Gains versus Costs in Legislative Bargaining*

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Abstract

Outcomes under the Baron-Ferejohn (1989) model are investigated when proposers distribute benefits versus imposing costs, under theoretically isomorphic treatments. Initial experimental sessions showed greater proposer power under Costs than Gains, contrary to the predicted isomorphism and reference dependent preferences. Questionnaire responses indicated that voters were most concerned with being left out of the winning coalition, thereby making the maximum Cost payment, and wiping out their entire endowment, given the high frequency of minimum winning coalitions. A second set of sessions increased voters' endowments resulting in modestly greater proposer power under Gains. Surprisingly this resulted from increased proposer power under Gains, as opposed to a reduction in proposer power under Costs.

Key words: legislative bargaining, pork versus taxes, reference dependent preferences
JEL classification: D72, C70, C92

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We experimentally investigate the Baron-Ferejohn (1989) model, the leading formal legislative bargaining model in the political science literature. The model has been the subject of a number of prior experimental studies, all of which involve distributing positive benefits (see Palfrey, 2016 for a recent survey). The primary contribution of the present paper is to investigate the model when proposers are tasked with distributing benefits (the Gains treatment) versus raising money to pay for a proposed project (the Costs treatment). In looking at Gains versus Costs in the laboratory players have different initial endowments, under which the two treatments are theoretically isomorphic; i.e., bargaining outcomes yield the same predicted outcome in terms of final payoffs under both Gains and Costs under Von Neumann-Morgenstern utility. In addition, pre-play communication (cheap talk) between the proposer and potential collation partners is permitted, as opposed to most previous experiments that do not permit consultation with potential coalition partners. Pre-play communication does not change the equilibrium predictions of the model, but comes closer, procedurally, to how legislative bargaining occurs outside the lab and empirically generates outcomes closer to the strong proposer power predicted under the stationary subgame perfect equilibrium (SSPE) (Agranov and Tergiman, 2014; Baranski and Kagel, 2015). Identifying differences in bargaining over gains and losses not only provides insight into what facilitates agreement and possible differences in proposer power, but it also has potential implications for institutional design as will be discussed later.

In an initial set of experimental sessions, voters' endowments were such that under a minimum winning coalition (MWC), players outside the winning coalition earned a zero payoff (in Costs players lost all of their initial endowment; in Gains they received no benefits). In these sessions, under both treatments the large majority of proposals pass without delay and there is strong proposer power, similar to what has been reported in earlier experiments with pre-play communication. However, there is significantly greater proposer power under Costs than Gains, with corresponding lower allocations to coalition partners. Furthermore, low shares for coalition partners are more likely to be rejected under Gains than Costs. These outcomes are contrary to the predicted isomorphism between the two treatments under Von Neumann-Morgenstern utility, as well what might be expected under Prospect Theory (PT) type preferences (Kahneman and Tversky, 1979).

A post experiment questionnaire designed to better understand behavior showed that under Costs players were most concerned with being left out of the winning coalition, thereby incurring the maximum cost, which would result in losing all of their initial endowments. In contrast under Gains, voters were most concerned with their payoff relative to the proposer's payoff. A second set of experimental sessions were conducted to investigate this by increasing subjects' initial endowments by $20 under both treatments while keeping total "tax" payments and "pork" to be distributed the same as in the earlier sessions so as to preserve the theoretical isomorphism between the two treatments. Now, being left out of an MWC would still leave voters with a reasonable positive payoff under Costs, as well as reducing the perceived disparity between the proposer's and voters' payoffs under Gains.[1]

In this second series of experimental sessions there was stronger proposer power under Gains when averaging over all bargaining rounds, with coalition partners' shares lower under Costs, with both outcomes marginally significant ($p < 0.10$). However, over the last 5 bargaining rounds, these differences were no longer statistically significant. Further, there were no significant differences in included voters' rejection rates between the two treatments, so that over the last five bargaining rounds we cannot reject a null hypothesis that the theoretical isomorphism predicted under expected utility is satisfied in the data. Most of the changes in bargaining outcomes from the earlier sessions resulted from changes in the Gains sessions, to be discussed in detail below.

The structure of the paper is as follows: Section I briefly reviews previous experimental results for the Baron-Ferejohn model with pre-play communication. Section II reports the experimental design and procedures, along with the results from the initial set of experimental sessions. Section III reports the procedures and results from the second set of experimental sessions. Section IV reports the content of voter-proposer communication. Section V concludes with a summary of the main results, along with their relationship to predictions from Prospect Theory.

[1] This outcome would be predicted as a result of the numerosity-adaptation effect identified in the psychology literature (discussed below).

I. Prior Experimental Research

Both Agranov and Tergiman (2014; AT) and Baranski and Kagel (2015; BK) report investigations of the Baron-Ferejohn (BF) model of legislative bargaining with pre-play communication. Both experiments involved distributing a sum of money by majority rule. AT employ a 5 player game with the amount of money to be distributed shrinking by 20% following a rejected offer, with BK employing a 3 player game with no discounting. There are a number of other, smaller differences between the two experiments, but the major results are quite similar. In both cases proposers' payoffs are substantially closer to the SSPE prediction with than without pre-play communication – 84.7% of the SSPE prediction versus 64.7% in AT and 88% versus 73.0% in BK. In both cases this was accompanied by a modest *increase* in the frequency with which first stage offers were accepted.[2]

As noted, there are no investigations of the Baron-Ferejohn model that we are aware of involving how to share costs, or comparing costs to an equivalent design distributing benefits. However, there are two papers dealing with similar issues. Camerer, et al. (1993) investigate a shrinking-pie, multi-round, *bilateral* bargaining game, comparing the results to an isomorphic treatment in which losses increase over time.[3] They find more dispersed offers, greater initial rejections and lower proposer payoffs with losses as opposed to benefits. However, the present experiment involves multilateral bargaining under majority rule, where one of the more robust experimental predictions is the formation of MWCs.[4] Closer in design to the present experiment, Christiansen and Kagel (2016) investigate the Jackson and Moselle (2002) multilateral bargaining model where agents bargain over both a public policy (with differential benefits to voters) along with distributing benefits or imposing costs. Unlike the present experiment, they find higher rejection rates when imposing costs as opposed to distributing benefits. This is discussed in more detail in the concluding section of the paper, pointing out significant differences between the structure of the present experiment and the Christiansen-Kagel experiment.

[2] From 81% to 89% in AT and from 76% to 80% in BK.
[3] Their emphasis is on using eye-tracking to record information search to determine the extent to which agents use backward induction.
[4] Although far from universally observed, MWCs occur with high frequency, commonly increasing with experience (see Fréchette, et al., 2003, 2005, as well the results reported here).

II. The Initial Set of Experimental Sessions

Experimental Design and Procedures: The experiment consists of a three-player Baron-Ferejohn (BF) legislative bargaining game under majority rule. In Gains players decide how to split $30 under majority rule where, as is typically the case, all players have $0 to begin with. In Costs players must decide how to raise funds to "pay for a common project." The initial cost of the project is $60, with each player endowed with a $30 voucher (see Figure A1 in the online appendix) against which to cover her costs.[5] To generate the theoretical isomorphism no player can be taxed more than the value of their voucher. (Note that "taxes" are never explicitly mentioned, rather the phrase, "the cost of the project" was used to avoid unintended meaning responses.) This restriction might be thought of as a constitutional requirement, a result of a prior bargaining outcome, or due to political "realities".

A bargaining round begins with one of the three players randomly chosen to propose the distribution of benefits, or costs, to be voted up or down without amendment. If the proposal passes the bargaining round ends with the proposed allocation binding. If the proposal is rejected the same set of players moves on to a new bargaining *stage*, with a new proposer randomly selected, with the amount of money to be split reduced by 15%. (In Costs the amount required for the project increases such that the sum of endowments minus all taxes also decreases by 15%.) This process repeats itself until a proposed allocation passes, after which play moves to the next bargaining round with subjects randomly reshuffled into new bargaining groups. Voter ids changed across bargaining rounds, but remained the same within a given bargaining round, so that voters had the opportunity to form a blocking coalition within a given bargaining round.

Prior to offering a proposal there was a period of free form communication between the proposer and each of the voters. Messages could be sent via public communication, seen by all, or privately between a voter and the proposer, or between the two voters. This communication stage lasted for up to three minutes, after which the proposer makes a take it or leave it allocation to be voted on.[6] Proposers were automatically counted as voting in favor of their proposal. During the

[5] Subjects had the $30 voucher on their desk at all times, which also served as a receipt for payment after subtracting out what-ever their costs were.

[6] The communication stage could be terminated earlier once the proposer and both voters clicked the end communications button. This rarely happened.

communication phase subjects were instructed to remain anonymous, not to reveal their names or any other identifying information.[7]

When voting, subjects saw the proposed allocation to all three players, with results reported immediately after the vote. Feedback following voting consisted of the proposed allocation and how each player voted. Players had access to this data within a given bargaining round as well as for allocations passed in prior bargaining rounds.

There were ten bargaining rounds in an experimental session, plus a dry run at the beginning to familiarize subjects with the software, voting rules and feedback provided. Earnings were based on one randomly selected bargaining round, plus an $8 show up fee. All payoffs were in cash at completion of the ten bargaining rounds.

There were four Cost sessions and four Gains sessions, with between 12 and 18 subjects in each session, with a total enrollment in the Gains treatment of 63 and 57 for Costs. There was no overlap in subject participation between sessions. All participants were Ohio State undergraduate students. Software was developed using z-Tree (Fischbacher, 2007).

Theoretical Considerations: There are multiple equilibria in the BF bargaining model. To narrow down these predictions researchers focus on the stationary subgame perfect equilibrium (SSPE), a subgame perfect equilibria in which players' strategies are the same in structurally equivalent subgames. Behavior will be compared to the SSPE point predictions, as well as a number of robust qualitative predictions of the model; e.g., the existence and level of proposer power, the frequency of minimum wining coalitions (MWCs), etc.

In the SSPE the proposer forms an MWC, giving the coalition partner her discounted continuation value, and keeping the rest. In the Gains treatment, the continuation value is $\delta^t(30)/3$ in stage $t = 1, 2, ...$ With $\delta = 0.85$ the stage 1 continuation value is $8.50 for the coalition partner, $21.50 to the proposer, and $0 to the voter outside the MWC. Bargaining is predicted to end without delay. To minimize the need for calculations, the amount of money left to be distributed following a rejected offer was posted on players' computer screens prior to each stage of the bargaining process.

[7] Reviewing the conversations, no one violated the anonymity rule. The complete set of instructions is reported in the online appendix along with screen shots.

The Costs treatment is isomorphic to the Gains treatment. The total value of the vouchers is \$90 (\$30 for each player), with \$60 to be raised in stage 1 of the bargaining process, where no voter could be charged more than \$30. With this restriction, in effect players were tasked with distributing \$30 as in the Gains treatment, but within a framework of losses as opposed to gains. The amount of money to be raised following a rejected proposal was set to maintain the strategic equivalence with the Gains treatment (rounded off to two decimal places), and again posted on players' computer screens prior to each stage in the bargaining process. The restriction on the maximum amount of any given player's tax remained fixed at \$30 across stages.

Under the SSPE with expected utility maximizers, the Gains and Costs treatments are strategically equivalent, with the same predicted outcomes in terms of money earned.[8] However, if voters have Prospect Theory type preferences over gains and losses, and use their respective starting cash balances as a reference point, one would expect equivalent proposals to be more likely to be rejected under Costs than Gains as a consequence of loss aversion, leading to greater proposer power in Gains than Costs.[9]

There are at least two other important considerations, which could contribute to differences in behavior between treatments. First, in deciding to reject or accept a proposed allocation, voters are not simply deciding between accepting the proposed offer versus a well-defined gamble, as there is ambiguity in terms of what they can expect in the next stage of the bargaining process: Whether they will be the proposer or not, whether there might be a more equitable distribution of benefits (costs), or whether there will be an MWC that includes them. Some of these considerations may be more or less apparent depending on whether bargaining is in the gains or loss frame.

Second, bargaining outcomes can be affected by other regarding preferences.[10] In theory inequity aversion combined with MWCs may lead to a *more* inequitable division inside the winning coalition (Montero, 2007).[11] This is based on the Fehr-Schmidt (1999) and Bolton and

[8] For expected utility maximizers, loss aversion results in an increase in proposer power with coalition partners accepting lower shares than under risk neutrality (Harrington, 1990).

[9] Even if voters do not fully adjust their reference point to their starting cash balances, one might still expect to see differences attributable to Prospect Theory type preferences, although more muted than when using their starting balances (Arkes et. al, 2008).

[10] See Cooper and Kagel (2016) for a recent survey of the other regarding preference literature.

[11] This prediction, as well as the Harrington (1990) result, is dependent on the SSPE outcome along with possible reshuffling of positions within the MWC. The possibility of being left out of the MWC altogether in the next stage,

Ockenfels (2000) models of inequity aversion resulting from differences in monetary outcomes. However, Montero also shows that changing some of the assumptions made in those models can change this prediction. For example, if players care only about the player with the highest payoff then inequity aversion can lead to a more equitable distribution of payoffs. Furthermore, as the experimental literature documents, subjects are not strictly concerned with differences in monetary payoffs, as intentions and spite play a role as well (as both Fehr-Schmidt and Bolton and Ockenfels noted). For example, Blount (1995) compared an ultimatum game with human proposers to one in which the offers were computer generated, with the same distribution as the human proposers. She found that low offers were substantially more likely to be accept when the computer was the proposer.[12] Finally it is important to note that perceptions of inequity may vary systematically between gains and loss frames. De Dreu, Lualhati, and McCuster (1994) report that individuals in the loss frame are more concerned with own payoffs and less with payoff differences than subjects operating in the Gains frame.[13]

Experimental results: Results will be reported for sessions as a whole and broken down by the first and last five bargaining rounds. For ease of comparison between the two treatments, Cost outcomes will be expressed in terms of money earned (gains).

Table 1 shows outcomes for all proposals passed without delay. Pass rates were quite high for both Costs (94.7%) and Gains (91.9%). Consistent with previous experiments, proposers earn significantly more than the highest voter share, averaging \$3.29 more over all rounds under Gains and \$4.69 more with Costs ($p < 0.01$ in both cases), with these differences increasing over the last five bargaining rounds.[14] Averaged over all rounds, the included voter's share (the voter receiving the highest share) is slightly lower under Costs compared to Gains

along with the large gap in payoffs this generates, incentivizes a player to demand less in the current stage. We are indebted to Maria Montero for clarifying this.

[12] Subjects were told that payoffs were going to real players in both cases. For other examples see Cooper and Kagel (2016).

[13] In a recent paper Mayraz, Aknin, and Helliwell (2017) compare responses to inequity in two player games. They find that when one player gains but the other loses there is a significant emotional cost to the loser that does not exist when both players make unequal gains. The difference between that paper and ours is that in the Costs treatment all players experience losses.

[14] Differences of \$4.21 and \$6.11 over the last five bargaining rounds for Gains and Costs, respectively ($p < 0.01$ in both cases). Statistical tests for treatment averages are based on a Wilcoxon rank sum sign test with bargaining round as the unit of observation.

($0.33, $p > 0.10$), with this difference increasing when averaging over the last five rounds ($0.80, $p < 0.01$).

[Insert Table 1 here]

But the payoffs in Table 1 are a bit misleading as there is a relatively high frequency of egalitarian offers ($10-$10-$10 and $12-$9-$9), which always pass with near unanimity.[15] These are typically concentrated among a small set of proposers, and decrease over time (see the last row in Table 1).[16] Table 2 drops these egalitarian proposals: Averaging over all rounds, proposers earned $3.81 more than included voters under Gains and $5.94 under Costs ($p < 0.01$ in both cases), with the included voter's share $0.75 lower under Costs than Gains ($p < 0.01$) averaged over all bargaining rounds, with these differences increasing in over the last five bargaining rounds as well.

[Insert Table 2 here]

Table 3, a probit for votes on stage 1 proposals, reports directly on willingness to accept offers between the two treatments. The dependent variable has value 1 when the included voter, the one receiving the largest payoff, votes in favor of the proposal (0 otherwise). Explanatory variables include the dollar payoff to the included voter (S), a Costs dummy equal to 1 for Costs (0 otherwise), and the interaction between the Costs dummy and the dollar payoff to the included voter (Costs*S). Voters other than the included voter are left out of the probit as they usually vote against the proposed allocation, always doing so within an MWC. Equal split proposals ($10 to everyone) or $9 to both voters are excluded as they usually pass unanimously, so that to include them (i) adds no new information and (ii) would conceal responses to proposals where the included voter is offered $9 or $10, with the proposer taking all, or most, of the remaining money. The probits were run for all rounds in order to gain increased power given the high overall acceptance rates.

[Insert Table 3 and Figure 1 here]

In the probit, the included voter's share (S) is positive and statistically significant at the 1% level which is to be expected. Figure 1a shows the point predictions for the probability

[15] The 10-10-10 allocations all passed unanimously for Gains, failing to pass unanimously in 2 out of 92 cases for Costs. There were a handful (8) of proposals where the proposer took 12 and offered 9 to both voters. These always passed and received 13 out of 16 votes.

[16] Proposers making more than one 10-10-10 offer did so in 72.2% (80.5%) of the bargaining rounds in which they were proposers for Gains (Costs). Those making a single offer did so in the first or second round 50.0% (57.1%) of the times for Gains (costs).

proposals will be accepted at different share levels over the range of the included voter's payoffs ($5-$15). Acceptance probabilities are considerably higher under Costs compared to Gains over lower share levels. Figure 1b calculates the 90% confidence interval for Costs + Costs*S. It shows that acceptance rates are significantly higher under Costs for share between over the interval $9-$11, after which they are essentially the same.[17] This compares to the stage 1 continuation value of the game, $8.50, so that in terms of a straight forward gamble between the proposal in hand and the expected return for rejecting the proposal, the implication is that voters are more risk seeking in Gains compared to Costs.[18] The latter is inconsistent with expected utility theory as well as Prospect Theory under the usual assumption of diminishing marginal utility for losses.

Conclusion 1: An overwhelming majority of proposals pass in stage 1 of the bargaining process for both the Gains and Costs. There are reasonable similarities in the frequency of MWCs between the two, particularly over the last five bargaining rounds. There is greater proposer power under Costs compared to Gains for proposals that pass in stage 1. In addition, voters were significantly *more* likely to vote in favor of low shares under Costs compared to Gains, which drives the greater proposer power under Costs.

Discussion: The results reported are inconsistent with the theoretical isomorphism between the Gains and Costs treatments under expected utility theory. They are also inconsistent with a straight forward application of reference dependent preferences (Kőszegi and Rabin, 2006) in conjunction with PT type preferences over gains and losses. If anything, one would expect more frequent rejection of low voter shares in Costs than in Gains, resulting from risk seeking behavior induced by diminishing sensitivity to losses. However, as the data shows, just the opposite occurred.

We were, quite frankly, surprised by these results. As a consequence in the last of the Cost and Gain sessions, we administered a short questionnaire aimed at better understanding

[17] In addition, there was a higher frequency of rejected offers at each included voter's share at each dollar value beginning with the interval $9-$13.
[18] There are very few observations below $8.50: 1 out of 3 voted in favor with Gains and 7 out of 9 for Costs ($p = 0.24$).

voter behavior.[19] Responses to the questionnaire showed that in the Costs treatment the most important factor influencing decisions was the possibility of paying the full $30 cost, i.e., losing their entire initial endowment (47%). In contrast ranked as most important for Gains was the included voter's payoff compared to the proposer's payoff (40%). By way of contrast, receiving a zero payoff was ranked as most important under Gains 20% of the time, with the voter's share compared to the proposer's share ranked as most important 27% of the time under Costs. The experimental sessions reported on below were designed to follow up on these results.

III. All Voucher Sessions

Experimental Design: The second set of experimental sessions was the same as the first except that an additional $20 voucher was added to both the Cost and Gains treatments.[20] That is, under the Cost treatment voters each got a voucher for $50, with total project costs the same ($60), along with the restriction that no voter could be charged more than $30. Now under an MWC, the excluded voter could not lose her whole initial endowment as a consequence of being left out of an MWC, the possibility of which the questionnaire suggested was the major factor in deciding to accept an offer or not.

To maintain the theoretical isomorphism between Costs and Gains, in the new Gains sessions all voters started with a $20 voucher, with the amount of money to be distributed staying at $30. Assuming that at least a significant portion of the $20 voucher is integrated into voters' decisions, the perceived inequality between any given offer would be reduced on account of what psychologists call the "numerosity adaptation effect". For example, as applied to the present case, the numerosity literature would predict that the included voter facing a $20-$10 allocation would be *less* likely to vote in favor of it compared to a $40-$30 allocation because the ratio of own payoff to the proposer's payoff is smaller (see Matthews, Lewis, and Hubbard, 2016 and Peters et. al, 2008).[21] The same should hold for Costs as well, but payoff inequality was not a major factor in deciding to accept or reject an offer, as attention was focused on avoiding the possibility of being left out of the MWC.

[19] See the online Appendix for the questionnaire and the responses.
[20] The $8 show-up fee was dropped as subjects left out of an MWC all earned $20.
[21] We could not find anything discussing differences between the numerosity effects over gains compared to losses.

Three new Costs and Gains sessions were conducted with $\delta = 0.15$ under this " all voucher" treatment, with between 12 and 18 subjects in each session (four sessions had 15 subjects) for a total of 45 subjects in Gains and 45 in Costs. In these sessions we also administered the same post experimental questionnaire as the one employed in the first set of sessions after each session.

Experimental Results: Table 4 shows allocations passed without delay in the enhanced voucher sessions, along with the percentage of allocations passed in stage 1, the frequency of MWCs, the frequency of offers within ± $2 of the SSPE, MWC offers with a $15-$15 split, and the frequency of egalitarian offers ($10-$10-$10). Stage 1 pass rates are quite close to those reported earlier in Table 1 – 90% or higher over all periods. There is a difference from the earlier sessions in that for Costs, the frequency of egalitarian proposals is higher to begin with and does not decrease in rounds 6-10. This is in large measure responsible for the reduced frequency of MWCs under Costs compared to the earlier sessions. Given the concentrated nature of these egalitarian splits among a handful of subjects, we do not place much weight on this difference.

Given the higher frequency of egalitarian proposals under Costs, a better picture of the differences in proposers' shares, and the included voters' shares, are reported in Table 5 where the egalitarian proposals have been dropped. Over all bargaining rounds proposers earned $0.59 *more* under Gains compared to Costs ($p < 0.10$) versus $1.38 *less* in the prior sessions ($p < 0.01$).[22] These differences remained essentially the same over the last 5 bargaining rounds ($0.63 more under Gains) but the difference is no longer statistically significant ($p = 0.25$). In contrast, in the earlier sessions, the difference in proposer earnings increased more over the last five bargaining rounds, remaining statistically significant as well. Included voters earned $0.53 *less* under Gains over all bargaining rounds ($p < 0.10$) compared to $0.75 *more* in the earlier sessions ($p < 0.01$). However, this difference was negligible over the last 5 bargaining rounds, reduced to $0.26 *more* under Gains ($p > 0.90$).

[Insert Tables 4 and 5 here]

Table 6 repeats the probit regression reported for the previous sessions, again dropping the egalitarian allocations as they mask responses to $9 and $10 shares within the context of an

[22] The latter is based on Table 2 where egalitarian proposals have been dropped.

MWC. As before the dependent variable is 1 if the voter with the highest payoff voted yes (0 otherwise), with dummy variables for dollar share allocated to the included voter, a dummy for Costs compared to Gains, and a dummy for the interaction effect Costs and dollar share allocated. The only significant variable in the probit is the share gong to the included voter, as neither the Costs dummy, nor the Costs*Share dummy is statistically significant, nor are the sum of the two significantly different from zero.

Figure 2 plots the predicted probability for the included voter voting in favor of the proposed allocation. In these all voucher sessions included voters are only slightly less likely to vote in favor the proposed allocation under Gains over lower offers ($9-$11), with none of these differences statistically significant. That is, unlike the first set of sessions, voters have the same pattern under both Gains and Costs treatments.

[Insert Table 6 and Figure 2 here]

Conclusion 2: Averaging over all periods in the all voucher sessions, proposers (included voters) earn significantly more (less) under Gains compared to Costs, with these differences marginally significant ($p < 0.10$). However, by the last 5 bargaining rounds, these differences are no longer statistically significant. Further, there are no significant differences in included voters' rejection rates for shares at all levels. In short, with experience, over the last five bargaining rounds we cannot reject a null hypothesis that the theoretical isomorphism predicted under expected utility is satisfied in the data.

Discussion: The driving force behind the differences from the initial series of experimental sessions is the impact of the voucher on the Gains treatment. Figure 3 shows this quite clearly as it reports voting under Gains between the first and the all voucher sessions (top panel) and voting under Costs (bottom panel).[23] There are large differences in acceptance rates for low values between the first and the all voucher sessions under Gains, with no significant differences under Costs.

[Insert Fig 3]

Looking at the results from the questionnaire for the all voucher sessions compared to the earlier sessions gives some idea of what is driving this result. First, there is clear evidence that the numerosity adaptation effect plays a substantial role for Gains: Now the question regarding

[23] These figures are derived from the probits reported in the online Appendix.

the difference between "the proposer's share (payment) and your share (payment)" was ranked as most important 22% of the time compared to 40% in the initial sessions (along with a modest reduction in its importance under Costs, going from 27% originally to 16% here). Replacing proposer's share compared to own share as having the *most* influence on their decision to accept or reject an offer were concerns about getting $0 if they rejected the offer – 42% versus 20% in the earlier sessions. Further, for the Cost sessions fear of losing $30 was ranked as most important 40% of the time in the all voucher sessions versus 47% earlier, so that unlike in Gains, there were negligible differences in what voters were most concerned about between the all voucher and the earlier sessions.

The reasons underlying the change for Gains appear clear. With the importance of the difference between a voter's own payoff versus the proposer's payoff diminished by the $20 voucher, attention focused to the fear of getting a $0 payoff. This likely induces voters to act as if they are more risk averse, increasing the amount kept by the proposer.[24] The numerosity adaptation effect kicked in, but with much smaller impact for Costs, with concern for paying the entire $30 about the same.

This leaves the question as to why the increased voucher had no effect in the Costs treatment? Our implicit assumption that paying the full $30 cost would be of less concern given the $50 voucher was obviously wrong. Clearly the increase in the voucher under Costs does nothing to change the potential for regret if one rejects a modest tax only to be excluded from the MWC—and lose $30—in the next stage. In addition, the expected gain from rejecting a decent offer was minimal in both cases. For example, take a popular proposal of a $10 and $20 split of costs between the proposer and the coalition partner. If a voter rejects the $20 tax, the total cost in stage 2 increases to $64.50 which, under an MWC, leaves $34.50 to be raised between two players. So if the coalition member who rejected the previous offer is lucky enough to be the proposer, and she makes a comparable offer which is accepted, her tax will be reduced from $20 to $11.50. However, there is a two-thirds chance her tax will increase from $20 to $30 or from $20 to $23. The increase to $30 is more likely if she is not the proposer, as subject ids do not change within bargaining rounds, and her rejection in stage 1 indicates she is not likely to accept

[24] Unfortunately, looking at the responses to each question in isolation and calculating an index of importance for the outcome in question from not important as 1, 2 for mildly important …, to 5 for very important shows minimal differences between Costs and Gains for each question, both within and across series.

a cost of $23 in stage 2. So short of having formed a blocking coalition, and either she or the other voter are chosen as the proposer, she is likely to be left out of the MWC, paying the $30 tax. As shown below, blocking coalitions were rare.

IV. Content of Proposer-Voter Communication

Discussions between proposers and voters, as well as between voters, provide insights into the process by which outcomes were reached. These discussions were coded for content by two graduate students not connected with the research, with the research team specifying the coding categories after reading a number of discussions within bargaining rounds. These categories were further clarified after the students coded a sample of the discussions to clarify any questions between the coders or between the coders and the experimenters. Messages were coded in the first, fifth and last bargaining rounds of each session, Stage 1 discussions only. Coders were in agreement over 90% of the time. Percentages reported are based on averages from the two coders.

The four major coding categories are shown in Table 7. There were several additional categories specified that did not attract much discussion, reported in the online appendix, including efforts to form a blocking coalition, which were rarely successful. Percentages for categories 1-3 are for the percentage of bargaining groups coded. Percentages for category 4 are reported by the percentage of voters calling for giving the other voter a zero allocation.

[Insert Table 7 here]

Coders were also instructed to record the minimum amount, if any, voters told proposers they would be willing to accept – the final amount, as this typically gets bid down within a bargaining round. Although these offers are not binding, they are not without meaning as they provide a coordinating device that helps the proposer identify the voter with the minimum reservation price, as well as a device for voters to be included in the winning coalition. We look to see how truthful these claims were, along with proposers responses to same.

[Insert Table 8]

Table 8 reports percentages for each category coded separately for Gains and Costs. These are pooled across both sets of sessions as there are relatively small differences between the two sets of sessions on these dimensions, and the goal here is to provide an overview of the pre-proposal discussions. Several things stand out. First, the frequency of proposer initiated auctions

is similar between Gains (20.8%) and Costs (14.7%) in the first bargaining round. In contrast, while the frequency of voter led auctions is similar to proposer led auctions in the first bargaining round for Gains (19.4%), voter led auctions are much more common in Costs (42.6%). Proposers bargaining within the framework of establishing equality drop substantially from the first to last bargaining rounds for both treatments, parallel to the increases in voter and proposer led auctions. Most striking are the large increases in the percentage of voters calling for giving the other voter a zero allocation, reaching over 60% in both treatments by the last bargaining round.

Table 9 reports on offers relative to stated reservation values. These are broken down between receiving at least one offer and when receiving two offers in the same bargaining round. When receiving one or more offers, proposers made offers equal to the proposed reservation values a majority of the time (63.9% and 80.4% for Gains and Costs, respectively) with the overwhelming number of these offers accepted. Offers that were rejected were often for low submitted reservation values, with a median value of $9.50, pooled over Gains and Costs (6 cases total) as opposed to $12 for accepted offers. There are a handful of offers to voters *below* their stated reservations values, with 40% of these being rejected in both treatments. The Gains treatment shows a number of offers *above* a voter's reservation value (27.8% of the time) substantially higher numbers than for Costs, no doubt in response to the higher rejection rates under Gains in the first set of sessions. These offers are always accepted for Costs, but rejected 4 times for Gains. Although rejection here seems strange, from the discussions, in three of these cases voters had formed a successful blocking coalition, and one involved a mistake on the voter's part.[25]

The right hand side of the table shows where both voters had stated different reservation values in a given bargaining round.[26] Most of the time proposers made an offer to the voter with the lower reservation value, with offers equal to the stated reservation value in all cases. Less frequently, proposers offered to the voter with the higher reservation value, indicating they were

[25] Blocking coalitions where voters went so far as to specify what the payoffs would be if successful were rare (10 times for Gains and 3 times for Costs in over 300 bargaining rounds in both cases). Of these, all 3 were carried out under costs (both voting against the proposed allocation and carrying through on shares decided on after the proposal was rejected), with 7 out of the 10 carried out under Gains.

[26] This was the norm when receiving offers from both voters. Proposers received identical offers 4 (6) times when receiving two offers in Gains (Costs). Proposers rarely made offers to voters who did not submit a reservation value: 3 out 21 times for Gains and 5 out of 24 times for Costs.

wary of the lower offer being credible and/or due to strategic uncertainty on the part of proposers. For both Gains and Costs, the median for these lower reservations values was $10 as opposed to $13 for the higher reservation value.

Conclusion 3: Cheap talk between voters and proposers served reasonably well as a coordinating device as in most cases proposers matched voters stated reservation values, with a minimal number of rejections. What seems surprising here is the number of times proposers made offers to the higher reservation value – a third of the time, in both treatments, when reservation values differed. This indicates proposers' wariness of these lower offers, along with the intention of going for the offer more likely to be accepted.

V. Summary and Conclusions

This paper reports two series of experimental sessions investigating the Baron-Ferejohn (1989) legislative bargaining model. The novel element in the experimental design is the comparison between bargaining over positive outcomes (aka "pork") as opposed to how to distribute costs (aka "taxes"). The experimental design is such that bargaining outcomes are theoretically isomorphic between the two treatments. Contrary to this prediction, in an initial series of experimental sessions there was stronger proposer power in the Costs sessions, with relatively low proposer shares rejected significantly more often under Gains compared to Costs. The latter would account for the greater proposer power under Costs.

A post experimental questionnaire showed that voters were most concerned with losing their entire endowment under Costs given the high frequency of MWCs, while in Gains they were more concerned with how their payoff compared to the proposer's. The fact that inequity concerns were more prominent in Gains than Costs is consistent with earlier research showing less concern for fairness in the loss frame (De Dreu, Lualhati, and McCuster, 1994). These results prompted a second series of sessions increasing vouchers in the Costs sessions by $20 and including $20 vouchers in the Gains sessions, while holding the amount of money bargained over the same. This reduced the differences in proposer power and eliminated the differences in voting outcomes between the two treatments. Further, most of the change in behavior came from the Gains sessions with increased proposer power and voters no longer more likely to reject low offers under Gains compared to Costs. This is consistent with numerosity adaptation effect widely reported in the psychology literature. After integrating their voucher payoffs, voters who compare own shares to the proposer's share perceive smaller disparities between the two. This,

in turn, would help to overcome "irrational" rejection of low offers based on non-financial considerations.

Reference dependent preferences, in conjunction with Prospect Theory type preferences over gains and losses (Kőszegi and Rabin, 2006) would have predicted higher rejection rates of comparable offers under Costs compared to Gains, but this did not materialize. This prediction is based on voters treating the choice between accepting and rejecting proposed allocations based primarily on risk preferences with diminishing marginal utility over losses up to and including loss of their entire voucher. But, contrary to this, in evaluating proposals voters were most concerned with losing their whole voucher, particularly relevant here given the high frequency of MWCs. The attempt to alleviate this concern with the introduction of a larger voucher had little effect in the Costs treatment. This might be due to regret aversion since the voucher did nothing to eliminate possible regret associated with rejecting a reasonable "tax" only to be left out of a MWC entirely.

A reference point effect of the sort predicted under Kőszegi and Rabin (2006) was observed in Christiansen and Kagel (2016) investigating the Jackson and Moselle (2002) legislative bargaining model. In that case, legislators with the least to gain or lose from location of the public good rejected similar proposals significantly more often under Costs compared to Gains. However, there are a number of important differences between that experiment and the present one. In that experiment bargaining was over a one dimensional public policy for which subjects had heterogeneous preferences, plus a distribution of "taxes" or "pork". Given the parameterization of the model, voters were far away from losing their entire starting balances regardless of the outcome under either the Costs or Gains treatments. In addition, the voter who rejected equivalent offers in Costs compared to Gains had much less to risk (and less to regret) than voters in the present experiment, as her preferences made her an attractive coalition partner to both of the other voters. As such she was almost always included in any MWC. This along with $\delta = 1$ (no discounting) meant that unlike here the potential cost of rejecting an offer for this pivotal voter was relatively low.

In legislative settings bargaining over allocations of pork or taxes outside the lab, the underlying structure would be more like the all voucher sessions as opposed to the all or nothing outcomes in the first sessions. As such the results reported here suggest we should expect similarities with respect to the *distribution* of outcomes, whether bargaining strictly over pork or

taxes. This is important for institutional design because bargaining over many issues can be framed differently. For example, a government that needs to raise more tax revenue could do so in at least two ways. First, it could set a relatively high universal rate and then discount the rate for some groups, providing a benefit much as in the Gains treatment reported on here. Alternatively, the government could set a low tax rate and then allocate additional taxes to some groups, much as in the Costs treatment. The results reported here suggest that either method would result in similar *distributional* outcomes. But more research is needed to determine if this predicted outcome will be observed.

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Table 1
Allocations Passed without Delay
(standard errors of the mean in parentheses)

	Gains			Costs		
Bargaining Rounds	All	Rds 1-5	Rds 6-10	All	Rds 1-15	Rds 6-10
Proposer's Share	$14.75 (0.24)	$13.86 (0.32)	$15.73 (0.33)	$15.82 (0.3)	$14.82 (0.38)	$16.83 (0.43)
Highest Voter Share	$11.46 (0.12)	$11.4 (0.17)	$11.52 (0.18)	$11.13 (0.12)	$11.5 (0.19)	$10.72 (0.15)
Percentages						
Percentage Approved	91.9%	96.2%	87.5%	94.7%	95.7%	93.7%
MWC	59.9%	47.5%	73.6%	72.1%	66.7%	77.5%
$SSPE_{\pm 2}$	11.5%	6.9%	16.5%	22.9%	12.2%	33.7%
$15-$15 Split	12.0%	12.9%	11.0%	11.2%	20.0%	2.3%
Equal Shares for All	28.3%	34.7%	20.9%	26.8%	31.1%	22.5%

Table 2
Allocations Passed without Delay: Excluding Egalitarian Proposals
(standard errors of the mean in parentheses)

	Gains			Costs		
Bargaining Rounds	All	Rds 1-5	Rds 6-10	All	Rds 1-5	Rds 6-10
Proposer's Share	16.5 (.178)	15.85 (.259)	17.1 (.223)	17.88 (.199)	16.85 (.276)	18.81 (.235)
Highest Voter Share	12.69 (.145)	12.93 (.217)	12.47 (.192)	11.94 (.181)	12.82 (.242)	11.14 (.229)
Percentage Approved	89.03%	94.29%	84.71%	92.96%	94.03%	92%

Table 3
Voting Probit
(standard errors in parentheses)

Vote	All rounds
Costs	2.61** (1.27)
S (included voter's share)	0.339*** (0.07)
Costs*S	-0.196* (0.12)
Constant	-2.82*** (0.79)
Pseudo R^2	0.13
Log-likelihood	-82.5
Observations	298

** significant at the 5% level, *** significant at the 1% level.

Table 4
Allocations Passed without Delay: All Voucher Sessions
(standard errors of the mean in parentheses)

	Gains			Costs		
Bargaining Rounds	All	Rds 1-5	Rds 6-10	All	Rds 1-5	Rds 6-10
Proposer's Share	15.25 (.336)	14.43 (.445)	16.18 (.487)	14.33 (.33)	13.99 (.408)	14.72 (.531)
Highest Voter Share	10.93 (.144)	10.86 (.188)	11.02 (.225)	11.15 (.148)	11.50 (.202)	10.76 (.213)
Percentages						
Percentage Approved	90%	96%	84%	92.62%	98.65%	86.67%
MWC	62.22%	51.39%	74.6%	57.97%	60.27%	55.38%
$SSPE_{\pm 2}$	17.78%	15.28%	20.63%	13.04%	9.59%	16.92%
\$15-\$15 Split	12.59%	12.5%	12.7%	16.67%	21.92%	10.77%
Equal Shares for All	32.59%	38.89%	25.4%	37.68%	38.36%	36.92%

Table 5
Allocations Passed without Delay all Voucher Sessions: Excluding Egalitarian Proposals
(standard errors of the mean in parentheses)

	Gains			Costs		
Bargaining Rounds	All	Rds 1-5	Rds 6-10	All	Rds 1-5	Rds 6-10
Proposer's Share	17.54 (.256)	16.93 (.388)	18.12 (.319)	16.95 (.261)	16.47 (.278)	17.49 (.443)
Highest Voter Share	12.07 (.223)	12.27 (.311)	11.88 (.319)	12.52 (.258)	13.36 (.257)	11.62 (.42)
Percentage Approved	85.85%	93.62%	79.66%	88.66%	97.83%	80.39%

Table 6
Voting Probit: All Voucher Sessions
(standard errors in parentheses)

Vote	All Rounds
Costs	.139 (1.211)
S (included voter's share)	**.155**** (.069)
Costs*S	-.008 (.099)
Constant	-.715 (.861)
Observations	204
Pseudo R2	.059

** Significantly Different from 0 at the 5% level.

Table 7
Pre-Proposal Communication Categories

1. *Proposer Auction*: Proposer essentially conducts an auction, playing the two voters off in terms of minimum acceptable payoffs (abbreviated as Prop Auction).
2. *Voter Auction*: Voters essentially lead the bargaining with one or both making *unsolicited* offers to the proposer. If the proposer goes on to actively bargain with the voters, this goes into category 1 above.
3. *Equality*: Proposer bargains within the context of significant payments to both voters, explicitly or implicitly expressing equality concerns. Or, one of voters calls for an equal split which sets off public discussions of same.
4. *Call Zero:* Voters privately call for giving the other voter a zero allocation. Frequencies are for the number of voters doing the same within a bargaining round.

Table 8
Pre-Proposal Communication Patterns
(percentages)[a]

	Gains				Costs			
Round	Prop Auction	Voter Auction	Equality	Call Zero	Prop Auction	Voter Auction	Equality	Call Zero
1	20.8	19.4	47.2	12.5	14.7	42.6	38.2	22.1
5	29.2	44.4	19.4	46.5	41.2	55.9	20.6	51.5
10	31.9	72.2	13.9	65.3	50.0	64.7	20.6	61.0

[a] Percentages for prop auctions, voter auctions and equality are given by bargaining session. Percentages for call zero are the percentage of voters calling for a zero allocation to the other voter.

Table 9
Offers and Acceptances Relative to Reservation Values
(numbers in parentheses are for rejected offers)

	When Receiving One or More Offers			When Receiving Two Offers	
	Equal To	Less Than	Greater Than	Offered Higher	Offered Lower
Gains (rejections)	39 (4)	5 (2)	17 (4)	13 (2)	26 (6)
Costs ejections)	41 (2)	5 (2)	5 (0)	9 (0))	17 (2)

Figure 1a: Probability of Included Voter Accepting Stage 1 Proposals: Excluding Egalitarian Proposals

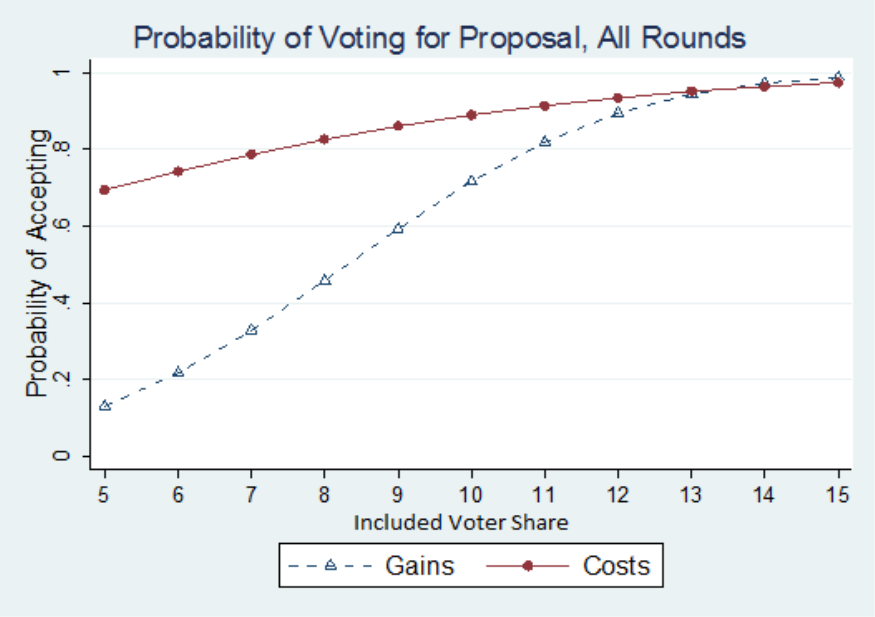


Figure 1b: Confidence Intervals: Probability of Included Voter Accepting Stage 1 Proposals

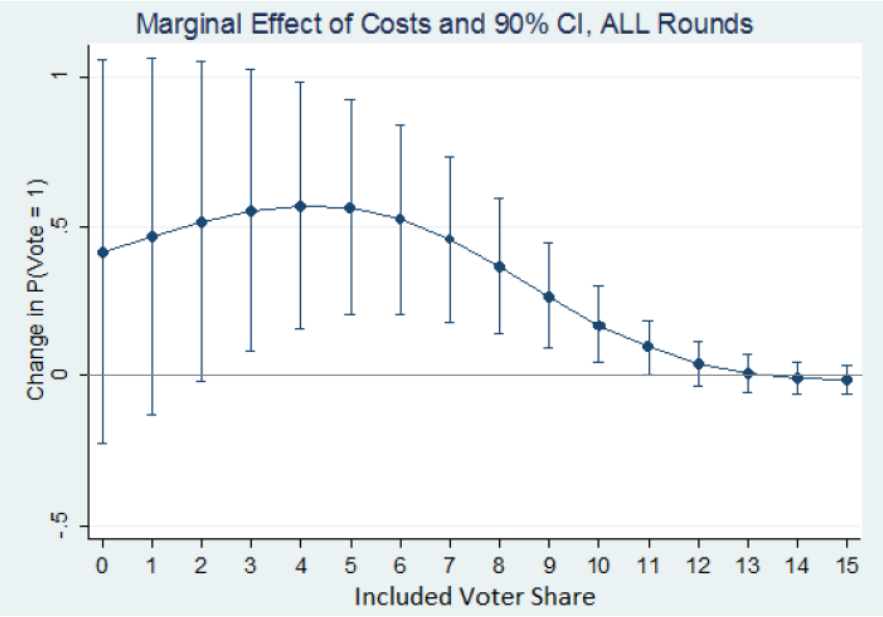


Figure 2: Probability of Included Voter Accepting Stage 1 Proposals in all Voucher Treatment: Excluding Egalitarian Proposals.

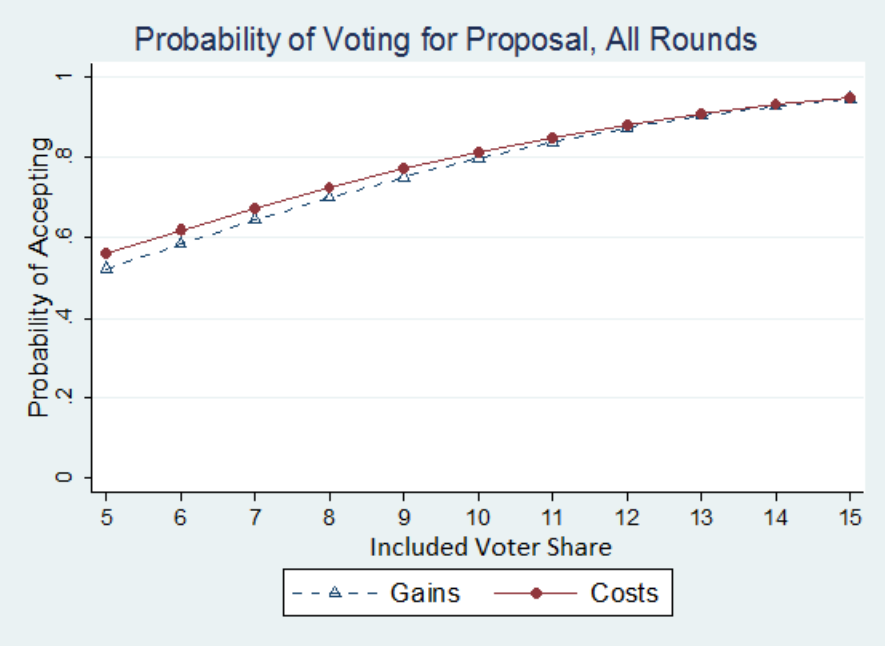
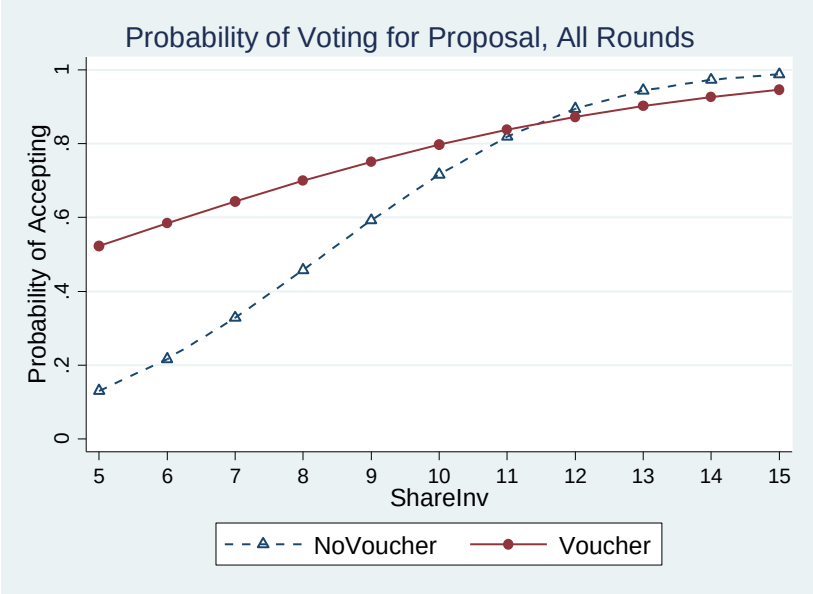


Figure 3

Comparing Probability Included Voter Accepting Stage 1 Proposals for Gains and Costs

Initial Sessions vs All Voucher Sessions

Gains



Costs