reports the percentage of proposals that were accepted in round 1. It gives the results for all elections and for the last 3 elections. These percentages are relatively high, averaging some 68% for the 3 treatments combined for inexperienced subjects, and 77% for experienced subjects. Averaging over the three treatments, the average number of rounds goes from 1.6 for inexperienced voters to 1.3 for experienced, with the number of rounds rarely exceeding 2 for experienced voters.

Conclusion 2 *A majority of proposals are for minimal winning coalitions.*

On average, 69% of the proposals for inexperienced voters are for minimal winning coalitions, with this number increasing to 85% for experienced voters.[13] Table 3 breaks these numbers out by treatments. Very few offers are *perfectly* egalitarian, only 7% for inexperienced subjects and 5% for experienced subjects.

Conclusion 3 *Proposers receive a uniformly larger share of the benefits than coalition members, so that we can reject a null hypothesis of no proposer power. Nev-*

[13] Unless stated otherwsie, we report data for all proposals, whether they were selected to be voted on or were actually passed.

	EWES	UWES	UWUS
Inexperienced	0.49	0.52	0.52
Experienced	0.55	0.51	0.52

Table 4: Average Share the Proposer Takes For Herself In Accepted Offers

ertheless, proposers take well below the SSPE prediction in all three treatments and well below Gamson's Law's prediction for the UWES and UWUS treatments.

The average share of the proposer for accepted offers is reported by treatments and experience levels in Table 4.[14] Inexperienced voters in their role as proposers obtain an average share of .51 for themselves, compared to the next highest average share of 0.43. For experienced voters these numbers are 0.52 versus 0.45. (These numbers add to less than 1 because on average all three players are receiving strictly positive shares.) For all treatments and experience levels, 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 5% level.[15]

The data in Table 4 show that proposers shares are quite far away, on average, from the 2/3 predicted under the SSPE in the BF model and from the average proposers' shares consistent with Gamson's law in UWES and UWUS treatments (62% and 78% respectively). In fact, there are relatively few SSPE proposals overall – 12% and 11% for inexperienced and experienced voters respectively, of which about half were accepted for inexperienced voters and about a third accepted for expe-

[14]Conditioning on accepted offers that are MWC, proposers requests are only slightly more: 0.55 at both experience levels in EWES, 0.54 and 0.52 in UWES for inexperienced and experienced voters respectivelly, and 0.56 and 0.55 in UWUS.

[15]These tests are performed using subject averages. Unless otherwise specified, all the tests reported in this paper will use subject averages.

rienced voters.[16][17] Average shares are approximately constant across treatments, consistent with the comparative static predictions of the BF model and inconsistent with Gamson's Law. Further, requests are effectively constant across treatments as well. That is, the hypothesis that shares proposers allocate to themselves are the same for any two treatments cannot be rejected in all cases except when comparing EWES to UWES for inexperienced subjects (using a Mann-Whitney test on subject averages and a 5% significance level). The small share that proposers actually take, relative to the BF model's prediction, will be explained shortly on the basis of coalition partners voting patterns, which yield sufficiently high rejections for proposals at or near the SSPE. We will show that the expected value of a proposal is maximized by offering shares close to those actually offered.

Conclusion 4 *Voting for or against a proposal is almost exclusively based on own share of the benefits, with minimal concern for the shares of the least well off or for the proposer's share. Shares below 1/3 are almost always rejected and shares above 1/3 are usually accepted. However, in a large number of cases, shares between 1/3 and 7/15 (between $10 and $14) are rejected.*

Figure 1 pools the data between the three treatments, but distinguishes between inexperienced and experienced subjects. Offers below 1/3 are rejected 97% of the time for inexperienced subjects and 98% of the time for experienced subjects. Note that Gamson's Law predicts that shares of $5 or more will be accepted under the

[16]Among inexperienced subjects, there are a number of proposals giving more than two thirds to the proposer, but these have been essentially eliminated for experienced subjects. One subject consistently proposed giving *all* the money to one player, sometimes himself and sometimes to others. This outlier has been dropped from the analysis throughout.

[17]The group of offers for which statistics are reported varies. For instance, the percentage of SSPE offers accepted is over the offers that took the floor. The percentage of SSPE offers is computed over all offers, those that took the florr and those that didn't. Average share to the proposer is computed only for accepted offers (a subset of the offers that took the floor). This is because Gamson's law is a statement about final allocations. Throughout the paper, whenever Gamson's law is tested, this is the subset that will be considered. Otherwise, the analysis will apply to all offers or only to the ones that took the floor if we are looking at voting behavior.

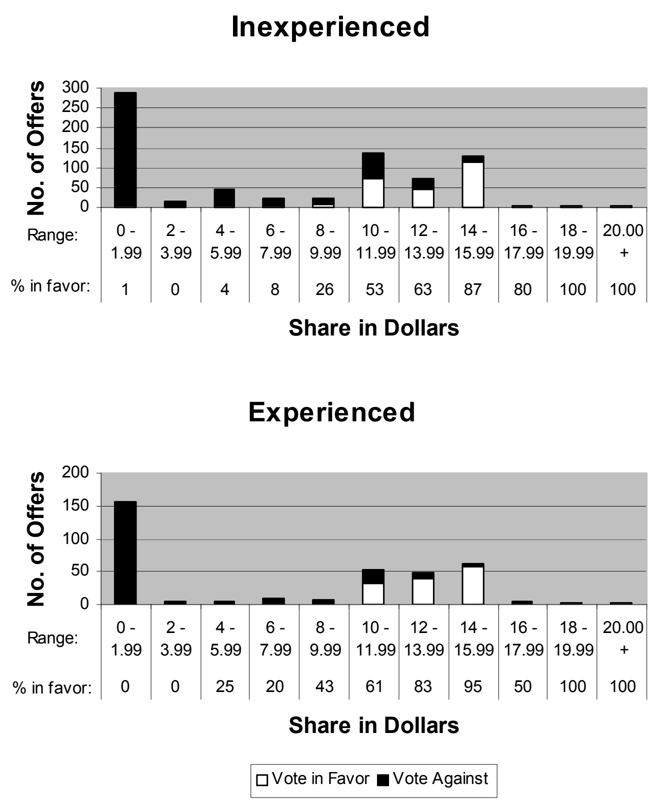

Figure 1: Votes by Shares (represented in dollar amounts) In EWES Treatment with $\delta = 0.5$

	EWES		UWES		UWUS	
	Inexp.	Exp.	Inexp.	Exp.	Inexp.	Exp.
Share	8.96***	15.34	14.99***	11.07**	9.14***	24.16**
	(1.34)	(18.54)	(4.02)	(4.92)	(1.38)	(9.69)
SZ	0.51	1.22	-0.49	0.18	0.13	-1.53
	(0.34)	(1.68)	(0.79)	(1.37)	(0.40)	(1.92)
PS	-3.03**	0.62	0.24	-9.58	-0.05	-5.31
	(1.36)	(7.32)	(2.70)	(5.85)	(1.43)	(6.56)
Constan	-1.64**	-6.03	-4.93**	1.20	-3.21***	-3.41
	(0.76)	(10.44)	(2.05)	(3.24)	(0.91)	(4.79)
No. of Obs.	250	74	240	130	268	150
Log Lik.	-74.36	-13.26	-66.94	-20.09	-80.47	-29.18

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

Table 5: Random Effects Probit Estimates of The Determinants of Vote

UWES and UWUS treatments by the small (9) vote block. But this is clearly not satisfied in the data. Further, although the BF model predicts that offers of 1/3 or more will be accepted, and they are a majority of the time, offers between $10-$14.49 are rejected 26% of the time for inexperienced subjects and 6% of the time for experienced subjects. Offers between $14.50 and $15 are rejected 7% of the time for inexperienced voters, and 4% of the time for experienced voters[18]

Table 5 reports estimates of the following voting equation:

$$vote_{it} = I\left\{\beta_0 + \beta_1 s_{it} + \beta_2 PS_{it} + \beta_3 SZ_{it} + \alpha_i + \nu_{it} \geq 0\right\} \tag{5}$$

where $I\{\cdot\}$ 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}), SZ an indicator variable taking value one if at least one subject is totally excluded from the division of the benefits (the single zero strategy) in the proposal on the floor, and the share the proposer takes

[18]There are very few proposals between $14.50 and $14.99.

(PS).[19] The equation is estimated using a random effects probit, with a one way subject error component for all rounds.[20] The sign of the coefficient (presented in Table 5) for own share is positive, large in value relative to the other coefficients, and statistically significant except for the EWES treatment with experienced subjects where nothing is statistically significant.[21] The coefficients for the SZ strategy, and for proposers share (PS), are not statistically significant except for the EWES inexperienced voter treatment, where PS is statistically significant at the 10% level. The implication is that subjects are primarily voting out of concern for their own share of the benefits, with little or no concern for the shares of the least well off and for proposer's share. As for differences in vote patterns for 9 vote versus 45 vote blocks, using likelihood ratio tests, the null hypothesis that voting is independent of block size cannot be rejected except for the UWUS treatment with inexperienced voters. Differences between the 9 and 45 vote blocks will be explored in more detail below.

The next several conclusions explore the differences between the treatments.

Conclusion 5 *There are minor differences in behavior between EWES and UWES treatments for inexperienced voters. These differences are, however, no longer present for experienced voters. These comparative static results support the BF model over Gamson's Law.*

Recall that since real bargaining power and the selection protocol are the same between the EWES and UWES treatments, the BF model predicts no differences in outcomes between he two treatments. In contrast, Gamson's Law predicts that the change in nominal bargaining power will sharply increase shares to the 45 vote block, and that the 9 vote block will always be part of the winning coalition. For

[19]Throughout the text, when we refer to the SZ strategy we mean a proposal for a minimal winning coalition.

[20]The null hypothesis of no random-effects can be rejected in all cases except for the experienced EWES treatment.

[21]However, if instead we only use share as a regressor, it is highly statistically significant. Regressing vote on SZ alone or on PS alone neither variable is statistically significant at the 5% level on its own.

inexperienced voters, the change in nominal bargaining power does, in fact, result in larger requests by those holding 45 votes versus those holding 9 votes (a 0.53 share versus a 0.48 share; p = .05, 2 tailed Mann-Whitney test).[22] Note, however, that these 45 vote proposals are no more than the average share requested under the EWES treatment (a 0.55 share). Further, these differences between 45 vote requests and 9 vote requests are no longer present for experienced subjects (0.52 for subjects with 9 votes and 0.53 for subjects with 45 votes). For inexperienced voters, 45 vote blocks offer shares to 9 vote blocks slightly more often than to 45 vote blocks (64% of all proposals versus 56%), but this difference is not significant at conventional levels. (These numbers do not sum to one because of offers to supermajorities.)[23]

In all other dimensions behavior is the same across treatments. In particular we cannot reject a null hypothesis that the fraction of SZ proposals is the same across treatments. Nor can we reject a null hypothesis that shares offered to 9 vote blocks versus 45 vote blocks are the same. Finally, the hypothesis that voting behavior is the same across both treatments cannot be rejected (even at the 10% level).[24]

Conclusion 6 *Under the UWUS treatment 45 vote blocks offer coalition membership to 9 vote blocks significantly more often than to 45 vote blocks. Further, as predicted under the symmetric BF model, a null hypothesis that 9 vote blocks are included in 90% of all such proposals cannot be rejected at conventional levels for experienced voters.*

With experienced subjects there are no significant differences in terms of proposed shares and voting behavior between the UWUS and the EWES treatments, nor between blocks of different size within the UWUS treatment, consistent with the BF

[22]The tests reported for this conclusion and the next one use all proposals, selected or not, and for all rounds within a given election.

[23]These are not the population averages. We first take the average for each subject and then report the average of these numbers. The two do not coincide because some subjects play more rounds than others. A sign test is performed to establish if the percentage offers to 9 vote blocks is the same as to 45 vote blocks.

[24]Interacting the share offered variable (s_{it}) with a dummy for the number of votes controlled by the subject (9, 33, or 45), we estimate the unrestricted model. Then a likelihood ratio test is performed using regression (5) as the restricted model.

model's prediction. There are only some minor differences in voting behavior with inexperienced subjects.

For inexperienced voters, 9 vote blocks are included in the proposals of 45 vote blocks more often than other 45 vote blocks (74% of the time versus 51% of the time, p <0.05, one tailed sign test). This difference increases for experienced voters, with 9 vote blocks included 77% of the time versus 47% of the time for 45 vote blocks (p <0.1, one tailed sign test). Even more striking, for experienced voters, we cannot reject (even at the 10% level) the null hypothesis that 9 vote blocks are given money 9 times more often than 45 vote blocks.[25] That is, we cannot reject that proposers mix in the proportions predicted under the BF model. Although this failure to reject the null hypothesis could be due to a combination of small sample size and the low power of the sign test, there is sufficient power to reject the null hypothesis that both types are equally likely to be invited into a coalition.

Shares requested by 45 vote blocks are not significantly different from those requested by 9 vote blocks for either inexperienced or experienced voters. (9 vote blocks average 0.53 when inexperienced and 0.47 with experience while 45 vote blocks average 0.55 and 0.53 respectively). Nor are they different from the shares requested under the EWES treatment (0.55 without experience and 0.56 with experience). As already noted, we do find that shares required to accept a proposal are greater for 45 vote blocks than for 9 vote blocks. However, this difference is not present for experienced voters.

5 Discussion of Results For $\delta = 1$ Treatments

Our results provide reasonably strong qualitative support for the BF model and rather decisively reject any hypothesis of proportionality of shares to nominal bargaining power, as Gamson's Law would suggest. In fact, (1) a majority of proposals pass without delay, (2) a majority of proposals are for minimal winning coalitions, (3)

[25] Once again this is not a result at the population level, but rather this is saying that each subject tends to mix in these proportions.

proposers get a significantly larger share of the benefits than coalition members (and substantially larger shares than the average "legislator"), (4) voting is essentially unaffected by the changes in nominal bargaining power, (5) the changes in nominal bargaining power do not produce any increase in shares requested or received for the 45 vote blocks compared to the EWES treatment, (6) 9 vote blocks are invited into coalitions significantly more often than 45 vote blocks in the UWUS treatment (as both BF and Gamson's Law predict) but not so in the UWES treatment (as BF predicts while Gamson's Law calls for inclusion in *all* coalitions), and (7) the null hypothesis that experienced voters mix in the proportion predicted under the symmetric BF model cannot be rejected.[26]

This last fact, that voters mix in the correct proportion, is quite striking and at odds with other reported tests of mixed strategy equilibria (see, for example, Ochs (1995), Erev and Roth (1998)). One potential caveat to this conclusion is that the analysis includes all proposals, whereas (arguably) we want to restrict attention to minimal winning coalitions. Restricting the analysis in this way does not, however, change the results using subject choices as the unit of observation and the sign test. If we are willing to rely on more stringent distributional assumptions, we can reject the null hypothesis of mixing in the correct proportion using a t-test (p-value = 0.05). Thus, it is not clear that subjects mix in exactly the right proportions. But this, we believe, is quite beside the point. It is not uncommon for experimenters to report that subjects mix in incorrect proportions *and that these proportions move in the wrong direction with changes in treatment conditions.* For example, Ochs (1995) reports that in a simple matching pennies game, when payoffs are changed, subjects increase the frequency of play for the choice predicted to decrease under the mixed

[26]The SSPE also predicts that between rounds of a given election subjects will select whom to include in their coalition randomly rather than exhibit either positive nor negative reciprocity based on offers in earlier rounds. For elections that have more than one round, we compute the number of times a subject includes the proposer from the previous round in his coalition and the number of times he doesn't. If proposers randomize between rounds the proposer from the previous round should be included as often as the other voter. Using a sign test and individual subjects as the unit of observation, we cannot reject a null hypothesis of randomization between rounds.

strategy equilibrium. While we can only speculate as to why subjects alter their behavior in the correct direction in our experiment, one peculiarity of the present design is that in equilibrium (and in actual play) payoff shares do not change, only who is getting what is affected. In contrast in the matching pennies game payoffs change with changes in the mixing, and subjects are required to choose the higher payoff alternative *less often* in order to change the mix in the required direction. That is, there are conflicting forces at work in the matching pennies game, which require counter-intuitive behavior – play the alternative whose payoff increased less often. In contrast, there are no such conflicting forces at work in the present game and, if anything, the mixing requirement seems much more intuitive – include the "weaker" player more often than the "stronger" one.

	Inexperienced	Experienced	Simulation§
Proportion of Votes Held	0.372***	0.275***	0.400***
	(0.035)	(0.040)	(0.024)
Constant	0.266***	0.333***	0.300***
	(0.016)	(0.020)	(0.014)
No. of Obs.	377	174	198
R^2	0.230	0.215	0.582

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

§ See text.

Table 6: Effects of Votes on Shares

Our decisive rejection of Gamson's Law is rather surprising given its robustness in field data (Browne and Franklin 1973, Browne and Frendreis, 1980, Warwick and Druckman 2001). The claim of support for Gamson's law using field data is based in large measure on using number of votes (proportion of seats held) as a regressor to explain the fraction of ministerial positions a party holds. Table 6 reports regressions to this for our data set where we substitute share of payoffs for ministerial positions as the dependent variable. We limit ourselves to using treatments EWES and UWUS, since they both employ nominally proportional selection rules for recognizing proposals, the pattern found with respect to government formateur rules in field data (Diermeier and Merlo 2001).[27] The results clearly show that the percentage of votes controlled affects the share of the benefits received.

How can we reconcile the results in Table 6 with the rather decisive rejection of Gamson's Law reported earlier? We argue that the regression confirming Gamson's Law is simply misspecified. The key factor at work here is the nominal proportional selection rule, in conjunction with the fact that proposers take larger shares for themselves and include the small voting block more often than the large block. As a consequence, blocks with more votes wind up, ex-post, taking more on average because they are selected to be the proposer more often, and they give smaller shares to their coalition partner. The role of these factors is rather dramatically illustrated in the simulation reported in the last columns of Table 6. There, we have generated results for 198 simulated elections. Half of the elections simulate the EWES treatment and half simulate the UWUS treatment. In both cases simulated subjects follow the SSPE of the BF model with proposal selection probabilities following the nominal proportional selection rule. The results reported in the last column of Table 6 provide a close match to the experimental data, even though our simulated voters are following the SSPE of the BF model![28]

Note however, that the empirical results using field data are stronger than those

[27]More precisely, we regress the share allocated to a subject on the votes controlled by that subject divided by the number of votes in the winning coalition. Of course, to appropriately estimate such a model, we should account for the panel structure of the data. However, our intention is to reproduce the kind of estimation performed on field data, and those do not correct for repeated observation and so we don't.

[28]The specification we have estimated is not the only one found in the litterature. For instance Warwick and Druckman 2001 propose two specifications, one which is the same as what we present in table 6 without a constant, and the other one has two regressors: percentage of seats held and percentage of seats held interacted with a dummy variable for the proposer. Estimating these specifications on our simulated data generate the same kind of problems. The fitted values for the two models are $\overline{s}_{it} = 0.827 \times (fraction\ of\ Votes\ Held)_{it}$ with a R^2 of 0.8649 and $\overline{s}_{it} = \underset{(0.059)}{0.791} \times (fraction\ of\ Votes\ Held)_{it} + \underset{(0.065)}{0.043} \times (fraction\ of\ Votes\ and\ proposer)_{it}$ with a R^2 of 0.8653. Notice that in the latter, the second regressor, which is supposed to identify proposer power, is not statistically significant.

reported in Table 6. Field data estimates yield a constant much closer to 0 and the coefficient estimate for the percentage of votes held by the voting blocks is much closer to 1. Also the R^2 is much higher than reported in our regressions. This superior fit of Gamson's Law in the field data rests on the fact that (i) government formateur rules typically follow a proportional selection rule (Diermier and Merlo, 2001) and (ii) in field data real bargaining power is likely to be closely correlated with the number of seats controlled, because the number of voting blocks (parties) is much larger than 3 in many countries. When there are many parties, as is typically the case with the field data since they are for European parliamentary democracies, the number of seats controlled provides a reasonably close approximation to real bargaining power most of the time. In any case, the lesson from the exercise reported in Table 6 is that even when Gamson's Law is clearly violated in favor of the SSPE of the BF model (as in our simulations), the proportional selection rule in conjunction with the SSPE share allocations yields a regression outcome consistent with Gamson's Law.

The quantitative deviations from the SSPE reported here are largely consistent with the deviations from subgame perfect equilibrium outcomes reported in bilateral bargaining game experiments and in three person ultimatum game experiments. The main insight from the bilateral bargaining game literature is that responders 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 though the subgame perfect equilibrium prediction calls for accepting any allocation short of zero.[29] Further, in anticipation of such responses proposers offer a substantial share

[29]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

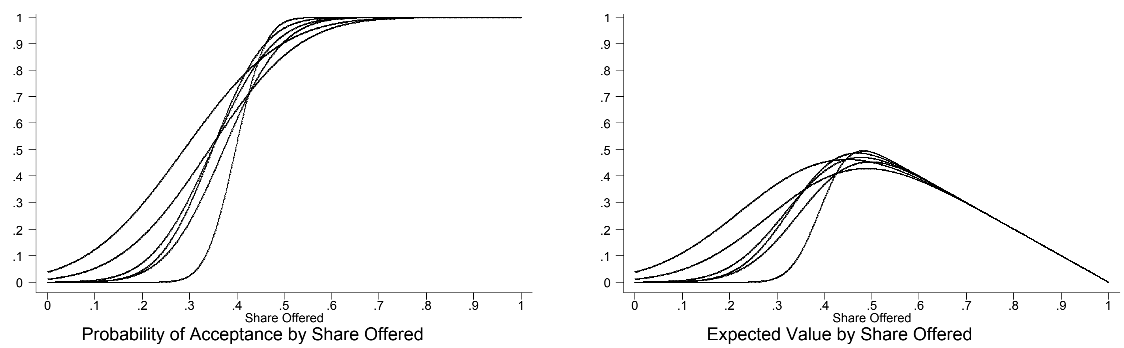

Figure 2: Probability of Acceptance and Expected Value by Share Offered

of the pie, with median shares for responders of around 40% (see Roth, 1995 for a review of this literature).[30]

These bilateral bargaining game results can help explain why proposer's don't take as much as predicted, but only if the minimum threshold for responders is above 1/3 of the pie. However, the 1/3 threshold is what one might expect based on (i) the limited three player ultimatum game results reported (Guth and Van Damme 1998, Kagel and Wolfe, 2001), (ii) models attempting to explain behavior in the ultimatum game and related experiments (Bolton and Ockenfels, 2000), and (iii) results from other legislative bargaining game experiments (Frechette, Kagel and Lehrer, in press). In fact, the 1/3 threshold provides a good ex-ante predictor of average voting behavior in our games: Inexperienced voters reject 97% of all offers below 1/3, with experienced voters rejecting 98% of all such offers; inexperienced voters accept 78% of all offers above 1/3, with experienced voters accepting 89% of all such offers. (Offers of exactly 1/3 are accepted close to 50% of the time)

The key to reconciling the reasonably good performance of the 1/3 rule of thumb (ROT) with the failure of proposers to obtain shares close to the SSPE prediction rests on the fact that for shares between 1/3 and 1/2, the rejection ratio is relatively

example, Slonim and Roth 1999).

[30]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.

high (recall Figure 1); sufficiently high that it is not profitable, in an expected value sense, to make offers closer to the SSPE prediction. Figure 2 shows the probability that different shares are accepted according to the estimation results presented in Table 5 (assuming SZ offers) for all three treatments and both experience levels. It also gives, for each of these shares, the amount that proposers would need to offer their coalition partner to maximize the proposers expected return. None of the lines are labelled (as it would make the graph too hard to read), but the point is that these curves are all very similar and their expected value peaks somewhere between an offer of 0.4 and 0.5. In fact the exact maximands are offers of: 0.48 for EWES without experience, 0.45 for EWES with experience, 0.50 for UWES without experience, 0.48 for UWES with experience, 0.49 for UWUS without experience, and 0.47 for UWUS with experience. In other words, to maximize expected value, proposers should take for themselves between a 0.5 and 0.55 share of the pie, which is very close to what is observed.

Our next treatment explores the effect of sharp discounting for the EWES case. In conducting this treatment we have two issues in mind. First, to better understand the failure of the 1/n ROT. Second, to test the predictive performance of the BF model when the 1/n ROT is wildly different from the continuation value of the game under the SSPE.

6 Results For $\delta = 0.5$ Treatment

Conclusions 1 through 4 carry over to the case with discounting.

(1) Most elections end in round 1 (89% for inexperienced subjects and 95% for experienced subjects). This is a higher percentage compared to EWES with $\delta = 1$ ($p < .05$, Mann-Whitney test for both inexperienced and experienced subjects). Thus, introducing discounting increases the probability that elections will end in round 1.

(2) Most proposals are for minimal winning coalitions: 43% for inexperienced voters and 77% for experienced voters. However, if we consider offers that allocate as little as $\frac{1}{30}$ as the smallest share to be of the SZ type (let's call this the approximate SZ or ASZ), then 62% and 85% of all offers are of the ASZ type for inexperienced

and experienced subjects respectively. [31] The percentage of equal splits are 6% and 1% for inexperienced and experienced voters respectively. The percentage of SSPE offers are less than 1% in both cases. This is much lower than for $\delta = 1$ were the SSPE offers averaged 12% and 11% for inexperienced and experienced subjects respectively.

(3) Proposers take significantly larger shares for themselves than for the next largest share holder: an average share of 0.50 when inexperienced, and 0.59 when experienced compared to shares of 0.41 and 0.39 for the second highest shareholders ($p < 0.01$, two-tailed sign test).

(4) Voting behavior is once again centered around 1/3 as the cut-off for accepting versus rejecting offers (see Figure 3). A random effects probit as described in equation 5 yields result similar to those reported in Table 5 for the $\delta = 1$ case. Namely, own share is the only significant variable in the regression. However, in this case shares between 1/3 and 1/2 are much more likely to be accepted than when $\delta = 1$. Table 7 reports a random effects probit with pooled data from the $\delta = 1$ and $\delta = .5$ treatments where own share is interacted with a dummy for the discount factor. This leads to our next conclusion.

Conclusion 7 *Subjects in the $\delta = 0.5$ treatment accept, on average, lower shares than in the $\delta = 1$ treatment.*

The willingness of coalition partners to accept lower shares when $\delta = 0.5$ reduces the offer maximizing proposers share to 0.39 and 0.36 for inexperienced and experienced subjects respectively. These offers would yield average shares of .61 and .64 for inexperienced and experienced proposers respectively, substantially larger shares than actually realized (shares of .50 and .59 for inexperienced and experienced proposers), from which we would have to conclude that propers were reasonably far

[31] With $\delta = 1$ distinguishing between strict SZ and offers of less than or equal to $\frac{1}{30}$ (an offer of \$1 or less in round 1, offers that are near universally rejected) had no impact because such offers were quite rare.

	EWES	
	Inexp.	Exp.
Share $\delta = 1$	7.23***	10.77***
	(0.76)	(2.60)
Share $\delta = 0.5$	10.10***	14.76***
	(0.94)	(3.62)
SZ	0.17	0.47
	(0.23)	(0.61)
PS	-1.31	-2.81
	(0.84)	(3.60)
Constan	-1.77***	-2.07
	(0.50)	(2.12)
No of Obs.	480	160
Log Lik.	-133.12	-23.71

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

Table 7: Random Effects Probit Estimates of The Determinants of Vote

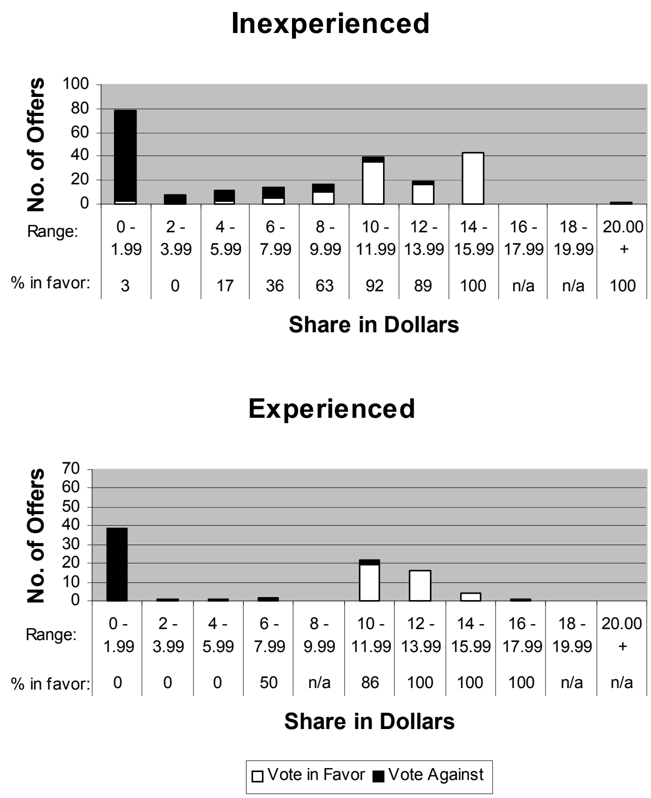

Figure 3: Votes by Shares (represented in dollar amounts) In EWES Treatment with $\delta = 0.5$

away from maximizing their returns. However, a closer look at the data shows considerable adjustment over time in shares offered for the $\delta = 0.5$ treatment compared to $\delta = 1$. In the $\delta = 1$ treatments, proposals were almost immediately at the correct level, meaning they maximized expected value given how coalition members voted. With $\delta = 0.5$ proposers start out offering too much, but adjust their offers over time so as to increase their own shares. This is reported in Figure 5 which shows the evolution of the proposers' share over time (this is using all proposed allocations, selected or otherwise). For both experience levels, proposers allocate more to themselves at the end then at the beginning (0.45 to 0.55 for inexperienced voters and 0.58 to 0.62 for experienced voters). Such evolution was absent from the $\delta = 1$

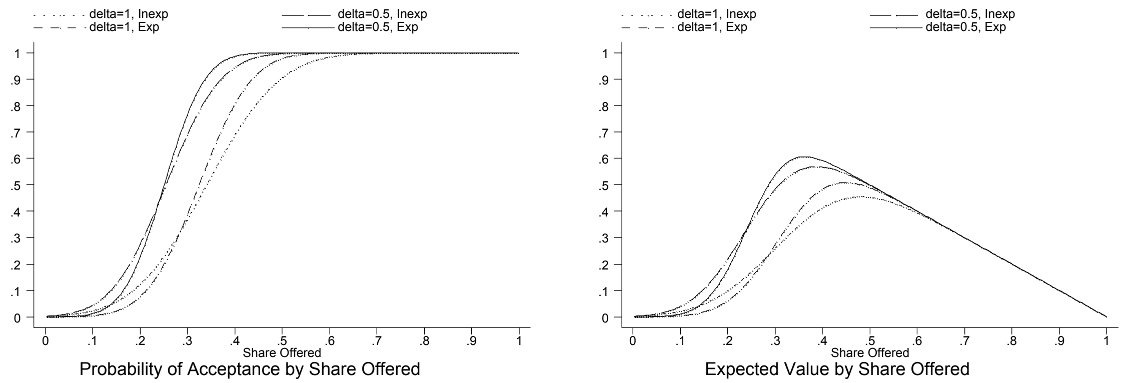

Figure 4: Probability of Acceptance and Expected Value by Share Offered

treatment.[32]

Note that experienced subjects start out asking for more than they did at the end of the inexperienced subject sessions, so that by the end of the experienced subject session, they are almost taking the share that maximize their expected return, conditional on how coalition partners were voting.

Conclusion 8 *The proposer's share increases with increases in the discount factor, as coalition partners are willing to accept smaller shares. However, it takes time for proposers to realize this. Further, coalition partners appear unwilling to accept shares much below 1/3 and/or proposers are reluctant to make such low offers. As a result, proposer's share is further away from the SSPE prediction with* $\delta = .5$ $(\frac{5}{6})$ *compared to the* $\delta = 1$ *case.*

The average share proposers allocate to themselves in the last three elections of the experienced voter session with $\delta = 1$ is 0.55 compared to 0.61 with $\delta = 0.5$ (p <0.05, two tailed Mann-Whitney test). This is a difference of .06 compared

[32]For instance, averaging by individuals the share they allocate to themselves in elections one through seven and eight through ten, and comparing these two numbers using a sign test, we can reject the null hypothesis that they are the same against the one sided alternative that the shares are greater at the end of the sessions for both experience levels in the $\delta = 0.5$ condition. On the other hand, that same test cannot reject the null in the $\delta = 1$ condition for either experience level.

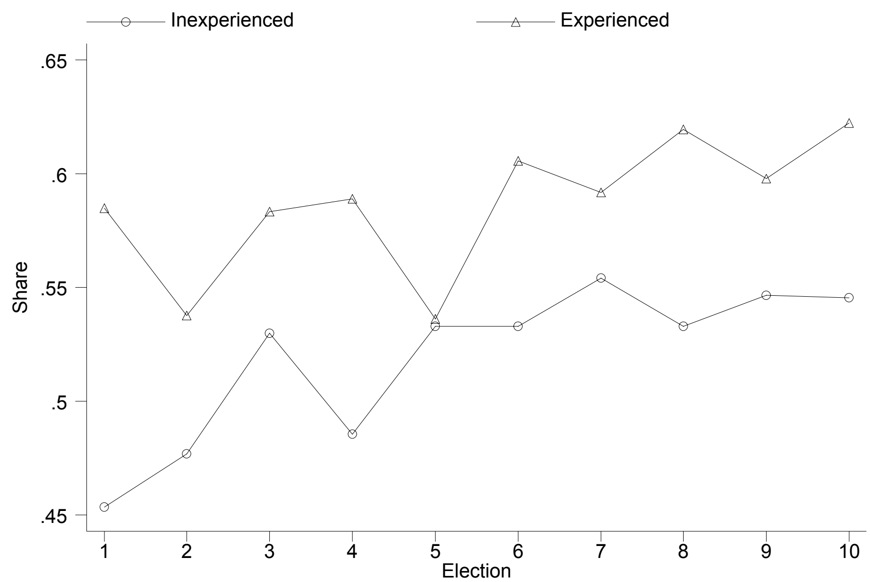

Figure 5: Proposer's Take in The $\delta = 0.5$ Treatment

to the predicted difference of 0.167.[33] Thus, lowering the discount factor affects behavior in the right direction: immediately lowering the acceptance threshold for coalition partners and slowly increasing proposer's share. However, the threshold for accepting an offer does not dip below the $\frac{1}{3}$ ROT suggested in the bilateral bargaining literature (Bolton and Ockenfels, 2000). As in the bilateral bargaining experiments, responders' reluctance to offers much below $1/n$ would appear to pose a fundamental barrier to achieving the SSPE outcome in these legislative bargaining games.

7 Conclusion

We have investigated the effect on legislative bargaining of changes in voting blocks nominal bargaining power, in the proposal selection protocol, and in the discount

[33] As noted, proposers are still converging to the optimum share with $\delta = 0.5$. However, even if they got to the share maximizing their expected return (0.64), the difference from the $\delta = 1$ treatment would be .09 compared to the predicted difference under the SSPE of 0.167.

factor that applies when passage of legislation is delayed. These changes in treatment conditions permit us to separate out the predictions of the Baron-Ferejohn bargaining model from the predictions of Gamson's Law both of which have been popular in the legislative bargaining literature. The paper makes three basic contributions.

First, it improves our understanding of the performance of the Baron-Ferejohn bargaining model. All the comparative static predictions of the model find some support: Changing the number of votes each legislator controls without altering their bargaining power doesn't affect behavior, contrary to the predictions of Gamson's Law, but consistent with Baron-Ferejohn. Changing the proposal selection rule to a nominal proportional one increases the probability that the small voting block will be invited into the coalition, as Baron-Ferejohn and Gamson's Law both predict. However, increasing nominal bargaining power without a proportionate increase in the proposal selection rule does not have the same effect, consistent with Baron-Ferejohn and contrary to Gamson's Law. Reducing the discount factor decreases the share legislators need to be offered to accept a proposal and, with some lag, increases the share proposers ask for, consistent with Baron-Ferejohn. (Gamson's Law is silent on this point). Finally, proposers have an advantage, albeit not as much as Baron-Ferejohn predict. All of these results are achieved without discounting or a finite number of bargaining periods, so that they clearly result from the fundamental force that Baron-Ferejohn predicts drives behavior: potential exclusion from the winning coalition.

Second, it refines our understanding of other regarding behavior. We confirm that subjects do not seem to care for others in an altruistic sense, or in terms of maximizing the worst off players share, as own share is, consistently, the only factor affecting voting for or against proposals. As in bilateral bargaining game experiments, proposers fail to take as much as predicted under the subgame perfect equilibrium, but come close to maximizing own expected return conditional on the heterogeneity in "responders" behavior. The $1/n$ ROT found to organize behavior in Frechette, Kagel and Lehrer (in press) and in Bolton and Ockenfels (2000) seems to act as a strict lower bound on acceptable offers both with and without discounting. However, it appears to take some discounting for it to serve as an acceptable ROT for offers between $1/n$ and strict equality within a minimal winning coalition.

Third, it improves our understanding of previous empirical work that uses field data. Distinguishing between competing hypotheses such as Gamson's Law and Baron-Ferejohn model's predictions is not as simple as it might seem at first glance. Even within our simple experimental design we find treatment conditions where the predictions of the two hypotheses coincide (EWES), and treatment conditions where Gamson's Law predicts even stronger proposer power than Baron-Ferejohn (when the proposer is a large voting block in UWES and UWUS). Our results also suggest that the empirical findings of proportionality (between the percentage of seats political parties hold and the percentage of ministerial positions obtained) result in part from the fact that the role of government formateur is more often held by parties with the largest number of seats in the parliament.

There are a number of obvious and potentially important extensions to the present line of research. First, what happens with changes in real as opposed to nominal bargaining power? Do shares now clearly favor those with greater bargaining power, and is this power proportionate or in line with the more extreme predictions of the Baron-Ferejohn model?[34] What is the impact of pre-proposal communication (cheap talk) that permits proposers to establish competition between potential coalition partners? This would seem to be part of any real world legislative bargaining process, and might well move proposer power closer to the Baron-Ferejohn predictions. What will be the impact of veto players on outcomes (see Winter, 1996 for predictions within the Baron-Ferejohn framework)? These and other related questions remain to be investigated.

[34]Preliminary results from a companion series of experiments clearly support significant changes in proposer's share with increased real bargaining power. However, the jury is still out on the question of proportionality of shares versus Baron-Ferejohn's predictions (Frechette, Kagel and Morelli, in preparation).

8 Proof of Proposition 1

(I) See Montero (2002).

(II) Suppose first that there is one player – say player i – who is offered $x < \frac{1}{3}$ in a SSPE, and the other players have an acceptance threshold strictly greater than x. Then any $j \neq i$ would strictly prefer to offer x to i rather than offering to the other potential responder. But then this means that the continuation payoff is $x = \rho_i X + (1-\rho_i)x$, where X denotes his payoff when he is a proposer. Note immediately that this implies $X = x < \frac{1}{3}$. But then consider any $j \neq i$. Given the assumptions made, he can be offered $y > x$, but he is only offered y when i is the proposer, since $k \neq j \neq i$ prefers i to j. Hence $y = 1-x$. However, the continuation equilibrium equation requires $y = \rho_j(1-x) + \rho_i y = (1-x)(\rho_j + \rho_i)$, which is in contradiction with $y = 1-x$. A similar logic allows to find a contradiction to the possibility that two players have equal expected payoff but both below $\frac{1}{3}$. Intuitively, in this case the third player would never be chosen as a responder, so the continuation equilibrium payoff would have to be low, contradicting his highest expected payoff.

(III) Given (II), the continuation equilibrium equations require:

$$\begin{aligned}\tfrac{1}{3} \;=\; & \rho_i \tfrac{2}{3} + \rho_j \left(1 - p_j^k\right) \tfrac{1}{3} + \left(1 - \rho_i - \rho_j\right) \left(1 - p_k^j\right) \tfrac{1}{3} \\ & \rho_i \left(1 - p_i^k\right) \tfrac{1}{3} + \rho_j \tfrac{2}{3} + \left(1 - \rho_i - \rho_j\right) p_k^j \tfrac{1}{3} \\ & \rho_i p_i^k \tfrac{1}{3} + \rho_j p_j^k \tfrac{1}{3} + \left(1 - \rho_i - \rho_j\right) \tfrac{2}{3}\end{aligned} \tag{6}$$

The solution to this system allows us to find the range for those three probabilities compatible with the unique acceptance threshold equal to $\frac{1}{3}$. For every $p_k^j \in [0,1]$, the other two probabilities have to be $p_j^k = \frac{\rho_i - p_k^j + p_k^j \rho_i + p_k^j \rho_j}{\rho_j}$ and $p_i^k = -\frac{1 - \rho_i - 2\rho_j - p_k^j + p_k^j \rho_i + p_k^j \rho_j}{\rho_i}$.

Notice that: $0 \leq \frac{\rho_i - p_k^j + p_k^j \rho_i + p_k^j \rho_j}{\rho_j} \Rightarrow \left\{ p_k^j \leq \frac{\rho_i}{1-\rho_i-\rho_j} \right\}$, $0 \leq -\frac{1 - \rho_i - 2\rho_j - p_k^j + p_k^j \rho_i + p_k^j \rho_j}{\rho_i} \Rightarrow \left\{ p_k^j \geq \frac{1-\rho_i-2\rho_j}{1-\rho_i-\rho_j} \right\}$, $1 \geq \frac{\rho_i - p_k^j + p_k^j \rho_i + p_k^j \rho_j}{\rho_j} \Rightarrow \left\{ p_k^j \geq \frac{\rho_i-\rho_j}{1-\rho_i-\rho_j} \right\}$, and $1 \geq -\frac{1 - \rho_i - 2\rho_j - p_k^j + p_k^j \rho_i + p_k^j \rho_j}{\rho_i} \Rightarrow \left\{ p_k^j \leq \frac{1-2\rho_j}{1-\rho_i-\rho_j} \right\}$.

Consequently, any profile of probabilities such that (1) holds constitute a mixed strategy SSPE. **Q.E.D.**

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