Behavioral Identification in Coalitional Bargaining: An Experimental Analysis of Demand Bargaining and Alternating Offers[*]

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Abstract

Alternating-offer and demand bargaining models of legislative bargaining make very different predictions in terms of both *ex-ante* and *ex-post* distribution of payoffs, as well as the role of the order of play. The experiment shows that actual bargaining behavior is not as sensitive to the different bargaining rules as the theoretical point predictions, while the comparative statics are in

line with both models. We compare our results to studies attempting to distinguish between these two approaches using field data, finding strong similarities between the laboratory and field data regardless of the underlying bargaining process.

JEL classification: C7, D72, C92, C52

Key words: legislative bargaining, alternating offer protocol, demand bargaining protocol, behavioral identification

1   Introduction

Most group decisions require the consent of the majority of group members. When the issue is how to divide a fixed amount of resources among the group members, the core of the game is empty, since we can always find a majority who would object to any given distributive proposal on the table. When the core is empty, voting and bargaining theories focus on the different predictions that could derive from the different "institutional" rules observed in reality (positive approach) or conceivable (normative approach) for such bargaining situations. These issues are especially relevant in distributive politics (e.g., committee and congressional decisions about pork barrel projects) and government formation in parliamentary democracies, but are also important problems in corporations. An additional complication, especially in government formation bargaining problems and in corporate governance, is the potential heterogeneity of bargaining power across group members. A strand of the cooperative game theory literature has focused on the latter, while more recently there have been various attempts to study such games with noncooperative bargaining models. The theoretical predictions of these noncooperative bargaining models are very sensitive to variations in the rules of the game, and the equilibrium solution(s) may well require an unrealistic degree of rationality on the part of agents. Hence one wonders whether the actual behavior of bargaining agents is as sensitive to changing the rules of the game as the theory predicts. Below we report an experiment analyzing two very different kinds of bargaining games advocated in the political science literature, which can shed some light on these issues.

The classic Rubinstein (1982) bargaining model of how two agents can agree to split a dollar can be interpreted in two equivalent ways: We can think either about the proposer making an *offer* to the other agent, or that the proposer is making a *demand* of a share, leaving to the other agent the choice between demanding the residual or disagreeing. In both cases the decision of the second mover depends on the discount factor, on the number of potential stages in the bargaining process, and on other institutional features, but not on the interpretation of whether the proposal was a demand or an offer. However, as soon as we consider a group with at least three members, as in legislative or committee bargaining, offers and demands are no longer equivalent. If the proposer is making a specific distributive offer, the other players' decision is basically a *voting* decision on the specific offer; on the other hand, if the first mover is only making her own demand on the total amount of resources, the subsequent movers have to decide what demand to make

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in turn, and hence the asymmetry between movers is reduced. In reality, one can certainly think of situations where the offer interpretation of the bargaining process seems more appropriate, and of situations where the opposite is true.[1] Although most real world bargaining processes are less structured than these two extreme theoretical idealizations, there have been a number of empirical studies employing field data to make comparisons between the offer and demand models (e.g., Warwick and Druckman, 2001; Ansolabehere et al., 2003). The present paper is the first experimental work to compare the two models. In addition, we show how the experimental data can be used to explore the validity of these previous empirical tests on field data.

The alternating-offer model of majoritarian bargaining most used in the political economy literature is Baron and Ferejohn (1989). In its closed-rule, infinitely-repeated form, someone is picked at random to make a proposal, then the others simultaneously vote yes or no. If the majority rejects the proposal then a new proposer is chosen at random with the process repeating until an allocation is determined (with or without discounting, and with various types of randomization protocols). If the probability of recognition for each group member after any rejection is proportional to her relative bargaining power, then the ex-ante distribution of expected payoffs is proportional to the distribution of bargaining power, and coincides with the nucleolus of the game (see Montero, 2001). However, the ex-post distribution of equilibrium payoffs, by which we mean the equilibrium distribution of payoffs after a first proposer has been picked, displays a very high proposer advantage.

For the *demand* bargaining model, we use a sequential game form similar to Morelli (1999).[2] Agents make sequential demands until every member has made a demand or until someone closes a majority coalition by demanding the residual payoff implicitly left by the other coalition members. If no majority coalition with a feasible set of demands emerges after all players have made a demand, a new

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[1]When the relevant players are committee members or individual congressmen, it is often the case that at some point (perhaps after a long discussion) someone makes a complete proposal and the others simply vote yes or no. On the other hand, when the relevant players are party leaders, like in the government formation process in European parliamentary systems, the formateur always has multiple consultations with the other party leaders about their individual demands for ministerial payoffs, and the final proposal is only a formal step, with the agreement being already reached at the demand stage.

[2]The first attempts of a noncooperative demand based approach to bargaining can be found in Binmore (1986), Selten (1992), Winter (1994a, 1994b) and Morelli (1999).

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first demander is randomly selected; all the previous demands are void, and the game proceeds until a compatible set of demands is made by a majority coalition. The order of play is randomly determined from among those who have not yet made a demand, with proportional recognition probabilities. This model makes a unique prediction for homogeneous weighted majority games – a prediction of proportionality between the relative ex-post payoff shares in the majority coalition and their relative "real" voting weights – which corresponds to the unique solution in the Demand Bargaining Set (see Morelli and Montero, 2003). With this game form, as we shall see, the *ex-ante* distribution of payoffs is more unequal than in the Baron and Ferejohn game, but the *ex-post* distribution of payoffs within the majority coalition is always proportional to the relative bargaining power within the majority coalition, without any first mover advantage.

The experiments reported here test first for the internal validity of the demand bargaining and Baron-Ferejohn models both in terms of their point predictions and their comparative statics. All games involve bargaining groups of five subjects, a majority rule, and no shrinking of the pie over time. We use the case in which every subject has the same number of votes as a benchmark, and compare it with the modified game in which one player controls three votes and the remaining players each control one vote (the Apex game). Moreover, in order to distinguish between different explanations of the results found in the Apex treatment, we also consider the case in which the Apex player retains only 1/3 of the payoff obtained in the game (as if the remaining 2/3 had to be given to other members of the same party or voting block). We find that one-vote (base) formateurs have some first mover advantage in both demand and offer games, whereas Apex formateurs display hardly any first mover advantage. In general, formateur power does not differ nearly as much between demand and offer games as the theory predicts.

We address the issue of external validity by running regressions similar to those performed with field data. Prior research comparing the demand bargaining approach to the Baron-Ferejohn approach has been limited to field data, analyzing power in coalition governments (portfolios a party holds) in relation to the number of votes a party controls (seats in parliament). Warwick and Druckman (2001) find a proportional relationship between portfolios held and the share of votes contributed to the winning coalition (for most specifications), roughly in support of the demand bargaining approach. On the other hand, Ansolabehere et al. (2003) analyze a similar data set and find evidence of proposer power, in support of the predictions of

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the Baron-Ferejohn model.[3] Surprised by these conflicting results, we re-run those regressions using our experimental data, taken from *either* of the two bargaining games. The regressions using the experimental data *cannot* identify the data generating process using the criteria commonly employed with the field data: Regardless of which of the two experimental data sets are used, the regressions yield results strikingly similar to regression coefficients found on the field data. On the other hand, using simulated experimental subjects who play the way the theory predicts under each protocol, we are able to identify the underlying data generating process using the criteria advocated for distinguishing between the two models with field data.

One interpretation of these regression results is that, to the extent that either of these two bargaining models faithfully characterizes the bargaining process underlying the composition of coalition governments, the behavioral similarities found in the laboratory are present in the field as well. That is, there is a *behavioral identification problem* with the regression approach advocated for the field data, in that even though the specifications used are well identified with respect to the theoretical behavior, the parameters of interest are not identified with respect to how agents actually behave. As such there is no clear mapping from the estimated parameters to the rules of the game that the investigator is trying to infer given how people actually play these games. To fully address this behavioral identification problem, one would need to observe actual institutional differences and/or come up with other ways to distinguish between the two models given the available field data.

Experimental studies of the Baron-Ferejohn model have been quite limited (McKelvey, 1991; Fréchette, Kagel and Lehrer, 2003; Diermeier and Morton, 2004; Fréchette, Kagel and Morelli, 2004b; Diermeier and Gailmard, 2004), all of them focusing on games in which agents have equal real voting weights. Experimental studies of demand bargaining are limited to Fréchette, Kagel and Morelli (2004a) who study demand bargaining in three player games when all parties have equal real bargaining power. Thus, the present paper is the first to directly compare the Baron-Ferejohn and demand bargaining approaches within an experimental framework, and obviously the first doing so with and without heterogeneous weights. There have been several earlier experimental studies of the Apex game within the framework of coop-

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[3]The main difference between the two econometric models is that Ansolabehere et al. use voting weights rather than seat shares as the independent variable. That is, they use real as opposed to nominal bargaining power – for the distinction between real versus nominal bargaining power (which is not an issue in the present paper) see Fréchette, Kagel, and Morelli (2004b).

erative game theory (see, for example, Selten and Schuster, 1968 and Horowitz and Rapoport, 1974). We compare our experimental results with these earlier studies, as well as with the broad experimental literature on bargaining and ultimatum games, in the concluding section of the paper.

The paper is organized as follows: Section 2 outlines the theoretical implications of the demand bargaining and Baron-Ferejohn models for the games implemented in the laboratory. Section 3 describes the experimental design and procedures. The experimental results are reported in Section 4. Section 5 compares regressions based on the experimental data to comparable regressions using field data. Section 6 summarizes our main findings and relates the results to earlier studies of the Apex game and to "fairness" issues derived from the experimental literature on bilateral bargaining games in economics.

2 Alternating Offers vs. Demand Bargaining: Theoretical Predictions

For the alternating-offer model we use the closed-rule infinite horizon bargaining model of Baron and Ferejohn (henceforth BF);[4] For demand bargaining we consider a slight modification of Morelli (1999), which will be called the DB model.[5] We present the two models in turn, displaying the specific predictions for the simple games on which we do experiments.

2.1 The Baron-Ferejohn model

Let there be 5 bargaining agents. In the Equal Weight (EW) game, where each agent has one vote, at least three players have to agree on how to split a fixed amount of resources (money). One player is selected at random to make a proposal on how to divide the money, with this proposal voted up or down with no room for amendment. If a majority votes in favor of the proposed distribution, the proposal is binding. If the proposal fails then a new proposer is picked at random, and

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[4]Fréchette, Kagel and Lehrer (2003) also study the open-rule model. Here the focus is on the closed-rule model because it is the one that has been compared with demand bargaining on field data, and because the closed rule provides a more radical benchmark in terms of the ex post distribution of benefits than the open rule.

[5]The difference is only in terms of the selection of the next mover after any demand: random here instead of being chosen by the first mover as in Morelli (1999). Both implementations have similar equilibrium predictions.

the process repeats itself until a proposal is passed. Thus, at the proposal and voting stage each agent has to keep in mind that if the proposal doesn't pass she will be recognized as the proposer in the next stage with probability 1/5. In our implementation the pie does not shrink if the proposal does not pass, so that 1/5 is also the continuation expected equilibrium payoff after a rejection. The unique Stationary Subgame Perfect Equilibrium (SSPE) outcome gives 3/5 of the money to the proposer and 1/5 to each of two other agents (their reservation continuation payoff), and the proposal is accepted. The remaining two agents receive zero of course.

Consider now what happens if four of the players have one vote but the fifth player (called the Apex player) has three votes. This is a game with heterogeneous bargaining power, since the Apex player only needs one other player to form a minimal winning coalition. Assume that the recognition probability is proportional, i.e., that after any rejected proposal the Apex player is recognized as the new proposer with probability 3/7, and every other player with probability 1/7.[6] In this game the SSPE prediction is as follows: if the first mover is the Apex player, then a minimum winning coalition (MWC) with two players forms, and the Apex receives 6/7 of the pie; if the first mover is not the Apex player, then the first mover receives 4/7, and the residual goes to the Apex with probability 1/4 and is divided equally among the three one-vote players (henceforth called "base" players) with probability 3/4. In other words, each of the base players, when proposing, invites the Apex player into the coalition with probability 1/4 and forms a four-person coalition with the other base players with probability 3/4. Hence, the predicted frequency with which the Apex player appears in an equilibrium MWC is $\frac{4}{7}$.[7]

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[6] This proportional recognition probability assumption is not crucial for the special games studied in this paper, and many other assumptions would do. However, the proportional recognition assumption is, in general, the only one consistent with ex-ante proportional payoffs (see Montero, 2001).

[7] With this probability mixture, when the small player is indifferent, the continuation payoff of the Apex player is indeed $\frac{3}{7}$, since it is $\frac{3}{7}\frac{6}{7} + \frac{4}{7}\frac{1}{4}\frac{3}{7}$. The mixture $\frac{3}{4}/\frac{1}{4}$ is the unique symmetric equilibrium, guaranteeing that $\frac{3}{7}$ and $\frac{1}{7}$ are the continuation payoffs for Apex and base players respectively. Of course, there could also be asymmetric equilibrium mixtures, but all with the same properties in terms of ex-ante payoff predictions and frequencies of coalitions. Thus, we ignore the asymmetric equilibria here.

2.2 The Demand Bargaining model

Rather than assuming that the first mover makes a proposal to be voted up or down, in the DB approach the first mover, chosen randomly, makes a demand for a share of the fixed amount of resources.[8] Next, a second mover is selected randomly from the other four, and makes a second demand. If the first two movers can constitute a MWC and their demands do not exceed the total amount of resources, then the two players will establish a majority coalition, and the next randomized mover(s) can only demand the residual resources, if any. If the first two movers do not have enough votes to constitute a winning coalition and/or the first two demands exceed the fixed amount of resources, then a third mover is selected (randomly among the remaining three players) and makes a third demand. Again, if the first three demands are such that there exists a winning coalition of players who made compatible demands, the coalition is formed; If the third mover has enough votes to close a coalition with either one of the previous movers by making the same demand, we let her choose who to include in the coalition; If the demands in any winning coalition using the votes of the first three movers are incompatible, a fourth player is randomly asked to make a fourth demand, and so on. The game may not reach the fifth mover, because as soon as a subset constituting a majority coalition have made compatible demands (exhausting the money), the game ends. But if, after all players have moved once, no set of compatible demands exists that constitute a potential majority coalition, then all demands are voided and the game starts again. The game can go on indefinitely, like the BF game.[9] We assume, consistent with the assumptions made in the BF model, that the probability of recognition is always proportional to the relative weight of the players who do not yet have a valid (i.e., not voided) demand on the bargaining table.

For the EW game the unique subgame perfect equilibrium (SPE) outcome of the DB model gives 1/3 of the pie to each of the first three movers who form a MWC. The proof of this result would be analogous to Morelli (1999), and hence is omitted. However, the analysis of the corresponding proportionality result for the Apex game is slightly different than in Morelli (1999), since in the original model of

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[8]Here we should think of a party leader who says what her party would want in order to participate in a government coalition, but does not propose what the other potential coalition members should get.

[9]It is possible to show that the equilibrium outcome of the DB model does not depend on whether the game is finite or not, nor does it depend on the discount factor (see Morelli (1999) for this point).

DB the first randomized mover would choose the rest of the order of play, whereas here each new mover comes from a new random draw. Thus, we prove the following *ex post* proportionality result in Appendix 1.

Proposition 1: *Consider a 5-player Apex DB game.*
(I) *In every SPE outcome any player included in the MWC receives a proportional share: $\frac{1}{4}$ for a base player and $\frac{3}{4}$ for the Apex.*
(II) *The unique case in which the equilibrium MWC is the base MWC (i.e., with the four base players) is when the Apex player moves last; In all other cases the equilibrium winning coalition includes the Apex player and a base player.*

Since the Apex player is in the MWC unless she moves last, the frequency with which the Apex player belongs to the MWC is roughly 97% ($1 - \frac{4}{7}\frac{3}{6}\frac{2}{5}\frac{1}{4}$). Hence the *ex-ante* payoff for the Apex player is almost 73% of the money (and the *ex-ante* payoff for a small player is slightly more than $\frac{1}{16}$).

2.3   Differences and similarities

The BF and DB models have a number of common features, as well as a number of major differences. For both models, subgame perfection predicts that money will be allocated in the first stage, only MWCs will be formed (with non-coalition members receiving zero payoffs), and the Apex player will receive substantially larger shares than the base players, or players shares in the EW game. The differences concern the distribution of ex-ante and ex-post payoffs, as well as the likelihood of observing one or the other type of MWC. Recall that by *ex-post* we mean "after a first mover has been randomly selected."

- **Ex-post**: The first mover always has a strong favorable position in the BF model. This makes the ex-post payoffs of the BF model far from proportional, whereas the ex-post payoff distribution using the DB model is always proportional to the relative weights in the MWC that is formed. Thus, in the EW game the ex-post payoff for the proposer is 60% of the pie in the BF model versus 33.3% for the first (and all other) movers in the DB game. In the Apex games, when the Apex player is the first mover, her predicted payoff is 85.7% in the BF game compared to 75% in the DB game. Further, conditional on being included as a member of the winning coalition, the share for the Apex player drops to 42.9% when the base player is the proposer in the BF game,

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	Base Formateur	Partner	Apex Formateur	Partner
Equal Weight				
BF	0.6	0.2	NA	NA
DB	0.333	0.333	NA	NA
Apex				
BF	0.571	0.429 [a]	0.857	0.143
DB	0.25	0.75 [a]	0.75	0.25

[a] Share for an Apex partner. To be divided in three equal parts in the case of all base players.

NA = not applicable

Table 1: Predicted Shares

whereas the Apex player's share remains fixed at 75% any time she is included in the winning coalition in the DB game.

- **Ex-ante**: In the BF game the ex-ante stationary payoff for the Apex player is 3/7. On the other hand, in the DB game the Apex player always receives 3/4 of the money when included in the MWC, and is in the MWC roughly 97% of the time, so that her ex-ante expected payoff is almost 73% of the money. Correspondingly, the ex-ante payoff for the small players is 1/7 in the BF game and less than half that in the DB game.

- Finally, the Apex player is predicted to be a member of the minimal winning coalition substantially more often in the DB game than in the BF game (97% vs. 57%, given the proportional recognition probabilities employed).

Table 1 summarizes the predictions of the two models. Regarding the allocation of shares, the emphasis is on the ex-post distribution, in part because of the field data we will compare our results to, and in part because these predictions are more extreme and thus less likely to match the observed behavior.

3   Experimental Design

Five subjects had to divide $60 among themselves in each bargaining round of an experimental session. In the treatments where subjects were given different weights, subjects holding more than one vote were treated like representatives of a

| Treatment | Experience | Number of Subjects | |
	Level	BF	DB
Equal Weight	Inexperienced	30	30
	Experienced	15	15
Apex	Inexperienced	30	30
	Experienced	15	10

Table 2: Number of Subjects per Treatment

unitary "voting block". Our initial experimental design employed the EW and Apex treatments for both DB and BF. After seeing the results from these two treatments, we implemented a third treatment, referred to as the $\text{Apex}_{1/3}$ treatment, in which the Apex player receives 1/3 of the Apex player's payoff rather than the full payment (as if the remaining two thirds had to go to the other members in their voting block). The motivation for this treatment will become clear when we report the results for the two initial treatments.

Either 10 or 15 subjects were recruited for each experimental session, so that there would be either 2 or 3 bargaining rounds conducted simultaneously in each session. After each bargaining round, subjects were randomly re-matched in groups, with the restriction that in the Apex sessions each group had to contain a single Apex player. Subject numbers also changed randomly between bargaining rounds (but not between the stages within a given bargaining round). In the Apex sessions, subjects weights, selected randomly at the beginning, remained fixed throughout the experimental session.[10]

In the BF treatments, the procedures of each bargaining round were as follows: First all subjects entered a proposal (on how to allocate the $60). Then one proposal was picked randomly 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 bargaining round ended. If the proposal was rejected, the process repeated itself (hence initiating a new stage of the

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[10]There is an obvious tradeoff here between having a larger sample of subjects in the role of the Apex player versus the possible effect of changing roles on speed of adjustment to equilibrium play and/or possible reciprocity considerations. This is an important technical issue that should be explored as part of any continuing research in this area.

same bargaining round). Complete voting results were posted on subjects' screens, giving the amount allocated by subject number (along with the number of votes that subject controlled in the Apex games), whether that subject voted for or against the proposal, and whether the proposal passed or not.[11] Recognition probabilities for proposals to be voted on equaled the ratio of number of votes controlled to the total number of votes.

In the DB sessions procedures were as follows: First, all subjects entered a demand for their desired share of the $60. Then one demand was randomly selected to represent the first demand and was posted on all subjects' screens. Once the remaining subjects saw this demand, they all entered a new set of demands, one of which was randomly selected and posted on all subjects' screens. This process repeated itself up to the point that a player could close the bargaining round without violating the budget constraint. At that point the player who could close the bargaining round was given the option to close it or to continue the process. When the player closing the bargaining round could include different subsets of players in the coalition, he/she had the option to choose who to include. Further, in case a bargaining round was closed without exhausting the budget constraint, and there were still players whose demands had yet to be recognized, these players were permitted to make demands on the residual.[12] In case all players had made their demands without anyone closing, the process repeated itself. The complete set of demands for each stage of a bargaining round were posted on subjects' screens, giving the amount demanded by subject number. Once a bargaining round closed, screens reported the demands/payoffs of those included in the winning coalition. In the Apex games the number of votes each subject controlled was reported, along with these demands. The order in which subjects were called on to make their demands was determined by the ratio of number of votes controlled to the total number of votes for those players who had yet to be selected.[13]

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[11]Screens also displayed the proposed shares and votes for the last three bargaining rounds as well as the proposed shares and votes for up to the past three stages of the current bargaining round. Other general information such as the number of votes required for a proposal to be accepted were also displayed.

[12]These residual demands were recognized in random order. If the first of these demands did not exhaust the budget constraint, the process was repeated until the residual was exhausted and/or all demands were satisfied. Any demand exceeding the residual was counted as a zero demand.

[13]It should be clear that for both the BF and DB games these procedures constitute what might be called a "partial strategy method," as they have some similarities to, but also important differences from, the full strategy method. For example, in BF we only ask for initial allocations from everyone,

Subjects were recruited through e-mail solicitations and posters spread around the Ohio State University campus. For each treatment, there were two inexperienced subject sessions and one experienced subject session. Experienced subjects all had prior experience with exactly the same treatment for which they were recruited.[14] A total of 10 bargaining rounds were held in each experimental session with one of the rounds, selected at random, to be paid off on.[15] In addition, each subject received a participation fee of $8. For sessions with inexperienced subjects, these cash bargaining rounds were preceded by a bargaining round in which subjects were "walked through" the various contingencies resulting from, for example, rejecting offers, not closing the coalition, etc.

4 Experimental Results

Results will be presented as a series of conclusions. The conclusions that concern exclusively the final allocations will have FA in parenthesis at the beginning. Otherwise, the analysis will be based on all observations, including proposals and demands that were rejected, as well as those that failed to be recognized. If a conclusion is limited to minimal winning coalitions, it will have MWC in parentheses. As a convention, the term formateur will be used to refer to the proposer of an accepted proposal in the BF treatments and to the subject who made the first demand in the final allocation in the DB treatments. For the statistical tests, unless otherwise noted, the unit of observation is the subject: for each subject we take the average across bargaining rounds in order to eliminate possible correlations across repeated observations of a given subject. Consequently, when hypothesis tests are performed,

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but *not* how they would vote contingent on the share offered. In DB, at each step of the bargaining process we ask the *remaining* subjects, those whose demands had yet to be selected, to all make demands, with *no* obligation to repeat earlier demands. We employed these procedures because they give us a wealth of data without being overly complicated.

[14] All subjects were invited back for experienced subject sessions. In case more than 15 subjects returned we randomly determined who would be sent home.

[15] The "walk through" was eliminated in the experienced subject sessions. The complete set of instructions, including the script for the walk through, are provided at the web site http://www.econ.ohio-state.edu/kagel/Apexinstructions.pdf. Inexperienced subject sessions lasted approximately 1.5 hours; experienced subject sessions approximately 1 hour as summary instructions were employed and subjects were familiar with the task. Although each bargaining round could potentially be infinitely long, there was never any need for intervention by the experimenters to insure completing a session well within the maximum time frame (2 hours) for which subjects were recruited.

Equal Weight	Frequency bargaining ends in stage 1		Frequency of MWC	
	BF	DB	BF	DB
Inexperienced	61.7% (1.7) [5]	96.7% (1.0) [2]	76.6%	82.5%
Experienced	50.0% (1.6) [3]	96.7% (1.0) [2]	94.2%	87.6%
Apex				
Inexperienced	57.9% (1.9) [12]	93.3% (1.1) [2]	63.1%	77.3%
Experienced	76.7% (1.4) [7]	95.0% (1.1) [2]	73.4%	100.0%

Table 3: Frequency of Bargaining Rounds that End in Stage 1 and of Minimum Winning Coalitions. Average [maximum] number of stages in parenthesis [square bracquets]

the associated statistics reported are averages of the subject averages. However, in the regression analysis we use all the data, employing a random effects specification (with subject as the random factor).

4.1 Demands and Proposals in the Equal Weight and Apex Treatments

The first two columns of Table 3 show the frequency with which bargaining rounds end in stage 1. The average number of stages per bargaining round are shown in parentheses next to these percentages, and the maximum number in brackets next to this. A majority of bargaining rounds end in stage 1 for both BF and DB, but bargaining rounds end in stage 1 much more frequently in DB than in BF (p<.01 using a Mann-Whitney test with session as the unit of observation).[16] However, what is missing from these statistics is that for DB, within a bargaining round, it often required more than the minimal number of steps (demands) to achieve an allocation. For example, in the EW treatment, 45.0% (33.4%) of all bargaining rounds required

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[16]In this case and others we have used session averages even though inexperienced and experienced sessions might be correlated. One alternative to avoid this potential correlation is to look exclusively at first round behavior for each bargaining group for inexperienced subjects only. However, there is considerable learning going on within each experimental session, so that in a number of cases the results using this alternative data base are not as strong (e.g. p < .10 for the tests reported here) even though we have doubled the sample size. Given the significant learning displayed in the experiments, we believe that it is more informative to look at session averages. Further, the $Apex_{1/3}$ treatment provides systematic replication of this and a number of other characteristics of the data.

more than three steps to close for inexperienced (experienced) subjects.[17] The typical reason for these extra steps was that one of the early players demanded too much, so that he was passed over (and received a zero share as a consequence); e.g., with inexperienced subjects, the average demand for subjects excluded from the final allocation in the EW treatment when four steps were necessary was a 0.54 share, compared to an average share of 0.29 for those included in the winning coalition.[18]

Conclusion 1 *Over* 50% *of all allocations were completed in stage 1 for both BF and DB, with substantially more allocations completed in stage 1 under the DB game. However, far from all of the DB bargaining rounds ended in the minimal number of steps, contrary to the theory's prediction.*

The last two columns of Table 3 report the frequency of MWCs across treatments. These percentages are consistently well above the 50% mark ($p < .05$, one-sided sign test using session values as the unit of observation), and tend to be somewhat higher under DB than under BF, although the latter difference is not significant at conventional levels.[19] At the other extreme very few bargaining rounds end with everyone getting a share of the pie. Non-MWCs in the DB treatments consist almost exclusively of cases where a subject closed the bargaining round but left money on the table.

The rather large increase in the frequency of MWCs under the EW treatment of the BF game are representative of a more or less continuous increase in the frequency of MWCs over time. For example, in the first three bargaining rounds for inexperienced subjects, the average frequency of MWCs was 71%, increasing to 86% by the last three rounds with inexperienced subjects, and continuing to increase for experienced subjects averaging 93% and 91% in the first and last three bargaining rounds, respectively. Similar trends occurred in the Apex treatment for the BF games: 48% and 69% in first and last three bargaining rounds with inexperienced subjects; 73% and 87% in first and last three rounds for experienced subjects.[20]

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[17]26.7% (26.7%) were closed in four steps, with the remaining 18.3% (6.7%) requiring five steps for inexperienced (experienced) subjects. The number of bargaining rounds ending in the minimal number of steps was a little higher in the Apex treatments, with 28.3% (20.0%) requiring more than the minimal number of steps for inexperienced (experienced) subjects.

[18]For bargaining rounds lasting five steps the corresponding shares were 0.457 for those excluded versus 0.330 for those included.

[19]p-value of two-sided Mann-Whitney test on session averages > 0.1.

[20]Similar increases in MWCs under BF for EW five player games are reported in Fréchette, Kagel and Lehrer (2003), but not in three player EW games (Fréchette, Kagel, and Morelli, 2004b). See

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Equal Weight	Baron-Ferejohn							
	1 Vote Formateur		Partner		Apex Formateur		Partner	
Inexperienced	0.393	[.600]	0.308^b	[.200]	NA		NA	
	(0.010)		(0.006)					
Experienced	0.404	[.600]	0.298^b	[.200]	NA		NA	
	(0.012)		(0.006)					
Apex – Inexp.								
Apex Included	0.469	[.571]	0.531^a	[.429]	0.721	[.857]	0.279	[.143]
	(0.015)		(0.015)		(0.034)		(0.034)	
Apex Excluded	0.319	[.571]	0.236^b	[.143]				
	(0.040)		(0.014)					
Apex – Exp.								
Apex Included	0.519	[.571]	0.481^a	[.429]	0.667	[.857]	0.333	[.143]
	(0.011)		(0.011)		(0.000)		(0.000)	
Apex Excluded	0.333	[.571]	0.222^b	[.143]				
	(0.053)		(0.018)					

a. Apex payoff for coalitions with Apex partner.

b. Highest share among coalition partners.

NA = not applicable

Table 4: Average Shares in Allocations Passed for Minimum Winning Coalitions [predicted values in brackets] (standard errors in parentheses)

Data for DB games do not exhibit these steady increases, but show clear increases in the frequency of MWCs after the first couple of bargaining rounds.[21]

Conclusion 2 *The majority of proposals are for MWCs with somewhat higher frequencies of MWCs in DB than in BF. MWCs are increasing, more or less continuously, in BF games, but level off quickly in DB games.*

One of the key differences between the DB and BF models relates to the ex-post distribution of benefits within MWCs. This is also the key factor used to distinguish between the two models with field data. Tables 4 and 5 report shares

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Fréchette (2004) for the development of an adaptive learning model organizing the data in Fréchette, Kagel, and Lehrer (2003).

[21] For example, in the EW case for DB, MWCs averaged 71% over the first three bargaining rounds then leveling off at 87%, on average, thereafter.

	Demand Bargaining							
Equal Weight	1 Vote Formateur		Partner		Apex Formateur		Partner	
Inexperienced	0.337	[.333]	0.364^b	[.333]	NA		NA	
	(0.012)		(0.008)					
Experienced	0.346	[.333]	0.348^b	[.333]	NA		NA	
	(0.012)		(0.006)					
Apex								
Inexperienced	0.358	[.250]	0.642^a	[.750]	0.636	[.750]	0.364	[.250]
	(0.031)		(0.031)		(0.033)		(0.033)	
Experienced	0.350	[.250]	0.650^a	[.750]	0.811	[.750]	0.189	[.250]
	(0.049)		(0.049)		(0.030)		(0.030)	

a. Apex payoff for coalitions with Apex partner.

b. Highest share among coalition partners.

NA = not applicable

Table 5: Average Shares in Allocations Passed for Minimum Winning Coalitions [predicted values in brackets] (standard errors in parentheses)

to coalition partners for accepted MWCs. Predicted shares are reported in brackets next to average realized shares. The tables distinguish between coalitions in which the formateur is a base player and those with an Apex formateur. Further, for the BF sessions we distinguish between MWCs involving the Apex player and those with base players only. (For DB sessions there are no MWCs involving all base players.) For coalitions with all base players, partner's share reports the average of the *largest* share allocated to *any* coalition partner.

There are a number of clear patterns in the data[22]:

1. For base players:

    (a) In the BF sessions base players have clear proposer power: In all cases their shares are greater than the share of votes they bring to the MWC ($p < .01$, two-sided sign test). In fact, not a single subject in those two treatments gets an average share as formateur less than the share

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[22]Statistical tests reported on below use subject averages, for final allocations, as the unit of observation in order to control for individual subject effects. Data reported in Tables 4 and 5 use final bargaining round outcomes as the unit of observation so that shares in the Apex game, with the Apex player in the coalition, add up to 1.0.

of votes contributed to the MWC. However, with the exception of base formateurs who form a coalition with the Apex player, they never achieve anything close to the extreme proposer power the BF model predicts.

(b) In the DB sessions, base players have a first-mover advantage, as average shares of first movers are consistently greater than the share of votes they contribute to the MWC ($p < .01$, two-sided sign test).[23]

(c) The first-mover advantage is consistently greater for base players in BF than in DB games, as the theory predicts ($p < .01$, two-sided Mann-Whitney test). However, the differences are not nearly as large as the theory predicts.

2. For Apex players:

(a) In the BF games, average shares for Apex players are below 0.750 for both inexperienced and experienced players. However, using subject averages as the unit of observation, we cannot reject that shares are significantly below .750 at conventional significance levels. Note that the power of this test is weak as we have 6 inexperienced and 3 experienced subjects in the role of Apex players.

(b) Inexperienced Apex players in DB games obtain average shares below the predicted level ($p < .01$, two-sided sign test), although experienced players do a bit better than predicted (not enough observations for sign test using subject averages for experienced players).

(c) We are unable to reject a null hypothesis that Apex players obtain the same average shares when they are first movers in DB and BF games ($p > .10$ for two-sided Mann-Whitney test). Average shares in both cases are much closer to those predicted under DB than BF.

3. About frequencies:

(a) In BF games base players earn substantially more as formateurs when partnering with the Apex player than when partnering with other base players (average shares of .469 versus .319 for inexperienced subjects; average shares of .519 versus .333 for experienced subjects). Hence, not

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[23] For the EW treatment, even though the average share for first movers is only a little above 1/3, this occurs for 27/36 subjects.

surprisingly, base players form MWCs with Apex players 70.4% (73.5%) of the time for inexperienced (experienced) players, compared to the predicted rate of 25%.

(b) In DB games base players partner with Apex players 100% of the time in MWCs, which is not unexpected given the recognition protocol employed. Indeed, there were only 4 bargaining rounds for inexperienced subjects (and none for experienced subjects) where the Apex player had not been selected by the fourth step in the demand process, and in all of these cases the fourth base player made a demand that did not permit closing the coalition.

Conclusion 3 *(FA, MWC) Base formateurs have a first-mover advantage in both BF and DB games, with the first-mover advantage significantly stronger under BF, as the theory predicts. However, base formateurs do not take nearly as much as predicted in BF games for the EW treatment. In contrast, Apex formateurs have little (if any) proposer power in both BF and DB treatments. In general, with respect to formateur power, behavior is much more similar between BF and DB games than the theory predicts. The frequency of inclusion of the Apex player in the MWC is better predicted by DB.*

Several remarks are in order here: First, proposer power in the DB game for base players could result from a number of factors. For example, in the EW game, one can imagine that later movers would be willing to accept a somewhat smaller share than predicted out of fear of being shut out of the winning coalition, as long as the price paid to guard against this was not too high. And the price was not very high, averaging $2.90 (14.5%) less than predicted for inexperienced subjects and less than half this ($1.46) for experienced subjects. Fear of being shut out of the winning coalition in the EW games could result from (1) risk aversion, which is not analyzed in the theory, (2) players own inability to follow the backward induction argument underlying the SPE, or (3) lack of confidence in others being able to follow the logic underlying the SPE.[24] However, these arguments for why later

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[24]This finding of proposer power where it does not exist in theory has some precedent in the bilateral bargaining literature. Ochs and Roth (1989) look at shrinking pie alternating offer games. They note that second movers were only slightly more likely to receive an opening offer of 50% in cells where the equilibrium offer was for 60% of the pie as opposed to cells where the equilibrium offer was 40%. Similar results are reported for second round offers as well, reflecting what Ochs and Roth call a "perceived first-mover advantage."

movers were willing to accept less in the EW game are much less convincing when applied to Apex players, since Apex players were almost certain to be included in the winning coalition when they did not move first. In spite of this, Apex players got substantially smaller shares than predicted ($6.48 and $6.24 less, on average, for inexperienced and experienced players respectively). As the next section will show, it appears that equity considerations underlie these deviations in the Apex games. Further, equity considerations also appear to underlie why base formateurs in the BF game preferred to partner with Apex players so much more than with other base players.

Second, the limited formateur's power in the BF games, compared to the predicted outcome, rests squarely on the fact that base players were almost certain to reject shares approaching the SSPE prediction in these games, so that offering the SSPE share did not maximize expected income. This is discussed in detail in Section 4.3 below, where voting behavior is analyzed.

Third, we noted earlier the large increases in the frequency of MWCs in the BF games. Looking at formateur shares conditional on being in a MWC for these same games, we see very little systematic movement over time with the exception of base players shares as formateurs in the Apex games. In this case formateur shares increased consistently over time for inexperienced players, averaging 42% over the first three bargaining rounds versus 47% over the last three, leveling off at around 50% for experienced subjects.

Finally, the SSPE of the BF game requires independent play between bargaining rounds, and between stages of a given bargaining round. McKelvey (1991), who conducted the first experiment with the BF game, observed more equal shares within winning coalitions than predicted and suggested that this resulted from a breakdown of the independence assumption.[25] That is, he suggested that formateurs were reluctant to give the small shares to coalition partners the SSPE predicts out of fear of retaliation should their proposal not be accepted. However, McKelvey (1991) did not provide any direct evidence to support this suggestion, simply offering it as a plausible rationalization for the more equal shares observed within coalitions. In our games we have minimized the ability to retaliate across bargaining rounds as members of the bargaining group were randomly remixed each period, and subject id numbers were changed (randomly) as well. Thus, there was no way to identify

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[25] The McKelvey experiment had three voters choosing over 3 or 4 predetermined allocations using a closed amendment rule. The resulting SSPE was a mixed strategy equilibrium.

who to retaliate against. However, subject id numbers remained fixed within stages of a given bargaining round; i.e., if a stage $n-1$ proposal was not accepted, players could punish proposers through excluding them in their own proposal in stage n. We can look at this directly, computing (for bargaining rounds that do not end in stage one) the number of times a subject includes the proposer from stage $n-1$ in his coalition. If formateur's randomize between stages of a given bargaining round, the formateur from stage $n-1$ should be included in an agent's proposal in stage n as often as the other coalition partners offered shares in stage n. Using a sign test and averages of individual subject proposals as the unit of observation, we are unable to reject a null hypothesis of randomization between stages at the 5% level for players in the EW treatment and for Apex players.[26] Thus, it appears that fear of retaliation in subsequent bargaining rounds does *not* explain the more equal distribution of shares within MWCs than the BF model predicts.[27]

4.2 The Role of Equity Considerations on Apex Game Outcomes: The Apex$_{1/3}$ Treatment

As the previous section showed, average shares for Apex players were less than the number of votes they contributed to the MWC when acting as formateurs in the BF game. Further, average shares for Apex players in DB games were smaller than the number of votes they contributed to the MWCs, with the notable exception of formateurs among experienced subjects (for which we have only two Apex players). In addition, base players acting as formateurs in the Apex game choose to partner with the Apex player far more often than predicted in the BF games, thereby earning substantially larger shares than had they partnered with all base players. One does not need to look very far for a candidate explanation of these deviations from the theory. The extensive experimental literature on bilateral bargaining games (see Roth, 1995, for a survey) indicates that players are likely to be motivated, in part, by minimum equity considerations regarding their own payoffs.[28] These equity considerations work in opposition to the greater bargaining power the Apex player has: Other things equal, it is much easier to satisfy any minimum equity

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[26]We exclude base players in the Apex games as the appropriate test is much less straightforward in this case.

[27]Similar tests for independence between stages of a given bargaining round are reported in Fréchette, Kagel and Morelli (2004b) for three player EW games with similar results.

[28]Previous studies of legislative bargaining games (McKelvey, 1991; Fréchette, Kagel and Lehrer, 2003; Fréchette, Kagel and Morelli, 2004b) indicate similar factors at work there as well.

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considerations for one Apex player than for three base players.[29]

One way to neutralize these equity considerations is to limit the "take-home" pay of the Apex player to 1/3 of the Apex player's share – as if the Apex subject were just a representative player for a three-member party, with equal payoff division inside the party. In terms of the BF model, the $Apex_{1/3}$ treatment equalizes the ex-ante payoff of the Apex player to that of the base players, thereby largely restoring equity between player types. For the DB model the Apex player still has an advantage, ex-ante, as she is almost certain to be included in the winning coalition. However, relative to the predicted distribution of shares within the MWC, equity has been restored between the Apex player and the base players *included in* the MWC. For both BF and DB games this change in the take-home pay for the Apex player has no impact on the subgame perfect equilibrium predictions. The $Apex_{1/3}$ treatment also acts as a stand-in for the fact that in real legislative settings payoffs must be shared among coalition partners constituting the Apex voting block.

Procedures were essentially the same for the $Apex_{1/3}$ treatment as for the other treatments. We ran two inexperienced subject sessions for DB and another two inexperienced subject sessions for BF, with 15 subjects (three groups of five subjects operating simultaneously in each session). We also ran one experienced subject session each for DB and BF with 15 subjects returning for the BF session and 10 for the DB. The only modification in the screen layouts were that they reported both the nominal share allocated to the Apex player along with the amount of money that player would actually receive.

Table 6 shows the frequency with which bargaining rounds ended in stage 1, as well as the frequency with which they ended in MWCs. For both bargaining protocols, the vast majority of games ended in stage 1 and involved MWCs.[30] There are no statistically significant differences between the Apex and the $Apex_{1/3}$ treatments for both DB and BF on these two dimensions ($p > .10$ using sessions averages as the unit of observation and a two-sided Wilcoxon/Mann-Whitney test). However, as with the Apex treatment, DB tends to involve a single stage of bargaining more often than BF, and to have a somewhat higher frequency of MWCs.

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[29]This would, of course, not necessarily be true if equity considerations co-varied with player power.

[30]As with the other BF games, there is a more or less steady increase in the frequency of MWCs in the $Apex_{1/3}$treatment averaging 52% versus 87% over the first and last three bargaining rounds for inxperienced players, and 76% versus 93% over the first and last three bargaining rounds for experienced players.

| | Frequency bargaining ends in stage 1 | | Frequency of MWC | |
Apex$_{1/3}$	BF	DB	BF	DB
Inexperienced	71.7% (1.8) [12]	72.6% (1.4) [6]	73.3%	93.6%
Experienced	80.0% (1.3) [4]	100.0% (1.0) [1]	79.5%	86.6%

Table 6: MWCs

With respect to bargaining shares, however, there are systematic effects, as (1) Apex players obtain a very small advantage as formateurs, under both bargaining protocols, as opposed to the small disadvantage they had in the Apex treatment, and (2) Apex players require a larger nominal share of the pie when invited into MWCs by base players in the BF game and when closing coalitions in the DB game.[31] The largest increase in Apex player shares is for the BF game where the base player acts as formateur, as now Apex players get substantially larger shares than the theory predicts (and substantially larger shares than in the Apex games). Not surprisingly, under these circumstances base formateurs in the BF game now invite the Apex player into MWCs much less often than in the Apex game, averaging 39.0% (42.0%) for inexperienced (experienced) subjects, as opposed to 70.4% (73.5%) in the Apex treatment.[32] In contrast, the Apex$_{1/3}$ treatment has essentially no impact on the shares base formateurs are able to obtain when forming a coalition with all base players: Average shares for formateurs with an all base player coalition averaged .282 (.242) and .260 (.250) for inexperienced and experienced players respectively (with highest coalition partner's share in parentheses).[33] Finally, note that base formateurs in both the BF game and the DB game (for inexperienced players in the latter case) display some small formateur advantage when partnering with the Apex player, as they achieve somewhat more than the .250 share of votes they contribute to the MWC.[34]

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[31] Pooling data across experience levels, and using session averages, we can reject the null that formateurs take shares equal to the the share of votes contributed to the winning coalition in both BF and DB at the 10% level using a one-sided sign test. Using subject averages, and pooling across experience levels, we can reject the null that Apex players obtain the same shares when the formateur is a base player in the Apex and Apex$_{1/3}$ treatments at the 1% level using two-sided Wilcoxon/Mann-Whitney tests.

[32] Using session averages and pooling across experience levels, the null of no difference can be rejected at the 5% level using a two-sided Wilcoxon/Mann-Whitney test.

[33] Pooling across experience levels and using subject averages, the formateur shares are not significantly different at the 10% level using a two-sided Wilcoxon/Mann-Whitney test.

[34] The former (BF) is statistically significant at the 10% level using a two-sided sign test on

Baron-Ferejohn	Apex$_{1/3}$ Treatment							
	Base Formateur		Apex Partner		Apex Formateur		Base Partner	
Inexperienced	0.283	[.571]	0.717	[.429]	0.775	[.857]	0.225	[.143]
	(0.029)		(0.029)		(0.012)		(0.012)	
Experienced	0.267	[.571]	0.733	[.429]	0.761	[.857]	0.239	[.143]
	(0.011)		(0.011)		(0.011)		(0.011)	
Demand Bargaining								
Inexperienced	0.290	[.250]	0.710	[.750]	0.779	[.750]	0.221	[.250]
	(0.027)		(0.027)		(0.016)		(0.016)	
Experienced	0.238	[.250]	0.763	[.750]	0.829	[.750]	0.171	[.250]
	(0.013)		(0.013)		(0.014)		(0.014)	

Table 7: Average Shares in Allocations Passed for Minimum Winning Coalitions [predicted values in brackets] (standard errors in parentheses)

Comparing the Apex player's shares in Table 7 above with those reported in Tables 4 and 5, can help to identify the equity effect on the Apex player's share in the Apex game. Compared to a player's share in the EW game, the Apex player's share in the Apex game is the net result of a (positive) bargaining power effect and a (negative) equity-consideration effect, whereas the Apex$_{1/3}$treatment has (largely) neutralized the equity-consideration effect. So how much were Apex player's giving up on account of equity considerations in the Apex game? In the BF games, with the Apex player as formateur, the average Apex player's share was 0.054 ($3.24) less than in the Apex$_{1/3}$ games for inexperienced subjects ($6.78 less for experienced subjects). This represents a reduction in the Apex player's payoffs due to equity considerations of some 14.4% (26.2%) for inexperienced (experienced) subjects. The numbers change considerably for Apex players as coalition partners, as the average Apex player's share was 0.187 ($11.22) less than in the Apex$_{1/3}$ games for inexperienced subjects and .252 ($15.12) for experienced subjects. These differences suggest that equity considerations are *not* independent of the Apex player's bargaining position in the BF games: the more powerful the Apex player's bargaining position, the smaller the impact of any equity considerations have on the share the Apex player gets In the DB game equity considerations do not vary as much depending in the Apex player's position as first mover versus when they are closing the coali-

subject averages, while the latter (DB) is not.

tion, probably reflecting the weaker first-mover advantage in the DB game. As first mover, the equity consideration effect in the Apex game cost the Apex player a .143 ($8.58) share for inexperienced subjects and a .013 share ($0.78) for experienced subjects. In closing the coalition, the equity-consideration effect averaged a .068 ($4.08) share for inexperienced subjects and a .113 ($6.67) share for experienced subjects.

Conclusion 4 *(FA, MWC) The $Apex_{1/3}$ treatment was designed to correct for potential equity consideration effects on outcomes in the Apex treatment. For the BF games, the major impact of any considerations shows up in terms of the high shares base formateurs obtain, and the strong preference they have for partnering with the Apex player, in the Apex treatment. In contrast, equity considerations play a minimal role when the Apex player has formateur power in the BF games. For both DB and BF games, Apex players in the $Apex_{1/3}$ game are able to achieve considerably larger shares than base players in the EW game, regardless of whether or not they act as formateurs, so that they clearly exercise their increased voting power.*

4.3 Voting Patterns

This section examines voting patterns across all three treatments. In the BF game voting is explicit, as each proposal that is recognized is voted up or down by everyone. We can obtain something comparable to this for the DB game, since any time a player has a chance to close a coalition she is, in effect, voting for or against a given allocation. For example, take the EW treatment, and suppose that the first two players have each demanded a 0.4 share of the pie. Then the third player can close the coalition by accepting a 0.2 share, or she can demand a larger share, so that in effect closing (not closing) the coalition is a vote in favor of (against) a 0.2 share. Of course, there are far fewer "votes" in the DB game than in the BF game, but there are sufficient numbers of observations to clearly identify voting patterns.[35]

Figures 1 summarize votes, by shares offered for both DB and BF games.[36] We have pooled over experience levels in all cases and have two separate figures for the Apex games, distinguishing between base and Apex players. As the figures illustrate, the probability of acceptance increases with own share in all cases. Looking at base players in the BF games, offers of $12 in the EW treatment and $8.57 in the Apex

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[35] In all cases we employ the maximum share the subject can request to form a minimal winning coalition.

[36] These figures exclude the votes of proposers in BF sessions.

treatment should be accepted according to the SSPE, but have little, if any, chance of being accepted in practice. Predicted voting patterns are also violated for base players in the DB games. In this case shares between $15 and $20 should always be rejected in the EW treatment and always accepted in the Apex and Apex$_{1/3}$ treatments. This does not happen: In all cases only a small percentage of $18 (and above) shares are consistently rejected, and a large proportion of $13-$20 shares are accepted. Apex players in BF games essentially reject all shares below $24, and accept most shares at or above $28, which is quite close to their predicted cut off point of $25.71 under the SSPE. In contrast, Apex players in DB games accept between 70-80% of all allocations greater than or equal to $28, which is well below their SPE cutoff point.

A more nuanced look at voting patterns is obtained through random effect probits. An initial set of probits were run to determine the sensitivity of votes to factors other than own share. The specification for BF sessions was:

$$vote_{it} = I\left\{\beta_0 + \beta_1 bS_{it} + \beta_2 aS_{it} + \beta_3 PS_{it} + \beta_4 D_{it}^2 + \beta_5 D_{it}^3 + \beta_6 D_{it}^4 + \alpha_i + \nu_{it} \geq 0\right\} \tag{1}$$

where $I\left\{\cdot\right\}$ 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}), the share the proposer takes (PS), and dummy variables $D^j, j = 2, 3, 4$, taking value one if the proposal on the floor included j members.[37] The dummy variable a takes value one if we are talking about the Apex player, and the dummy b takes value one if we are talking about a base player. From this general specification one can derive the special case of the regression for the EW treatment by dropping $\beta_1 aS_{it}$. α_i is a subject specific error term (random-effect) and ν_{it} is an idiosyncratic error term.

In all the regressions own share is the key determinant of voting for or against a proposal. The dummy variables $D^j, j = 2, 3, 4$, fail to achieve statistical significance at anything approaching conventional levels for any of our data sets, indicating that: (i) subjects had little, if any, concern for *other* subjects getting zero shares as long as their own share was large enough, and (ii) there were no systematic differences in acceptance thresholds in cases where the money was divided between two, three, four, or five subjects. The variable PS achieves statistical significance in the Apex treatments but not in the EW treatment.[38] Given all this, the simpler specification

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[37]The excluded category is the one where funds were distributed to all five voters.

[38]These results are robust to specifications in which the PS variable was permitted to take on

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No. of Offers										
Range:	0 - 1.99	2 - 3.99	4 - 5.99	6 - 7.99	8 - 9.99	10 - 11.99	12 - 13.99	14 - 15.99	16 - 17.99	18 - 19.99	20.00 +
% in favor:	0	0	0	0	0	12	41	72	78	89	96

Share in Dollars

Demand Bargaining

No. of Offers										
Range:	0 - 1.99	2 - 3.99	4 - 5.99	6 - 7.99	8 - 9.99	10 - 11.99	12 - 13.99	14 - 15.99	16 - 17.99	18 - 19.99	20.00 +
% in favor:	0	14	0	0	25	30	n/a	42	44	70	80

Share in Dollars

☐ Vote in Favor   ■ Vote Against
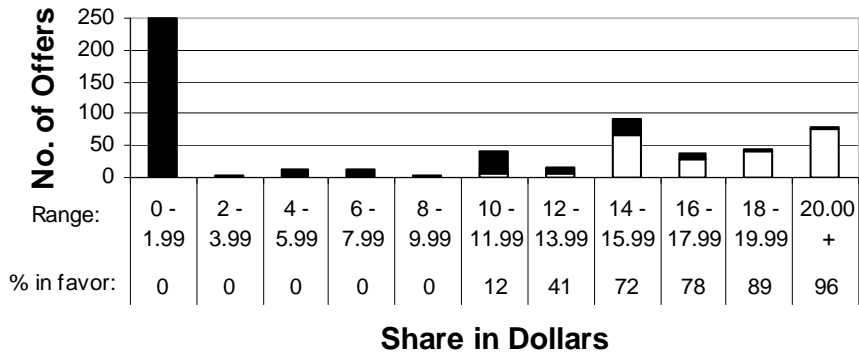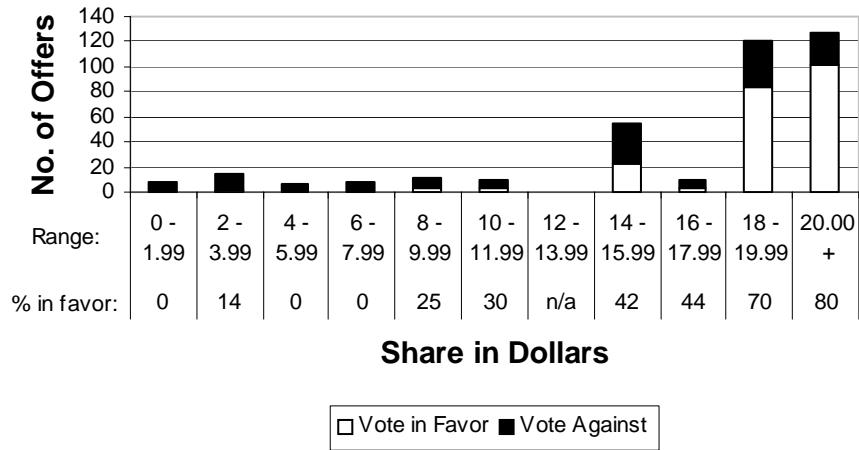
Figure 1: Equal Weight Games: Votes by Shares (represented in dollar amounts)

1 Vote

Share in Dollars	0 - 1.99	2 - 3.99	4 - 5.99	6 - 7.99	8 - 9.99	10 - 11.99	12 - 13.99	14 - 15.99	16 - 17.99	18 - 19.99	20.00 +
	4	0	6	80	25	42	49	90	100	0	91

3 Votes

Share in Dollars	0 - 3.99	4 - 7.99	8 - 11.99	12 - 15.99	16 - 19.99	20 - 23.99	24 - 27.99	28 - 31.99	32 - 35.99	36 - 39.99	40.00 +
	13	0	0	33	100	22	41	82	100	0	100

1 Vote

Share in Dollars	0 - 1.99	2 - 3.99	4 - 5.99	6 - 7.99	8 - 9.99	10 - 11.99	12 - 13.99	14 - 15.99	16 - 17.99	18 - 19.99	20.00 +
	n/a	42	0	n/a	41	n/a	83	n/a	61	n/a	76

3 Votes

Share in Dollars	0 - 3.99	4 - 7.99	8 - 11.99	12 - 15.99	16 - 19.99	20 - 23.99	24 - 27.99	28 - 31.99	32 - 35.99	36 - 39.99	40.00 +
	n/a	n/a	0	n/a	0	n/a	n/a	71	82	70	75

Figure 2: Apex Games: Votes by Shares (represented in dollar amounts)

1 Vote

Share in Dollars	0 - 1.99	2 - 3.99	4 - 5.99	6 - 7.99	8 - 9.99	10 - 11.99	12 - 13.99	14 - 15.99	16 - 17.99	18 - 19.99	20.00 +
	2	n/a	29	33	39	46	82	89	n/a	100	100

3 Votes

Share in Dollars	0 - 3.99	4 - 7.99	8 - 11.99	12 - 15.99	16 - 19.99	20 - 23.99	24 - 27.99	28 - 31.99	32 - 35.99	36 - 39.99	40.00 +
	0	0	0	25	0	14	44	0	0	100	100

1 Vote

Share in Dollars	0 - 1.99	2 - 3.99	4 - 5.99	6 - 7.99	8 - 9.99	10 - 11.99	12 - 13.99	14 - 15.99	16 - 17.99	18 - 19.99	20.00 +
	0	n/a	17	28	47	34	n/a	50	n/a	25	55

3 Votes

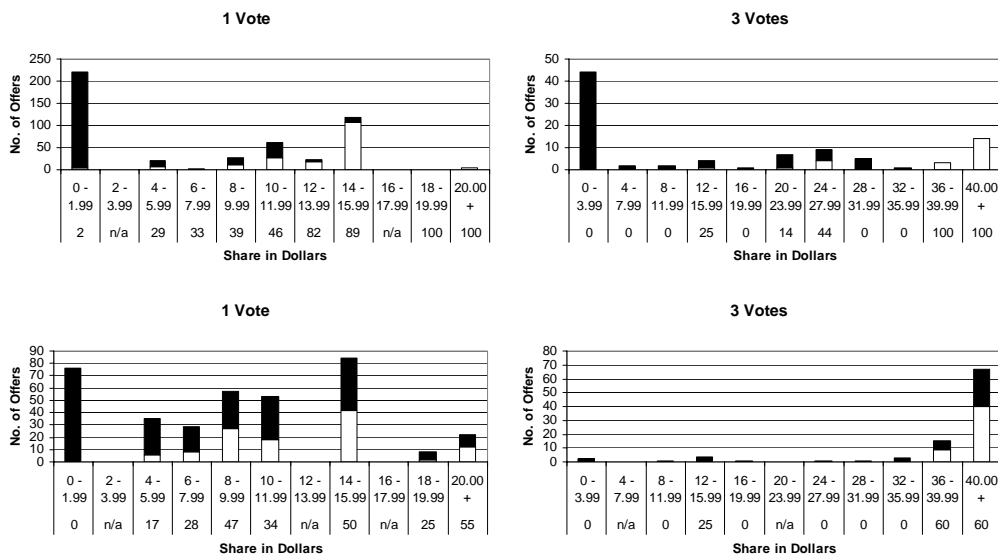| Share in Dollars	0 - 3.99	4 - 7.99	8 - 11.99	12 - 15.99	16 - 19.99	20 - 23.99	24 - 27.99	28 - 31.99	32 - 35.99	36 - 39.99	40.00 +
	0	n/a	0	25	0	n/a	0	0	0	60	60

Figure 3: Apex$_{1/3}$ Games: Votes by Shares (represented in dollar amounts)

we report for the BF sessions is:

$$vote_{it} = I\left\{\beta_0 + \beta_1 aS_{it} + \beta_2 bS_{it} + \beta_3 PS_{it} + \alpha_i + \nu_{it} \geq 0\right\} \tag{2}$$

For DB sessions, recall that we consider only the data about the players who had the possibility to close a majority coalition. The initial set of probits employed the following specification:

$$vote_{it} = I\left\{\beta_0 + \beta_1 aS_{it} + \beta_2 bS_{it} + \beta_3 HS_{it} + \alpha_i + \nu_{it} \geq 0\right\} \tag{3}$$

where HS is the highest share demanded by previous players from the demands forming the cheapest potential coalition.[39] The HS variable is meant to mirror what PS captures in the BF probits. There is no equivalent for the number of subjects included in the distribution in this case. However, the HS variable failed to achieve statistical significance at anything approaching conventional levels and/or had an incorrect sign (in one case $\beta_3 < 0$), so that the specification reported excludes HS.[40] As with the BF sessions, own share is statistically significant for all of the data sets for which we have a reasonable number of observations.

Table 8 reports the regression results for the BF sessions, along with estimates of ρ defined as $\frac{\sigma_\alpha^2}{\sigma_\alpha^2+1}$ where σ_α^2 is the variance of the subject specific random effects. As such ρ measures the extent of the individual subject effects, or the dispersion in the likelihood of acceptance across individual subjects.[41] From the coefficient estimates, using the mean value of PS for the treatment in question, we compute the share that the *average* voter requires just to be indifferent between accepting or rejecting a proposed allocation. These indifference points both in shares and in dollars are reported at the bottom of the table. (The IP values reported.) Our focus is on the indifference points for inexperienced voters, as these coefficient estimates are substantially more reliable, especially in the Apex treatments, because of the limited number of observations for experienced subjects.

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different values for base versus Apex proposers. Also see Kagel and Wolfe (2001) and Bereby-Meyer and Niederle (2004) for results from bargaining experiments where players do not appear to have any concerns for other players' payoffs.

[39] For instance, in the EW treatment, if there were three requests prior to yours, 0.5, 0.4, and 0.3, HS would equal 0.4, as the 0.5 share lies outside the cheapest winning coalition.

[40] The results reported are robust to alternative specifications in which the HS variable was permitted to take on different values for Apex and base proposers.

[41] ρ has a minimum value of 0 (no individual subject effects) and a maximum value of 1 (all the variance is explained by individual subject effects).

	Equal Weight		Apex		Apex$_{1/3}$	
	Inexp	Exp	Inexp	Exp	Inexp	Exp
S. - 1 vote	19.988***	25.023***	11.875***	26.976***	15.950***	25.507***
	(2.640)	(5.883)	(1.349)	(10.323)	(1.544)	(5.882)
S. – Apex	NA	NA	6.466***	16.137***	5.224***	9.956***
			(1.122)	(6.189)	(0.897)	(3.065)
PS	-1.051	-1.286	-1.336**	-5.784**	0.51	-0.132
	(1.027)	(2.129)	(0.535)	(2.503)	(0.494)	(1.024)
Constant	-4.033***	-5.166***	-1.710***	-0.835	-2.783***	-3.685***
	(0.709)	(1.769)	(0.381)	(1.735)	(0.417)	(0.995)
ρ	0.307§	0.256	0.544§	0.783§	0.271§	0.561§
	(0.134)	(0.261)	(0.098)	(0.159)	(0.095)	(0.203)

Standard errors in parenthesis.

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

§ indicates statistical significance at 1% using a likelihood ratio test.

Indifference Points (IP - see text for description)						
IP – 1 vote	0.223	0.229	0.200	0.143	0.159	0.147
	($13.39)	($13.74)	($11.98)	($8.57)	($9.54)	($8.81)
IP – Apex	NA	NA	0.367	0.239	0.485	0.376
			($21.99)	($14.32)	($29.11)	($22.56)
Obs.	404	192	444	168	420	152

Table 8: Random Effect Probit Estimates of the Determinants of Votes in BF Games

	Share Offered to Coalition Partner:		Expected Return to Proposer:		Average
Treatment	Income Maximizing	SSPE	of Income Maximizing Share	of SSPE Offer	Share Offered
Equal Weight	$17.57	$12.00	$21.80	$14.01	$17.75
					(0.56)
Apex					
Base Player	$29.70	$25.74	$23.71	$23.09	$30.97
					(0.99)
Apex Player	$16.97	$8.58	$38.66	$34.18	$17.81
					(3.91)
Apex$_{1/3}$					
Base Player	$30.90	$25.74	$19.45	$18.74	$37.94
					(2.53)
Apex Player	$13.92	$8.58	$43.83	$39.73	$12.93
					(0.85)

Average Share Offered reports the average of the subject average share offered.

Values in parentheses are standard errors of the mean using subject averages as the unit of observation.

Table 9: Coalition Partner's Share Maximizing Own Expected Share

For base players indifference points are essentially the same between the EW and the Apex treatment, around $13.50, slightly above the $12 cutoff under the SSPE. This drops rather sharply under the Apex$_{1/3}$ treatment to $8.94, which is not much above the SSPE share of $8.57. Similarly, the indifference point for the average Apex player jumps from $21.82 to $29.87 in going from the Apex to the Apex$_{1/3}$ treatment, bracketing the $25.71 predicted under the SSPE. The reduced demands of the base players and the increased demands of the Apex players in the Apex$_{1/3}$ treatment were what we anticipated when implementing this treatment, as Apex players require a larger nominal payoff to compensate for the fact that they are only getting a 1/3 share of the Apex "block's" payoff. Although this should not happen according to the theory, it is consistent with the notion that subjects have some lower bound on payoffs that they are willing to accept independent of continuation values. At the same time, the large difference in cut-off values between Apex and base players makes it clear that subjects respond to the presence of bargaining power asymmetries.

From the voting regressions we can compute the share formateurs should offer to

maximize their expected return and compare this with the shares actually offered, as well as their expected return had they played according to the SSPE. These shares are consistently well above the indifference points reported in Table 8, as the latter are based on average responses. In contrast, the formateur must cope with the dispersion in minimal thresholds across subjects, so that offers equal to the average indifference point have only a 50% chance of being accepted. The first column of dollar values in Table 9 reports the shares formateurs should have offered to potential coalition partners to maximize own income, *given* the dispersion in minimal acceptance thresholds for inexperienced players in the BF games. Predicted shares under the SSPE are reported in the next column. The following two columns report the formateurs' expected income as a result of offering these shares compared to their expected income from offering the SSPE share.[42] The last column reports the average share actually offered, computed over all offers. In the EW treatment the income maximizing share for coalition partners is $5.57 above the SSPE share and yields a correspondingly higher share ($7.79) to formateurs compared to what they would have gotten had they offered the SSPE share.[43] Further the average share actually offered is remarkably close to the income maximizing share ($17.78 versus $17.75). Similar results are found in the Apex treatments in the sense that in all cases the (own) income maximizing share for coalition partners are greater than the SSPE share, with the result that the expected income of formateurs is greater than had they offered the SSPE share. This difference is particularly large (over $4.00) for Apex players when serving as formateurs. Further, with the notable exception of the base players in the $\text{Apex}_{1/3}$ treatment, all of the coalition partner shares actually offered are reasonably close to the income maximizing shares, and much closer to the formateurs' income maximizing share than the share prescribed under the SSPE.

Table 10 reports the regression results for the DB sessions along with the implied

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[42]For the EW treatment these are obtained using the formula Expected value $=$ $\left(\text{Pr}\,\frac{(1-\text{Share to Self})}{2}\right)^2 \times (\text{Share to Self}) + \left(1 - \left(\text{Pr}\,\frac{(1-\text{Share to Self})}{2}\right)^2\right) \times (\text{Continuation Value})$ where $\text{Pr}\,(s)$ is the estimated probability that a share of s is accepted using the random effects probits. The continuation value is approximated by the average payoff. Similar calculations are employed in the Apex treatments adjusting for the fact that in these cases the formateur had only to obtain one additional coalition partner and with the continuation value approximated by the average payoff for the Apex players.

[43]Note that the formateur's share here is less than $60 less two times partners' shares as there remains a positive probability that at least one potential coalition partner will reject the offer.

	Equal Weight		Apex		$\text{Apex}_{1/3}$	
	Inexp	Exp	Inexp	Exp	Inexp	Exp
S. - 1 vote	5.343***	17.447***	3.611***	30.382	6.305***	12.580***
	(0.798)	(3.931)	(0.791)	(18.865)	(0.999)	(4.559)
S. - Apex			3.259***	4.866*	3.132***	3.098**
			(0.794)	(2.519)	(0.626)	(1.480)
Constant	-1.483***	-4.504***	-1.124***	-2.675*	-1.843***	-1.659**
	(0.275)	(1.183)	(0.341)	(1.600)	(0.277)	(0.813)
ρ	0.150§	0.583§	0.415§	0.000	0.426§	0.408§
	(0.085)	(0.157)	(0.106)	(0.000)	(0.097)	(0.212)

Standard errors in parenthesis.

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

§ indicates statistical significance at 1% using a likelihood ratio test.

Indifference Points (IP - see text for description)						
IP − 1 vote	0.277	0.258	0.311	0.088	0.292	0.132
	($16.65)	($15.49)	($18.67)	($5.28)	($17.54)	($7.91)
IP − Apex	NA	NA	0.345	0.550	0.588	0.535
			($20.69)	($32.98)	($35.31)	($32.13)
Obs.	254	115	241	87	390	69

Table 10: Random Effect Probit Estimates of the Determinants of Votes in DB Games

share that the *average* voter requires to be indifferent between closing or not closing the coalition (the IP values reported at the bottom of the table). With the exception of the Apex player in the Apex treatment, indifference points are larger in DB than BF for comparable treatments, as the theory predicts on the basis of the formateur power in the BF games. However, these differences are not nearly as large as predicted, consistent with the smaller than predicted shares obtained by the formateur in the BF games. The indifference point for Apex players in the Apex treatment is only slightly higher than for base players, but is considerably higher in the Apex$_{1/3}$ treatment. This should not happen according to the theory, but is again consistent with the notion that subjects have some lower bound on payoffs that they are willing to accept, so that the cut in the Apex player's "take-home" pay has this effect. Finally, the indifference point for the Apex player in the Apex treatment is surprisingly close to that of the base players for inexperienced subjects (.345 versus .311), even though the Apex player was almost certain to be included in any winning coalition.

Conclusion 5 *Own share of the benefits is the key factor affecting voting for or against a proposed allocation, with essentially no concern for players left out of MWCs when deciding how to vote.*

Conclusion 6 *Average shares required to vote favorably on a proposed allocation are consistently larger under DB than BF, as the theory predicts. But these differences are not nearly as large as predicted. Apex players in the Apex$_{1/3}$ treatment require substantially larger shares than in the Apex treatment, consistent with the notion that subjects have some lower bound on payoffs they are willing to accept. Acceptance thresholds are sensitive to strategic considerations as witness the large differences in average acceptance thresholds between base players and Apex players in the BF treatment.*

Finally, note that in going from the Apex game to the Apex$_{1/3}$ game for the BF games, the average share offered by Apex players to their coalition partners in MWCs drops from 0.252 to 0.210 ($2.52) but is accompanied by an increase in the probability of acceptance from 0.58 to 0.79. Thus, the lower shares offered were accompanied by a higher probability of acceptance. This suggests that the lower shares offered by the Apex players in the Apex$_{1/3}$ treatment were considered reasonable offers under the circumstances.[44] In going from the Apex to the Apex$_{1/3}$

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[44]There is a parallel here to the bilateral bargaining literature. In the Roth et al. (1991) four

treatment in the DB games, the average share Apex players left over for their coalition partners decreased from 0.364 to 0.221 ($8.58). This sharp decrease did result in a reduced probability of acceptance from 0.56 to 0.37. But given the rules for ordering demands, the Apex player was still virtually certain of being included in any winning coalition. Thus, the result of the reduced acceptance probability in this case was to simply increase the average number of steps required before closing the coalition.

5   Comparisons with Field Data

A key arena for distinguishing between demand based and offer based models of legislative bargaining with field data has involved analyzing the share of cabinet posts held within coalition governments in parliamentary democracies as a function of parties' relative voting strength. The two most recent efforts along these lines have been explicitly designed to distinguish between demand based and offer based bargaining models using Morelli (1999) and Baron-Ferejohn (1989) as their respective reference points (see Warwick and Druckman, 2001, and Ansolabehere et al., 2003). The hope in this research is to find out which of the two models is the "right" bargaining model, both for descriptive purposes, as well as to make inferences about a variety of outcomes that are difficult to observe directly. For example, in the literature on the endogenous size of governments, and local public good provision in a congressional budget system (see for example chapter 7.2 in the political economics textbook by Persson and Tabellini, 2000), the degree of proposer power determines not only the distribution of local public goods in a common pool problem, but it also affects the relative size of the districts receiving money for local projects, as the greater the proposer power the more unequal the distribution of benefits among claimants. There are also simple welfare consequences, since with concave utility functions a more unequal distribution of a common pool of resources usually involves lower ex-ante utilitarian sums.[45]

country comparison of ultimatum game outcomes, proposers offered significantly less in Japan and Israel with no increase in rejection rates relative to the US and Slovenia. Roth et al. attribute this outcome to the fact that what differs between countries is not aggressiveness, or toughness in bargaining, but rather the perception of what constitutes a reasonable offer under the circumstances.

[45]Even in private organizations, or clubs, the possibility of knowing which bargaining model best represents the behavioral patterns has not only descriptive value but also other implications: Corporations where the bargaining process displays a large advantage for the agenda setter (as in the BF model) are likely to have either a very strong CEO, or a frequent turn-over in executive

Warwick and Druckman, and the studies preceding theirs (e.g., Browne and Frendreis, 1980) measure a party's voting strength in terms of the share of legislative seats each party contributes to the winning coalition (as opposed to the share of seats each party in the winning coalition has in the legislature as a whole). These studies consistently find that a party's share of cabinet posts is linearly related to its share of legislative seats within the coalition government, and that there is little or no advantage to being the formateur. Given the linear relationship and the general absence of a formateur effect these studies conclude in favor of the DB approach.[46]

Ansolabehere et al. re-analyze the Warwick and Druckman data employing as primary regressor a measure of a party's voting-weight within the legislature, as opposed to using their share of seats within the winning coalition.[47] Seat shares do not generally equal voting-weight shares, and voting-weight shares constitute the key factor underlying legislative bargaining power. Ansolabehere et al. also develop a framework for nesting the DB and BF approaches, and estimate the model using both voting-weight shares and shares of seats within the governing coalition. They conclude that the data favors the BF model as they find a statistically significant formateur effect both with and without weighting the prime minister's (PM's) portfolio more than other portfolios, and the coefficient value for voting-weight shares is close to 1. They note, however, that the estimated formateur effect is significantly *lower* than predicted under BF – one third of the predicted value for the unweighted data, and one half of the predicted value when weighting the PM's portfolio.

The analogue to these approaches for our data is to use the share of benefits obtained by a subject as the dependent variable in the regression, and to use either the share of votes that a subject contributes to the winning coalition, or its voting-weight share, as the key explanatory variable.[48] As in the field data analysis, we

roles, as there will be strong competition to be the CEO, compared to corporations where the bargaining process is such that the agenda setter has less power (as in the DB approach).

[46] This conclusion is robust to weighting the portfolios by importance using rankings from Laver and Hunt (1992). Not surprisingly, they also find that if the prime minister post is given a weight large enough, then a formateur effect can re-appear.

[47] They also add two additional countries and several more years of data, but the analysis makes it clear that this has no material effect on the differences between their results and Warwick and Druckman.

[48] Payoff shares are perfectly divisible, eliminating the "lumpiness" problem associated with using portfolios as the dependent variable in the regression. The field data also suffer from problems inevitably associated with attempts to weight the relative importance of different portfolios. Further, we can compute voting weight shares directly, whereas Ansolabehere et al. use an algorithm to compute these values from seats held.

Specification 1	BF Games		DB Games		Field Data[a]		
	Inexp.	Exp.	Inexp.	Exp.	Unweighted	LH W.	LH/PM W.
Share of Votes	0.94***	0.90***	0.93***	1.01***	0.915***		
	(0.02)	(0.03)	(0.02)	(0.02)	(0.01)		
R^2	0.91	0.87	0.88	0.95	-		
Specification 2							
Share of Votes	0.83***	0.77***	0.90***	0.91***	1.049***	1.032***	0.859***
	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.016)	(0.02)
Form.*Share	0.29***	0.44***	0 .08*	0.18***	-0.182***	-0.152***	0.135***
of Votes	(0.03)	(0.05)	(0.04)	(0.04)	(0.02)	(0.019)	(0.02)
R^2	0.93	0.92	0.88	0.96	-	-	
No. Obs.	345	171	348	137	-	-	

[a] From Warwick and Druchman (2001): LH W. uses weights derived from Laver and Hunt, LH/PM W. uses weights derived from Laver and Hunt with PM weight increased by a factor of 3.65.

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

Table 11: Estimates of Payoff Shares as a Function of Vote Share in Winning Coalition (standard errors in parentheses)

	BF Games		DB Games		Field Data[a]	
	Inexp.	Exp.	Inexp	Exp	Unweighted	PM weighted
Constant	0.07***	0.13***	0.09***	-0.07**	0.07***	0.06***
	(0.02)	(0.01)	(0.02)	(0.03)	(0.01)	(0.01)
Voting Weight	0.99***	0.75***	1.01***	1.80***	01.12***	0.98***
	(0.09)	(0.05)	(0.11)	(0.15)	(0.05)	(0.05)
Formateur	0.14***	0.16***	0.08***	0.09***	0.15***	0.25***
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
R^2	0.54	0.61	0.39	0.78	0.72	0.82
No. Obs.	345	171	348	137	682	682

[a] From Ansolabehere et al (2003): PM weighted increases the PM weight by a factor of 3.

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

Table 12: Estimates of Payoff Shares as a Function of Voting Weights (clustered standard errors in parentheses)

use a dummy variable to test the importance of being a formateur. We pool the data from the Apex and EW treatments in the regressions reported. Similar results are obtained when pooling over the $\text{Apex}_{1/3}$ and the EW treatments (reported in Appendix 2). We provide separate estimates for our BF and DB games.

Table 10 reports the results of these regressions using the Warwick and Druckman specification, along with the estimated coefficient values reported from their study. The first thing to notice is that it is difficult to distinguish between DB and BF games based on the coefficient estimates reported. In both cases the coefficient values for share of votes are reasonably close to 1.0. Further, in both cases the formateur dummy is statistically significant, with the major difference being the substantially larger coefficient value for the BF games. Thus, one cannot decide between specifications based on the statistical significance of the formateur dummy, as tends to be done when analyzing the field data, or on the linear relationship between shares and "seats," as these characteristics are present in the experimental data for *both* BF and DB games. Finally, independent of whether or not the underlying game structure is BF or DB, our coefficient estimates are remarkably close to those reported in Warwick and Druckman, with the notable exception of the formateur dummy interacted with the share of votes for their data that doesn't overemphasize the prime ministership.

Table 11 reports the results of our regressions using the Ansolabehere et al. specification. Here too it is difficult to distinguish between BF and DB games based on the regressions results. In both cases, the constant (which, in theory, should be zero) is statistically significant, as it is in the field data. The coefficient values for voting-weight share are very close to 1.0 for inexperienced subjects in both DB and BF games as Ansolabehere et al. claim should be the case for BF games alone. The coefficients for the formateur dummy are statistically significant for both the DB and BF games, so that on this basis alone there is no way to distinguish between DB or BF type games as Ansolabehere et al. do. Finally, using Ansolabehere et al.'s regression specification, the estimated coefficient value for voting-weight share, in conjunction with the average voting weight in the underlying data, yield a predicted value for the formateur dummy that can be used to determine how short the predicted formateur effect is from the actual effect. Applying this procedure to our data, the predicted value for the formateur dummy is 0.415, compared to an estimated value in the BF games of 0.14 (0.16) for inexperienced (experienced) subjects. This yields the same ratio of actual to predicted effect (approximately

1/3) as reported in Ansolabehere et al. for the unweighted field data. Finally, viewed overall, there is little difference between the estimates using *either* of our data sets (BF or DB) for inexperienced subjects versus the field data reported in Ansolabehere et al.

The reasons for the difficulty in distinguishing between DB and BF games with the experimental data in these regressions is reasonably transparent: Although the two models make very different predictions regarding ex-post bargaining outcomes, realized differences in bargaining power are not nearly as large as predicted, while base players enjoy a first-mover advantage in both DB and BF games. Thus, behaviorally the two models are much closer to each other than one would predict, so that deciding between them on the basis of a linear relationship between voting shares and payoff shares, or the presence or absence of a statistically significant formateur effect, would appear to be doomed to failure.

Table 13 makes this point absolutely clear. There we report regressions based on our Apex and EW treatments, but instead of using actual behavior we use simulated subjects who behave according to the BF and DB models' predictions. The regression results under either the Warwick and Druckman or Ansolabehere et al. specifications clearly identify the nature of the game being played by the simulated subjects. For the BF games, the Warwick and Druckman specification yields a coefficient value for the interaction term between formateur and share of votes (F_i*Share of Votes) which is positive and very large relative to what is typically reported, indicating a strong formateur effect.[49] Similarly, for the BF games, the Ansolabehere et al. specification yields a formateur dummy that is large and positive, the coefficient value for voting weight is close to 1.0, and the implied value of the formateur based on the coefficient value for voting-weight, in conjunction with the average voting weight, is within a reasonably close neighborhood of the estimated value for the formateur dummy.

In contrast, when the data are generated by subjects behaving in strict conformity with the DB model, the Warwick and Druckman specification correctly characterizes the process as the F_i*Share of Votes variable is not significantly different from zero, and the coefficient value for Share of Votes is just slightly above

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[49]Note that excluding the interaction term between F_i*Share of Votes, as was done in earlier studies (e.g., Browne and Franklin, 1973) gives the totally misleading impression that the data is generated by a DB type process, as the coefficient value for Share of Votes is not significantly different from 1.0, and is essentially the same value as when the data is actually generated by a DB process (see the first column under Demand Bargaining Data).

	Baron-Ferejohn Data			Demand Bargaining Data		
	W. and D.	Ans. et al.		W. and D.	Ans. et al.
Share of Votes	1.01***	0.64***		1.09***	1.10***	
	(0.05)	(0.06)		(0.03)	(0.04)	
F_i*Share of Votes		0.77***			-0.03	
		(0.09)			(0.07)	
Voting Weight			1.020***			1.782***
			(0.006)			(0.002)
F_i			0.414***			0.002***
			(0.001)			(0.001)
Constant			-0.004***			-0.018***
			(0.001)			(0.001)
R^2	0.58	0.66	1.00	0.78	0.78	1.00
No. Obs.	316	316	316	304	304	304

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

Table 13: Simulated Data (standard errors in parentheses)

1.0. In this case the Ansolabehere et al. specification shows a trivial amount of formateur power, although the F_i dummy is significantly different from zero (due to specification error). The voting-weight variable is reasonably close to 2.0, the predicted value under DB in their specification.[50] Thus, it is not the differences in the regression specifications that prevent distinguishing between DB and BF for the experimental data, but rather the fact that there is much more similarity in actual behavior as opposed to what the theories predict.

Conclusion 7 *Replicating regressions like those performed with field data for our experimental data, we are unable to clearly distinguish between BF and DB games, as a result of the similarities between the actual behaviors. Further, there are a number of striking similarities between the regression estimates from the experimental data and the field data. One interpretation of these results is that, to the extent that either the DB or BF models faithfully characterizes the bargaining process underlying the composition of coalition governments, the behavioral similarities found in the*

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[50] Ansolabehere et al. claim to have a regression specification that nests DB and BF. The approximations in their model introduce some small specification errors, but these do not distract from clearly distinguishing between the DB and BF games for our simulated treatments.

laboratory are present in the field as well.

6   Summary and Conclusions

We have examined, experimentally, the predictions of the leading alternating-offer (Baron-Ferejohn, 1989) and demand bargaining (Morelli, 1999) approaches to legislative bargaining. We have investigated behavior in games where players have equal real voting power and in Apex games where one player has disproportionate (real) voting power. The models make distinctly different predictions regarding the ex-post distribution of benefits between parties, with the BF model predicting a sharply skewed distribution in favor of the proposer and the DB approach predicting shares proportionate to real voting power. These different predictions have formed the basis for distinguishing between the two models using field data.

The experimental data show proposer power for base players in BF games, and show that benefits shift substantially in favor of the player with greater real voting power (the Apex player) in both DB and BF games, all of which are consistent with the models' predictions. However, the sharp differences in ex-post shares that the theory predicts between BF and DB games fail to materialize, as a result of formateurs' failure to obtain anything approaching the large shares predicted in the BF games. We attribute the latter to the reluctance of players to take the small shares predicted under the SSPE in the BF games, which is consistent with the large body of experimental data from alternating-offer bilateral bargaining games (Roth, 1995). However, in this case it is not so much what the *average* base player is willing to accept that is responsible (as the average willingness to accept is reasonably close to the SSPE prediction). Rather, it is the between subject variation in what base players are willing to accept that is responsible, so that to maximize expected income formateurs need to offer substantially more than the SSPE share, or else face very high rejection rates.

Using our data to conduct regressions similar to those reported with field data for distinguishing between BF and DB bargaining models we find that we are *unable* to distinguish which game subjects are playing using the criteria typically applied with the field data. Further, there are a number of strong similarities between our regressions results and those reported with the field data. We attribute these results to the fact that, contrary to the theory, there is a limited first-mover advantage in DB games, and proposer power is much more limited than predicted in the BF

games. At a minimum our regression results suggest that it is likely to be very hard to distinguish between game forms using the field data in the way it has been done in the past. Moreover, as a general methodological point, our results demonstrate the relevance of a closer interaction of experimental and field data analysis, in order to avoid drawing inference from specifications that are identified in the traditional sense but may not be *behaviorally* identified.

The regression results also suggest that the limited formateur power reported for the BF games in the laboratory closely parallels the field data, as the difference between predicted and realized formateur power is remarkably similar in both cases. This has significant implications for the external validity of our experimental results, and by extension, for the large body of results from the experimental literature on bilateral bargaining games.

There have been a number of earlier experimental studies of the Apex game, using a more or less free form of bargaining between players. These experiments were designed to assess the implications of various cooperative bargaining solutions. The two closest in spirit to our games are Selten and Schuster (1968) and Horowitz and Rapoport (1974).[51] Selten and Schuster employed free form communication with face-to-face bargaining, and permitted all possible coalitions to form. Horowitz and Rapoport limited communication to a small preselected set of messages without allowing players to hear or to see each other, and restricted outcomes to MWCs. The vast majority of games, 83.3% (10/12), involved MWCs in Selten and Schuster. Among MWCs the vast majority involved the Apex player in both cases: 80.0% (8/10) in Selten and Schuster and 91.7% (11/12) in Horowitz and Rapoport. [52] For MWCs including the Apex player, base player shares averaged 0.435 in Selten and Schuster and 0.283 in Horowitz and Rapoport, as opposed to shares of 0.250 predicted under the leading cooperative bargaining models.[53] Further, in Horowitz and Rapoport there were minimal differences in shares achieved conditional on whether the base player or the Apex player was permitted to communicate first.[54] These

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[51]Both used cash payments contingent on performance and 5 person Apex games. See Oliver (1980) for a summary of this and related earlier studies of the Apex game.

[52]For Horowitz and Rapoport we only consider games for which payoffs were the same for coalitions including the Apex player and all one-vote player coalitions.

[53]These were the main simple solution of von Neumann and Morgenstern (1944) and the competitive bargaining set (Horowitz, 1973).

[54]However, in Horowitz and Rapoport's Apex games with 4 subjects, there were substantial differences in shares achieved, with significantly larger average shares for the base player when base players were permitted to communicate first.

results are similar to ours in the sense that (i) the overwhelming number of MWCs included the Apex player and (ii) the Apex player's average share of the pie failed to achieve the 75% mark, by a minimal amount in Horowitz and Rapoport and by a more substantial amount in Selten and Schuster.[55]

There are obvious connections between our results and the large experimental literature on shrinking-pie bilateral bargaining games (including the ultimatum game; Roth, 1995 surveys the experimental literature). In the latter, play consistently deviates from the subgame perfect equilibrium in favor of a more equal distribution of benefits between bargainers. This in turn has led to the development of a literature designed to explain these deviations in terms of arguments other than own income in agents' utility function, something commonly referred to as "other regarding preferences" (see, for example, Fehr and Schmidt 1999; Bolton and Ockenfels 2000; Charness and Rabin 2002, to cite a few of the more prominent attempts to systematically organize the experimental data).

The results of our multilateral bargaining experiments are both informed by and have implications for this literature. First, as already noted, subjects appear to have minimum thresholds for accepting an offer, that may or may not be the same as the subgame perfect equilibrium predictions of the DB and BF models. This is quite similar to the results reported for bilateral bargaining games.

Second, we have noted that although the estimates of the average minimum acceptable offer in the BF games are close to the subgame perfect equilibrium prediction, it is the between subject distribution in these minimum acceptable thresholds that argues against making subgame perfect equilibrium proposals, as they are almost certain to be rejected because of subjects with higher than average thresholds. Variations in minimum acceptable offers are a prominent feature of bilateral bargaining experiments as well, and these variations play a prominent role in models incorporating other regarding preferences.

Third, our voting regressions suggest essentially no concern for the zero payoffs offered to non-coalition players in the BF game, in apparent contradiction to more recent results suggesting that agents have maximin preferences, meaning that they care about the payoff of the least well off player (e.g., Charness and Rabin, 2002; Engelmann and Strobel, 2001). However, it should be clear that in our game there are very strong forces acting against any concerns for players receiving zero, or very

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[55]The cooperative bargaining models underlying these experiments make no prediction regarding the frequency with which Apex players will be members of the winning coalition.

small shares: Given the relatively high frequency of MWCs, to reject an offer with a respectable share for yourself because other players are getting small or zero shares opens up the distinct possibility of receiving a zero share in the proposal that finally passes. This is a very strong counter-force to the concern for the least well off, which is not present in the experiments reporting maximin preferences.[56]

Fourth, our $Apex_{1/3}$treatment involves the Apex player sharply reducing social efficiency as she essentially throws away 2/3 of her allocation for the sake of obtaining a "fair share" of the pie for herself. In contrast, more recent results from the other regarding preference literature argue that agents are willing to pursue social efficiency (maximizing total payments for the group) as long as the cost is not too high (e.g., Charness and Rabin, 2002; Engelmann and Strobel, 2001). In our case the Apex player must "burn" $2 for each extra $1 she gets. We do not attempt to pass judgement on whether this cost is high or low, but do note that in directly pitting social efficiency against own payoffs, Apex players come down squarely in favor of own payoffs as they take a larger nominal share of the pie in the $Apex_{1/3}$treatment than in the Apex treatment.

Finally, methods for establishing asymmetric power in bilateral bargaining games are limited to setting up different outside options for players, different discount rates, or different risk preferences. These options have been subject to limited exploration (see Roth, 1995, for a review). In multilateral bargaining games, in addition to these options, it is most natural to consider differential voting weights, as in the Apex game. In doing so we can directly compare the effects of real changes in voting strength versus equity considerations or other regarding preferences. Results from the present experiment show that Apex players do exercise a fair amount of the power granted them, taking substantially larger shares for themselves than base players do in the Equal Weight games. It is true that equity considerations play a role in limiting the extent to which Apex players are able to exercise their increased power. However, when given proposer power, as in the Baron-Ferejohn game, Apex players achieve around 80% of the gain in (nominal) payoffs achieved in the $Apex_{1/3}$treatment, which was explicitly designed to neutralize any equity considerations that might have impinged on the Apex player's payoffs. Further, minimum acceptable payoffs are sensitive to these strategic considerations as well, as witness the sharp reduction in the indifference point for base players between

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[56]This counter-force is *not* present in the Kagel and Wolfe (2001) and the Bereby-Meyer and Niederle (2004) experiments in which there is little if any concern for the least well off as well.

the Apex and Apex$_{1/3}$ BF games. Thus, there are clearly both strategic factors and equity considerations guiding behavior in these games, with sometimes subtle interactions.

There are a number of obvious and potentially important extensions to the present line of research. First, 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 BF predictions as it would enable formateurs to distinguish between coalition partners willing to accept smaller shares. What will be the impact of veto players on outcomes (see Winter, 1996 for predictions within the Baron-Ferejohn framework)? Is there a method for clearly distinguishing between the two bargaining models using field data, and what will these results show? How do demand-based and offer-based models perform when the bargaining process is over multiple policy dimensions, rather than just over the distribution of a fixed amount of resources? These and a number of other interesting and important questions remain to be investigated.

Appendix 1

Proof of Proposition 1. Let $d_a \in [0,1]$ denote the demand made by the Apex player, and d_{b_i} the demand by base player b_i. Let the index i be increasing in the order of play, i.e., b_1 is the first base player moving, then b_2, and so on. Let s denote the generic step in a round of demands, and denote by m_s the mover at step s. It follows from these notational conventions that a base player b_i moves either at step $s = i$ (if the Apex player hasn't moved yet) or at step $s = i + 1$. Let $I(s)$ be an indicator function taking value 1 if the Apex player has already moved when step s arrives, and 0 otherwise. The formal description of our proportional recognition probability assumption is as follows: for each step $s \in \{1, 2, 3, 4\}$, the prob. that the s-th mover is a, $\Pr(m_s = a)$, equals $(1 - I(s))\frac{3}{8-s}$. (The computation of the corresponding residual probabilities for the base players is left to the reader).

For any player j, denote by W_j the set of coalitions T such that $T \cup \{j\}$ is a winning coalition (at least 4 votes). Let $FW(s) \equiv \{S \in W_{m_s} : \sum_{k \in S} d_k + d_{m_s} \leq 1\}$, i.e., the set of feasible coalitions in W_{m_s} given the demand m_s wants to make.

A strategy for any player j associates to every step s in which j could be moving (and to each corresponding history of demands) a demand d_j and a choice $S \in FW(s)$ if $FW(s) \neq \emptyset$. Let there be no discounting (even though the discount factor is irrelevant for the equilibrium payoffs, as in Morelli (1999)). We can describe the candidate equilibrium strategy profile limiting attention to the first round of (maximum) five steps. Assuming that the continuation equilibrium expected payoff for a base player if the five demands are voided is $u_b \leq \frac{1}{4}$, consider the following candidate strategy profile:

Apex:

1. $d_a = \frac{3}{4}$ if a moves first;

2. Let $i'(s) \equiv \max i \in \arg\min_{i<s} d_{b_i}$. If a moves at $s = 2, 3, 4$, the best response pair for a is

$$\left(d_a = (1 - d_{b_{i'(s)}}), \ S = \{i'(s)\}\right)$$

   if

$$(1 - d_{b_{i'(s)}}) \geq \min\left\{\left(\frac{3}{4} + \sum_{i=1}^{s-1} d_{b_i} - \frac{s-1}{4}\right), [1 - (5-s)u_b]\right\} \qquad (4)$$

   and the best response is to demand $d_a = \min\left\{\left(\frac{3}{4} + \sum_{i=1}^{s-1} d_{b_i} - \frac{s-1}{4}\right), [1 - (5-s)u_b]\right\}$ otherwise;

3. If a moves last (which means that the four base players have not found an agreement), the best response pair is $\left((1 - d_{b_{i'(5)}}), \{i'(5)\}\right)$ iff $1 - d_{b_{i'(5)}} \geq \frac{3}{4}\frac{67}{70}$; otherwise restart.

Base:

1. $d_{b_1} = \frac{1}{4}$ if $m_1 = b_1$;

2. If a base player moves at $s = 2, 3$ with $I(s) = 0$:

$$d_{b_i} = \min\left\{\frac{1 - \sum_{i=1}^{s-1} d_{b_i}}{5 - s}, \min_{\substack{j < i}} d_{b_j}\right\} \tag{5}$$

iff such a demand is higher than u_b;

3. If a base player i moves at $s = 2, 3, 4$, with $m_{s'} = a$ *for some $s' < s$*:

$$d_{b_i} = \max\left\{(1 - d_a), [1 - \sum_{j=1}^{s-2} d_{b_j} - (5 - s)(1 - d_a)]\right\}, \tag{6}$$

conditional on this being greater than u_b;

4. If $m_4 = b_4$ (i.e., $I(4) = 0$), b_4's demand is $\max\left\{1 - \sum_{i<4} d_{b_i}, \min_{i<4} d_{b_i}, u_b\right\}$ (implicitly closing the base MWC if the max is the first term, implicitly inviting the Apex to join if the max is the second term, and implicitly making a demand that would make it impossible to close a MWC in the third case).

5. When a base player moves last,

$$d_{b_i} = \max\left\{(1 - d_a), (1 - \sum_{j=1}^{3} d_{b_j}), u_b\right\} \tag{7}$$

and if the first two terms are equal the tie is broken in favor of the MWC containing m_4.

To see that this strategy profile is a SPE, let's check each potential decision node backwards (using the one-deviation property). Item 3 of the Apex and item 5 of the base player's strategies are clearly in the best response correspondences and do not need any clarification. Going backwards, consider item 4 of the base players' strategy: given item 3 of the Apex's strategy, the action described in item

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4 of the base player's strategy is best response by definition, since it requires to simply pick the highest feasible demand or restart. Going backwards to item 2 of the Apex's strategy, the key inequality to understand is (4): the LHS is clearly the payoff from closing with one of the minimum previous demanders; the first term in the curly brackets on the RHS is the payoff from just making a demand that can be expected to lead the subsequent mover to close with the Apex; and the last term is the payoff from making a demand that makes the subsequent movers indifferent between closing and moving to another round of demands. The first term in the curly brackets on the RHS of (4) is justified by the continuation expected behavior described in items 3 and 4 of the base players' strategy, and the last term is clearly an upper bound on d_a if a wants to be chosen next, hence the d_a cannot exceed the minimum of those two terms if a does not want to close with one of the previous movers. As far as item 3 of the base player's strategy is concerned, note that the last term in the curly brackets in (6) is the maximum demand compatible with (a) the previous demands by the other base players and (b) the minimum that should be left over for the subsequent base movers in order not to make them choose to close with the Apex. Thus, the choice identified in (6) is again best response by inspection. Moving to item 2 in the base player's strategy, the two terms in curly brackets in (5) are both upper bound constraints, above which the Apex would be induced not to choose i in case a moves next: Demanding something greater than the second term would automatically make a prefer one of the base players before i, and a demand higher than the first term would make a prefer to make a demand without closing, to attract one of the subsequent movers. Hence the minimum of those two is the maximum demand i can make if she wants to have a chance to be selected by a in case a moves next. To see that item 1 of the Apex's strategy is the only demand consistent with the rest of this SPE profile, note from (6) that when $m_1 = a$, b_1 has to compare $(1-d_a)$ with $(1-3(1-d_a))$, so that he is made indifferent by $d_a = \frac{3}{4}$. Similarly, from (4) one can easily see that $\frac{1}{4}$ is the maximum demand that b_1 can rationally make when $m_1 = b_1$. Any $d_{b_1} > \frac{1}{4}$ leads to being excluded.

So far we have shown that the candidate strategy profile described above is a SPE. Now we have to show that (I) there is no other SPE outcome in terms of shares and (II) the only case in which the base MWC emerges is when the Apex is not selected to move in the first four steps.

(I) can be proved by contradiction. If $m_1 = a$, any $d_a > \frac{3}{4}$ cannot be part of any SPE, because b_1 can deviate demanding $\frac{1}{4}$, counting on the fact that perfection

requires the subsequent movers to choose her over a because of $d_a > \frac{3}{4}$. If $m_1 = b_1$, $d_{b_1} > \frac{1}{4}$, and $m_2 = a$, there cannot be any continuation equilibrium where she closes and demands $1 - d_{b_1}$, because she can demand $\frac{3}{4} + \epsilon$ and be sure, for ϵ small enough, that the subsequent mover will prefer to close with her rather than demanding something compatible with the demand of b_1. This implies that if $m_2 = a$, b_1 surely receives zero payoff if $d_{b_1} > \frac{1}{4}$. This remains true even if $m_2 = b_2$, since the latter will choose to follow the strategy described above, just from perfection. These considerations are sufficient to rule out SPE where a base player asks more than $\frac{1}{4}$. What is left to rule out is the existence of SPE in which the base player receives less than $\frac{1}{4}$ when included in a MWC. We have already established that this cannot happen when $m_1 = a$. Suppose that $m_1 = b_1$ and $d_{b_1} < \frac{1}{4}$; with probability $\frac{1}{2}$ the next mover will be a, in which case a's best response is to close with $1 - d_{b_1}$, because if she does not close perfection alone would make the subsequent movers choose the base MWC for any $d_a > \frac{3}{4} - (\frac{1}{4} - d_{b_1})$; with probability $\frac{1}{2}$ $m_2 = b_2$, but in this case no continuation SPE will have b_1 in the final MWC, unless the Apex moves last, which happens with probability $\frac{3}{70}$; given that the probability of inclusion in the MWC is the same for every $d_{b_1} < \frac{1}{4}$, the only rational demand is $\frac{1}{4} - \eta$ if η measures the smallest possible unit, and hence converges to $\frac{1}{4}$ as η goes to zero.

For the proof of (II) we only need to rule out the possibility of SPE in which at some step $s \geq 2$, with $m_{s-1} = a$, m_s chooses not to close with the Apex player. Given that in any SPE the equilibrium demands are $\frac{1}{4}$ and $\frac{3}{4}$ for base and Apex players respectively, the simple reason for the impossibility of having this choice by m_s in a SPE is that the Apex could deviate by demanding $\frac{3}{4} - \epsilon$. The only case in which this type of deviation is not possible is in the profile in which every player chooses the last previous mover when indifferent. This implies that the only case in which the base MWC forms is when the Apex moves last. **QED.**

Appendix 2: Field Regressions Using the Apex$_{1/3}$ Data

	Baron-Ferejohn Games		Demand Bargaining Games	
Specification 1	Inexp.	Exp.	Inexp.	Exp.
Share of Votes	1.01***	1.00***	0.99***	1.03***
	(0.01)	(0.01)	(0.02)	(0.02)
R^2	0.97	0.87	0.93	0.95
Specification 2				
Share of Votes	0.93***	0.93***	0.94***	0.98***
	(0.01)	(0.01)	(0.02)	(0.03)
Form.*Share of Votes	0.16***	0.18***	0.12***	0.10**
	(0.02)	(0.02)	(0.03)	(0.04)
R^2	0.97	0.98	0.93	0.95
No. Obs.	379	179	298	142

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

Table 14: Estimates of Payoff Shares as a Function of Vote Share in Winning Coalition (standard errors in parentheses)

	Baron-Ferejohn Games		Demand Bargaining Games	
	Inexp.	Exp.	Inexp	Exp
Constant	-0.02	-0.03**	-0.08***	-0.10***
	(0.02)	(0.01)	(0.02)	(0.04)
Voting Weight	1.50***	1.60***	1.78***	1.97***
	(0.08)	(0.08)	(0.09)	(0.15)
Formateur	0.08***	0.09***	0.08***	0.05***
	(0.01)	(0.01)	(0.02)	(0.02)
R^2	0.76	0.83	0.68	0.76
No. Obs.	379	179	298	142

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

Table 15: Estimates of Payoff Shares as a Function of Voting - Weight Shares (clustered standard errors in parentheses)

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