Identifying and Exploiting Weak Coalition Partners in Legislative Bargaining: A Laboratory Experiment *

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Abstract

In legislative bargaining, a skilled negotiator seeking to pass a proposal tailors it to build a coalition just large enough to ensure passage, and seeks weak coalition partners who are willing to acquiesce in return for relatively cheap concessions. We investigate experimentally whether proposers recognize and exploit weak coalition partners in forming minimal winning coalitions. The ability to identify weak partners is observed in simple settings where outside options determine bargaining power directly. However, as the bargaining setting becomes more complex, many subjects respond to subjective strategic uncertainty through egalitarianism within coalitions, and through proposals that target the grand coalition.

Keywords: legislative bargaining, predictability, ultimatum game, laboratory experiment. *JEL codes*: D72, C92, C73

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1 Introduction

A legislator can pass a proposal in legislative negotiations only if her proposal has the support of sufficiently many other legislators. Thus, she has to make concessions and tailor her proposal so that other legislators find it in their interests to support it. To avoid diluting the benefits of the proposal to her, she would seek weak coalition partners who are willing to acquiesce in return for relatively cheap concessions. Armed with an ability to recognize weak potential partners, legislators with even transient agenda-setting power can in principle capture large fractions of the available surplus, particularly when the identities of subsequent proposers become known in advance (see, e.g., Ali et al. 2019). But is it reasonable to assume that negotiators have this ability? Do they in fact form minimal winning coalitions (MWCs) with the weakest available partners and take maximal advantage of them? And are some types of weakness easier to identify than others? And even if they can identify weak coalition partners, how much surplus can they extract from them?

We investigate these issues through a series of experiments that build on the canonical sequential bargaining framework of Baron and Ferejohn (1989). In each period, one legislator proposes an allocation of the available surplus. If the proposal receives majority support, it passes and the game ends; otherwise, another legislator makes a proposal. We study variations of the Baron-Ferejohn model in which some players are "weaker" than others. We investigate whether proposers seek to form MWCs, whether they do so by identifying and recruiting weak partners, the degree to which they seek to exploit those partners, and the extent to which they succeed in achieving each of these objectives.

What makes a party's strategic position weak or strong? The literature suggests various potential definitions. For example, concepts from cooperative game theory (e.g., Nash Bargaining) emphasize players' "outside options," which they obtain if they are unable to reach agreement. A player with a more attractive outside option may be more demanding because she finds disagreement less costly. In contrast, non-cooperative models in the tradition of Rubinstein (1982) and Baron and Ferejohn (1989) focus on "proposer power," which involves having temporary control of agenda setting. A player who expects to make the proposal tomorrow anticipates capturing a larger fraction of the available surplus and is therefore more willing to reject an offer today.

In principle, the source of bargaining strength does not matter for the purpose of coalition formation in dynamic legislative bargaining. Provided the proposer knows the *continuation value* every other player receives when the period-t proposal is rejected (denoted V_i^t for player i), the period-t bargaining scenario is essentially identical to one with a single-round of negotiations wherein each player i has an exogenous outside option conferring value V_i^t. In choosing coalition partners, the period-t proposer should select the $\frac{n-1}{2}$ players with the *lowest* continuation values, and secure their acquiescence by offering them slightly higher payoffs. Thus, player i's continuation value is a "sufficient statistic" for her period-t bargaining strength. The source of these continuation values—whether it involves outside options or continuation play—does not, in theory, bear on the proposer's choice of coalition partners, or on her offer.

That said, the properties of continuation values can be subtle and counterintuitive even in relatively simple dynamic bargaining problems. To illustrate, suppose a player, Carol, enjoys a relatively strong bargaining position in period t (but she is not the proposer). The period-t proposer will exclude her from a MWC because securing her vote is too costly, and will instead target weaker players. Looking forward from period $t-1$, Carol rationally expects to be excluded from the period-t deal, and consequently her period-$(t-1)$ continuation value is low. Thus, being too strong in one period makes Carol weak in the previous period.

To see how this logic can have powerful implications about proposer power, consider the following specific example of a finite-horizon multi-period legislative bargaining game with majority rule. Alice, Bob, and Carol are bargaining over shares of a perfectly divisible dollar. The bargaining rules ares as follows. First, Alice makes a proposal for how to split the dollar, which is followed by a vote. If it receives 2 or more votes the proposal is implemented and there is no further bargaining. If not, then it's Bob's turn to make a proposal. If Bob's receives 2 or more votes the proposal is implemented and there is no further bargaining. If not, then it's Carol's turn to make a proposal. If it receives 2 or more votes the proposal is implemented. Regardless of the vote, the game ends and there is no further bargaining. If Carol's proposal fails, then there is a bargaining impasse and players receive impasse payoffs (outside options), (v_A, v_B, v_C). What is the subgame perfect equilibrium of the game? The exact details of the sequence of equilibrium offers depends on the outside options, (v_A, v_B, v_C). However, it turns out that the equilibrium actual outcome of the game does not. Regardless of the exact values (v_A, v_B, v_C), Alice gets essentially the entire dollar!

For concreteness, suppose that $(v_A, v_B, v_C) = (.6, .3, .1)$. If bargaining were to reach the last stage, then Bob would be the weaker coalition partner, so Carol will offer Bob just above his outside option of .3 and offer nothing to Alice: i.e., propose $(0, .3^+, .7^-)$, which will pass 2-1.[1] In the next to last stage, Alice is the weaker coalition partner, so Bob will propose $(0^+, 1^-, 0)$, which will pass 2-1. Thus, in the initial stage, Carol is the weaker coalition partner, so Alice will propose $(, 1^-, 0, 0^+)$, which will pass 2-1. The key here is not the exact value of the outside options, but that the *identity of stage t proposer is always known at stage $t-1$*. In fact, this is merely an example of a very general result (Ali et al. 2019) that sufficient "predictability" about future proposers results in the first proposer getting the entire pie. The horizon does not have to be finite, the voting rule does not have to be majority, voters can vary in their patience and risk aversion, and the order of proposers does not have to be known from the start of the game. All that is required is one-period-in-advance information about the identity of a sufficiently restricted set of possible next-period proposers. The key intuition is that the possible next-period proposers are in a strong bargaining position (and hence will not be invited as coalition partners) while those who are excluded as next-period proposers are in a weak bargaining position.

As the preceding example shows, for a proposer to identify weak coalition partners can require very sophisticated strategic reasoning, and this is further complicated by the need for a proposer to consider the possibility that prospective coalition partners might not grasp the logic and hence may not realize how weak or strong their own bargaining position is. Whether or not standard game theoretic reasoning provides a reasonable prediction of human behavior in the presence of such strategic uncertainty is an open question, and one of the primary motivations for conducting our laboratory experiment. Even when a committee member i (either a proposer or a potential coalition partner) finds the logic of equilibrium challenging, one imagines she will still form beliefs about the consequences of the failure of a period-t proposal, and these beliefs will imply a perceived continuation value of the game. If the period-t proposer also finds equilibrium logic difficult, and/or if she is uncertain about the specifics of player i's confusion, she may have diffuse beliefs about others' beliefs about continuation values. In that case, she may attempt to form a MWC consisting of the players she perceives to be the weakest, or she may "hedge her bets" by making an offer that potentially benefits everyone (i.e., the grand coalition). There may be other considerations, such as social preferences that can further confound the logic and make the strategic reasoning even more opaque.

[1]We write 3^+ as shorthand for slightly more than 3.

In light of these considerations, we decompose the main theoretical hypothesis – that proposers recognize and exploit weakness in potential coalition partners – into two components. First, the *strategic intent hypothesis* holds that people wish to identify and exploit others who find themselves in strategically weak positions. Second, the *strategic ability hypothesis* holds that people have the ability to recognize strategically weak positions and then exploit those weak coalition partners. If bargaining theory's predictions concerning the exploitation of weakness prove to be inaccurate, the fault could lie in either or both component hypotheses. In particular, the strategic intent hypothesis could fail if social motives overwhelm personal interest (e.g., if people are sufficiently fair-minded or altruistic),and the strategic ability hypothesis could fail if people have limited ability to reason strategically (e.g., if they struggle with backward induction).

The strategic ability hypothesis itself can be broken down into two distinct component, which we call the *strategic recognition hypothesis* and the *strategic exploitation hypothesis*. The former refers to the ability for proposers to identify and choose as coalition partners the (theoretically) weaker committee members, as well as the ability of potential coalition partners to themselves recognize and understand their own relative bargaining strength or weakness. The latter refers to the ability of proposers, conditional on successfully identifying weak coalition partners, to fully exercise their proposal power by extracting large concessions from those weak partners.

We investigate these hypotheses by studying bargaining experiments involving varying degrees of complexity using subjects drawn from two populations that differ in terms of quantitative aptitude (students at the University of California, Irvine, and students at Caltech). We begin with one-stage problems, wherein outside options hardwire the continuation values, and no strategic inference is required. Behavior in these simple settings speaks to the strategic intent hypothesis. We then examine the strategic ability hypothesis by studying progressively more complex settings involving two-stage, three-stage, and open-ended bargaining. In all cases, we analyze the behavior subjects exhibit after gaining experience with the bargaining protocol.

For both subject pools, we find strong support for the strategic intent hypothesis. In one-stage bargaining problems, a substantial majority of successful proposals involve MWCs, and nearly all of those include the weakest potential partner. While proposers do not extract as much surplus as theory predicts (assuming all parties pursue narrow monetary self-interest), they nevertheless exercise substantial power. These patterns are somewhat more pronounced for the CIT sample than for the UCI sample, but the differences are not dramatic.

Next we turn to two-stage bargaining problems. These are the most favorable environments for finding strategic ability, both because the recognition of weakness requires relatively little strategic sophistication, and because we have our subjects participate in two-stage bargaining after gaining experience with one-stage bargaining. Results for the CIT sample provide qualitative support for the strategic ability hypothesis. Specifically, CIT subjects typically form MWCs that include the weak partner, and proposers extract large fractions of the surplus. In contrast, results for UCI subjects are decidedly mixed and in some respects unfavorable. While subjects form MWCs with high frequency, proposers are more likely to include strong players than weak players (possibly because, counter-intuitively, strong players in the first stage are the ones with worse outside options). As result, UCI proposers are noticeably less successful at extracting surplus.

The three-stage bargaining problems we study involve even greater complexity, particularly inasmuch as we do not expose subjects first to one-stage and two-stage problems. UCI subjects develop a strong inclination to build grand coalitions and to divide resources equally within coalitions. The comparative statics predictions derived from Ali et al. (2019) concerning the role of predictability do not materialize. Caltech students continue to rely rather heavily on MWC offers, and display a reasonably robust ability to identify weak partners, but nevertheless shift toward equal division within coalitions. Thus, in both samples, proposer power derives primarily from the use of MWCs, rather than from identifying and exploiting weak partners.

Finally, we consider open-ended (infinite horizon) bargaining problems. While these settings involve greater mathematical complexity, their stationary structure invites both logical and heuristic shortcuts. For example, it is a simple matter to postulate a sharing rule and then check its consistency. Even so, our results generally do not bear out the predictions of bargaining theory. UCI subjects have an easier time recognizing the benefits of forming MWCs than in three-stage games, but they take only slight advantage of coalition partners, and consequently do not fare much better than if they had simply agreed to equal division with a single partner. Announcing proposers one period in advance (*predictability*) promotes the formation of MWCs and, consistent with theory, leads proposers to choose weaker partners, but, contrary to theory, does not meaningfully enhance the exploitation of selected partners. As a result, proposers achieve only slightly higher shares with predictability than without.

Our experimental results require careful interpretation. On the one hand, models of sophisticated bargaining may assume a level of strategic sophistication that surpasses the capacity of well-educated adults. While our subjects are interested in exploiting weak partners, those who are less quantitatively inclined have difficulty distinguishing between weak and strong strategic positions. Even the quantitatively adept apparently lack the confidence to exploit what they take to be weak positions in all but the simplest settings. However, some patterns are qualitatively consistent with theoretical predictions, particularly among subjects with high quantitative aptitude, and in comparatively simple settings. Thus, if the object of theory is to depict the choices of professional negotiators who exhibit a relatively high proclivity for strategic reasoning and who accumulate significant experience, one can find in our results reasons for both optimism and pessimism.

An intriguing feature of our results is that increases in strategic complexity drive proposers toward grand-coalition offers, as well as toward egalitarianism within coalitions. We conjecture that both patterns reflect the higher level of subjective strategic uncertainty that prevails in complex environments. As we noted above, making a grand-coalition offer can provide a useful "hedge" against the perceived randomness of other players' acceptance/rejection decisions. Proposers may also respond to strategic uncertainty by offering allocations with "bonus" characteristics, such as egalitarianism, that add moral force.

Our paper contributes to a vast theoretical and experimental literature on legislative bargaining. The principle that a proposer should seek to build minimal winning coalitions with the weakest players lies at the core of most theoretical models in the tradition of Baron and Ferejohn (1989). For example, it plays a prominent role in McCarty (2000), Eraslan (2002), Nunnari (2018) and Kalandrakis (2006), where legislators vary with respect to time-preferences, voting power, and the probability of recognition, as well as in Ali et al. (2019), where agents learn about future bargaining power in advance. The experimental literature has focused on the degree to which proposers form and exploit minimal winning coalitions, whether institutional details such as the use of a closed-rule or open-rule bargaining protocol affects this behavior, and whether the comparative statics highlighted in Baron and Ferejohn (1989) emerge in practice; for a survey, see Palfrey (2016). At a general level, the literature has explored the frequency with which proposers form minimal winning coalitions and the degree to which they exploit their partners. Because most of the experimental treatments have involved symmetric respondents, the issues that constitute our focus have received relatively little attention.

Also related to the current paper are studies of three-player bargaining games with heterogeneous outside options. Diermeier and Gailmard (2006) consider bargaining with a single-round, which resembles a three-player ultimatum game with simple majority rule.[2] They find that the proposer has a slight tendency to target the player with the lowest disagreement value.[3] However, contrary to theory (assuming subgame perfection and selfish agents), the proposer's outside option affects her payoff. Miller et al. (2018) study an environment with an indefinite horizon, and find that proposers are more likely to exclude the player with the higher disagreement payoff. These studies anticipate our finding concerning the validity of the strategic intent hypothesis by showing that proposers exploit obviously weak players. Our investigation builds on these studies by varying the complexity of the bargaining process and hence the difficulty of identifying weak players, and by studying subject pools with different levels of quantitative aptitude, thereby illuminating the strategic ability hypothesis. Across both dimensions, we document significant variation in proposers' ability to identify weak players.

2 One-Stage and Two-Stage Bargaining

In this section, we address the validity of the strategic intent hypothesis and the strategic ability hypothesis by examining treatments involving one-stage and two-stage bargaining problems. One-stage bargaining problems are useful because the identification of weakness in potential coalition partners is trivial. To the extent subjects have strategic intent, we would therefore expect them to form MWCs with the weakest available partner and to exploit that partner successfully in one-stage settings. Upon finding strong evidence of strategic intent (see Section 2.3.1), we turn in the rest of the paper to an evaluation of strategic ability. The two-stage bargaining games we ex-

[2] Knez and Camerer (1995) were the first to study an ultimatum game with three players. Their experiment involved a proposer playing two separate ultimatum games in which the respondents had unequal outside options. The role of the third party was primarily to facilitate social comparisons. Guth and van Damme (1998) considers a setting in which one of two respondents has veto power, while the other is a dummy-player with no ability to influence the outcome. Contrary to the predictions obtained from models with social preferences, they find that the proposer targets the respondent with veto power, and the dummy player receives a very small share.

[3] Overall, 40% of proposals are for minimum winning coalitions with the weak player, 20% of proposals are for minimum winning coalitions with the strong player, and the remaining 40% of proposals are for grand coalitions, so the strong coalition partner receives a positive share more than half the time. By design, the difference between weak and strong coalition partners is very small. The outside option for the weak coalition partner is $2 - 3\%$ of the pie, and the outside option for the strong coalition partner is only 5% of the pie.

amine in this section are of interest because they are the most favorable environments for finding strategic ability, both because the recognition of weakness requires relatively little strategic sophistication, and because we have our subjects participate in two-stage bargaining after gaining experience with one-stage bargaining. Results for Caltech subjects provide some qualitative support for the strategic ability hypothesis, while results for UCI subjects are decidedly mixed and in some respects unfavorable. Given the greater mathematical aptitude and skill of Caltech students,[4] one potential interpretation of our findings is that strategic ability relies on high cognitive aptitude.

2.1 Experimental design

The experimental sessions for this portion of our analysis involve one-stage and two-stage bargaining problems, which subjects played in sequence. The one-stage bargaining problems correspond to a 3-person ultimatum game, which we present to the subjects as a 3-person majority rule voting game. We select one member at random and instruct him or her to propose a three-way allocation of a fixed sum of money. The members then vote on the proposal, and the majority determines the outcome. If a majority disapproves, the following default allocation prevails: 0.05 for the proposer, 0.05 for member 2, and 0.90 for member 3. Subjects play 15 repetitions of this game with random rematching and random reassignment of proposers and committee member numbers.

Assuming the players only care about their own monetary payoffs, the subgame perfect equilibrium proposal allocates just under 0.95 to the proposer, just over 0.05 to member 2 (the weak potential partner), and 0 to member three (the strong potential partner). In equilibrium, the proposal passes with support from the proposer and member 2. The key features of this equilibrium are as follows: (1) the proposer forms a minimum winning coalition (MWC) that excludes the strongest potential partner (member 3), and (2) member 2 receives approximately his or her default share, so the proposer extracts nearly all the surplus.

In the second part of these sessions, subjects play a two-stage bargaining game in which the second stage is precisely the same as the one-stage game from the first part of the session. The proposers for both stage 1 and stage 2 are known to all in advance, as is the default allocation, which assigns 0.05 to the first proposer, 0.05 to the second proposer, and 0.90 to the remaining member. Subjects also play 15 repetitions of the

[4] According to PrepScholar, the average Math SAT scores for UCI and Caltech students are 655 and 790, respectively.

Table 1: Design of One-and-Two-Stage Treatments

TREATMENT	PROP ID Stage 2	PROP ID Stage 3	Default	Equilibrium	# Subs
UCI - Part 1	NA	1	(.05,.05,.90)	(.94,.06,.00)	57
UCI - Part 2	1	2	(.05,.05,.90)	(.99,.00,.01)	57
CIT - Part 1	NA	1	(.05,.05,.90)	(.94,.06,.00)	33
CIT - Part 2	1	2	(.05,.05,.90)	(.99,.00,.01)	33

Notes: All one-stage and two-stage treatments involved perfect predictability and three member committees.

two-stage bargaining game with random reassignment of roles.

Assuming the players only care about their own monetary payoffs, the subgame perfect equilibrium yields continuation shares (if players do not agree at stage 1) of just under 0.95 for the stage 2 proposer, just over 0.05 for the stage 1 proposer, and 0 for the remaining player. Thus, in the first period, the remaining player is in the weakest strategic position despite her large default share. Accordingly, the stage 1 proposer offers to allocate just under 1.00 to herself, zero to the stage 2 proposer (the strong potential partner), and some tiny positive amount to the remaining member. In equilibrium the proposal passes with support from the proposer and the latter individual.

This design illustrates the strategic subtlety of identifying the weak player: because the stage 2 proposer would receive just under 0.95 in equilibrium if the stage 1 proposal failed, the weak player in stage 1 is committee member 3, whose default payoff is 0.90, but whose continuation value if stage 2 is reached is 0.00. Hence the stage-one proposer's subgame perfect equilibrium decision is to offer a tiny positive share to committee member 3 and allocate a share of nearly 1.00 to herself. In equilibrium the proposal passes with the yes votes of the proposer and committee member 3.

Nine sessions were conducted in Phase III, using 129 subjects. Overall, the three phases of the experiment used a total of 380 subjects, with each subject participating in exactly one session. Table 1 provides a summary of the Phase III design.

2.2 Approach to Data Analysis

Our interest is in behavior after subjects have had the opportunity to experience the game and converge to a stable behavior. Therefore, in the analysis that follows we focus on the second half of the experiment, i.e., the last eight repetitions of the game played in each part of the experimental session, and refer to these repetitions as *experienced games*. The analysis of data from all fifteen rounds is presented in an Appendix and, in general, shows similar but more noisy results due to learning.

Moreover, we allow for small perturbations in our classifications of coalition types. Specifically, the coalition in which two out of three group members receive at most 5% of the whole budget each is defined as the *Dictator coalition*. Similarly, the coalition, in which two out of three members receive more than 5% of the whole budget is defined as *Minimum Winning Coalition (MWC)*. Finally, the coalition, in which all three members receive strictly more than 5% of the whole budget is defined as the *Grand coalition*. Similarly, conditional on the coalition size, we call the distribution of resources equal, i.e., *MWC equal* or *Grand equal*, when shares of any two coalition partners differ by less than 5% of the total budget. Throughout the paper we focus on characterizing the allocations which received a majority of committee members' votes, i.e., approved allocations.[5]

When we compare outcomes between two groups, be that two treatments or two coalition types, we present the *average* outcomes and use regression analysis to draw statistical conclusions. Specifically, we regress the variable of interest (i.e., the share of the proposer or the frequency of reaching particular stage of the game) on a constant and on an indicator for one of the two considered groups. To account for interdependencies between observations that come from the same session, we cluster standard errors by session. We say that there is a significant difference between the outcomes in the two groups under consideration if the estimated coefficient on the group indicator dummy is significantly different from zero at the standard 5% level, and we report p-value associated with that estimated coefficient.

2.3 Results

We divide our discussion of results into two parts. First we examine behavior in the final stage of the bargaining games (Part 1, and Stage 2 of Part 2), which shed light on the strategic intent hypothesis. Then we study the first stage of the two-stage bargaining problem (Stage 1 of Part 2), which speaks to the strategic ability hypothesis in a setting with only modest strategic complexity. Most of the statistics mentioned in the text appear in Table 2.

[5]The description of all proposed allocations are available from the authors upon request. In most tables presented below, one can deduce the properties of the proposed allocations from the information concerning rejection probabilities for different types of proposals.

Table 2: Outcomes for One-Stage and Two-Stage Bargaining Games

	UC Irvine		Caltech	
	Part I	Part II	Part I	Part II
	(n = 152 obs)	(n = 152 obs)	(n = 88 obs)	(n = 88 obs)
DELAYS				
proposal passed in stage 1	0.84 (0.07)	0.68 (0.03)	0.77 (0.02)	0.73 (0.03)
proposal passed in stage 2		0.25 (0.02)		0.24 (0.02)
impasse	0.16 (0.07)	0.07 (0.02)	0.23 (0.02)	0.03 (0.02)
COALITION TYPES				
Passed in stage 1				
Dictator	0.01 (0.01)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
MWC	0.66 (0.10)	0.74 (0.11)	0.88 (0.08)	0.84 (0.13)
with equal division	0.15 (0.02)	0.66 (0.12)	0.13 (0.09)	0.19 (0.06)
Grand	0.33 (0.10)	0.26 (0.11)	0.12 (0.08)	0.16 (0.13)
with equal division	0.21 (0.21)	0.22 (0.18)	0.75 (0.38)	0.90 (0.18)
Passed in stage 2				
Dictator		0.00 (0.00)		0.00 (0.00)
MWC		0.79 (0.14)		0.71 (0.19)
with equal division		0.33 (0.12)		0.00 (0.00)
Grand		0.21 (0.14)		0.29 (0.19)
with equal division		0.25 (0.38)		0.67 (0.22)
PROPOSERS' SHARES				
(out of total budget)				
all proposals passed in stage 1	**0.61** (0.04)	**0.50** (0.01)	**0.70** (0.08)	**0.60** (0.03)
MWCs passed in stage 1	0.67 (0.03)	0.52 (0.01)	0.74 (0.07)	0.65 (0.02)
Grand coalitions passed in stage 1	0.48 (0.03)	0.44 (0.03)	0.39 (0.08)	0.34 (0.02)
all proposals passed in stage 2		**0.57** (0.02)		**0.59** (0.07)
MWCs passed in stage 1		0.60 (0.03)		0.69 (0.005)
Grand coalitions passed in stage 1		0.47 (0.07)		0.36 (0.02)
REJECTION PROBABILITIES				
Proposals in stage 1				
if proposal is MWC	18%	32%	22%	30%
if proposal is Grand	11%	29%	11%	0%
Proposals in stage 2				
if proposal is MWC		25%		12%
if proposal is Grand		0%		14%

Notes: All statistics in this table pertain to experienced games. We report average outcomes and the robust standard errors when appropriate in the parenthesis, where observations are clustered at the session level. Coalition types are defined based on the number of members that receive more than 5% shares. Dictator coalition comprises one member only, MWC comprises two members, while Grand Coalition includes all three players. The entries for equal division of resources are conditional frequencies. Equal division means that the difference between shares of the members of the coalition are less than 10%.

2.3.1 Do people want to identify and exploit weakness in bargaining?

To evaluate the hypothesis that people wish to exploit weakness in bargaining (the strategic intent hypothesis), we focus on situations that are effectively one-stage bargaining outcomes (for Part I and Stage 2 of Part II), where the task of identifying the weak partner is trivial. Our discussion proceeds in three steps. First we examine the composition of the coalitions that form during the bargaining process. Consistent with the strategic intent hypothesis, we find that MWCs predominate, and that they generally include the weaker potential coalition partner. Next we study allocations in order to determine the extent to which proposers successfully exploit their selected coalition partner or partners. While substantial proposer power is readily evident, it is much less pronounced than theory predicts.[6] One potential explanation for this discrepancy is that, as in other experiments involving the ultimatum game or multiperiod legislative bargaining, proposers face a tradeoff between the greediness of the proposal and the probability the proposal passes. Accordingly, the final portion of our discussion focuses on rejection rates, which are indeed moderate, and which produce some inefficient delay. The strategic intent hypothesis is therefore quantitatively off, but qualitatively successful. Results for subjects at Caltech favor it more strongly than those for subjects at UCI, but the difference is not dramatic.

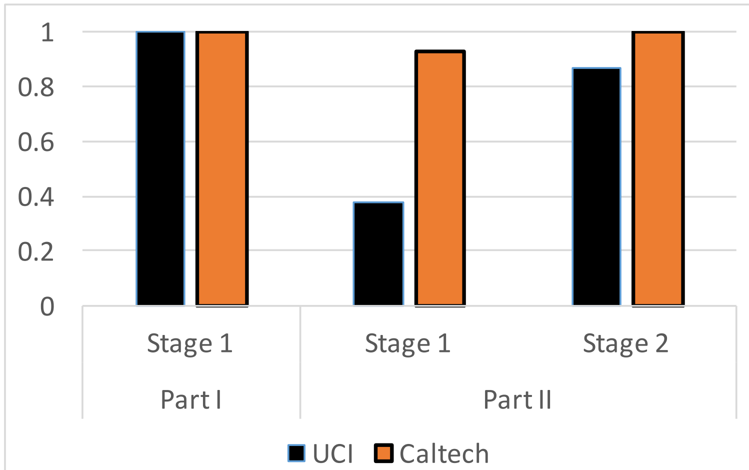
The composition of coalitions. We begin by analyzing the composition of the coalitions implied by successful proposals (i.e., those that passed). As noted above, we deem any subject receiving a share exceeding 5% to be a member of a coalition, regardless of how the subject voted.

First we note that high fractions of final-stage offers involved MWCs: at UCI, 66% in Part 1 and 79% in Stage 2 of Part 2; at CIT, 88% in Part 1 and 71% in Stage 2 of Part 2. Virtually all of the remaining successful offers were grand coalitions.

Taken together, our results on the composition of successful coalitions in one-stage bargaining games are consistent with the hypothesis that proposers can recognize potential partners who are in strategically weak positions, and that they aim to exploit that weakness.

[6]The failure to fully extract the surplus from coalition partners is not surprising, given existing results from ultimatum games and legislative bargaining games that show significant proposer advantages that generally fall well short of the subgame perfect equilibrium benchmark.

Figure 1: Frequency with which Weak Player is Included in MWCs, One-Stage and Two-Stage Games



Notes: This figure focuses on the MWC proposals that passed without delay in every bargaining stage in the experienced games.

Allocations. To determine whether proposers successfully exploit their partners' weaknesses, we turn next to an analysis of proposer shares.

First notice that relatively low fractions of allocations for successful MWCs involved equal division within-coalition: at UCI, 15% in Part 1 and 33% in Stage 2 of Part 2; at CIT, 13% in Part 1 and 0% in Stage 2 of Part 2. Clearly, proposers are not governed by norms of equal division, even within coalitions.

Next we examine proposer shares. To say whether a particular share is high or low, one needs a meaningful benchmark. Relative to the benchmark of equal strength within a MWC (a proposer share of 0.50), proposers exercise substantial power: at UCI, the share is 0.67 in Part 1 and 0.60 in Stage 2 of Part 2; at CIT, it is 0.74 in Part 1 and 0.69 in Stage 2 of Part 2. In both cases, one can reject the hypothesis that being the proposer has no impact on bargaining strength. Clearly, in these simplest bargaining problems, where there is only one period remaining in the game and outside options are common knowledge, proposers are able to at least partially exploit their proposal power.

That said, there is obviously a discrepancy between these results and the implications of theory based on narrow monetary self-interest. According to the theory, proposer shares should be 0.95. Why do our proposers fall so far short of the theoretical benchmark? A natural explanation is that, as in other ultimatum games, subjects reject sufficiently ungenerous offers even when doing so is contrary to their narrow monetary self interest. As we show below, that explanation finds strong support in our data.

In cases where subjects form grand coalitions, we see a rather striking difference between UCI and CIT subjects. The UCI subjects do not generally divide equally within grand coalitions: the frequency of equal splits is 21% in Part 1 and 25% in Stage 2 of Part 2. In contrast, the CIT subjects generally do divide equally: the comparable frequencies are 75% and 67%, respectively. The explanation for this difference is unclear. There are two reasons to make a grand coalition offer: either it is an attempt to hedge in the face of strategic uncertainty (in which case equal division is only optimal in knife-edge cases), or it is an attempt to appeal to equity (in which case equal division is the natural choice). This suggests that CIT subjects may be using grand coalition offers to appeal to equity, while that does not seem to be the case in the UCI sample.

Rejections and delays. In practice, elevated propensities for subjects to reject ungenerous proposals (contrary to monetary self-interest) limits proposers' ability to extract surplus. At UCI, rejection frequencies for offers involving MWCs were 18% in Part 1 and 25% in Stage 2 of Part 2; the corresponding frequencies for CIT were 22% and 12%, respectively. Rejected offers were less common for grand-coalition offers than for MWCs: at UCI, the frequency of rejection was 11% in Part 1 and 0% in Stage 2 of Part 2; at CIT, it was 11% in Part 1 and 14% in Stage 2 of Part 2. The preceding finding is consistent with the notion that grand-coalition offers provide hedges against strategic uncertainty.

Next we ask whether rejection rates are higher for MWCs that include the strong partner than for those that include the weak partner. Finding such a pattern would corroborate our interpretation that attempts to recruit strong partners reflect errors in strategic reasoning. This comparison is difficult to make because proposers so rarely included the stronger player in MWCs. However, in Stage 2 of Part 2, 6 out of 10 (60%) MWC proposals involving the strong player were rejected, compared with only 4 of 30 (13%) MWC proposals involving the weak player. The test of proportions indicate that these two fractions are significantly different at the standard 5% level ($p = 0.0032$).

Proposers anticipate the proclivity to reject and moderate their demands, but not sufficiently to avoid rejections. Thus, the overall rates of impasse for one-stage games were 16% at UCI and 23% at CIT.

In summary, for one-stage games, theory does well qualitatively in terms of predicting the formation of MWCs with strategically weak partners and high proposer power. It is off quantitatively, however, because the inclination to reject ungenerous offers is elevated relative to the theoretical benchmark. CIT subjects conform to the theory somewhat more closely than UCI subjects.

2.3.2 Do people identify and exploit strategic weakness in two-stage bargaining?

Next we turn our attention to the first stage of the two-stage bargaining games, and ask the same set of questions. Here the differences between the UCI and CIT samples, which were evident to a degree in the one-stage bargaining problems, become more striking.

The composition of coalitions. High fractions of successful offers continue to involve MWCs in the first stage of two-stage bargaining: 74% at UCI and 84% at CIT. The difference between these frequencies is not statistically significant ($p = 0.533$). All of the remaining successful offers were grand coalitions; none were dictatorial. These findings are inconsistent with the hypothesis that subjects are narrowly concerned with their own monetary outcomes and play subgame perfect equilibria, inasmuch as the first proposer would then receive the entire prize.

Again we turn to the question of whether proposers form MWCs with weak players. In this context, there are three competing notions of weakness rather than two. First we have theoretical weakness. For the game in question, player 3 is the weakest potential partner: according to theory, she should expect a share of 0 if the group rejects the first-round offer, whereas player 2 should expect a share of 0.05. In theory, pairing with player 3 therefore allows the proposer to extract (virtually) all of the surplus, rather than 0.95.

Next we turn to the question of whether proposers formed MWCs with the weakest potential partner, as theory predicts. To answer this question, we first need to clarify what we mean by weakness. We call one potential partner *theoretically weaker* than another if, acting in her narrow material self-interest, she would accept less favorable offers. A conceptual issue arises, however, because a proposer has nothing to gain from forming a MWC with a theoretically weak partner who mistakenly believes herself to be in a position of strength. Accordingly, we call one potential partner *behaviorally weaker* than another if she actually accepts less favorable offers. In our experiment, in Stage 1 of Part II, subjects in the role of player 3 are theoretically weaker than those in the role of player 2, but are they behaviorally weaker? To answer this question, we estimate a logit model explaining favorable votes from non-proposers in Stage 1 of Part 2 as a function of the share proposed for the voter and a dummy variable for the player's role, separately for UCI and CIT subjects.[7] In CIT, we find that subjects in the role of player 3 vote in favor of offers more readily than those in the role of player 2 controlling for the offered shares ($p < 0.001$). This effect is only marginally significant at UCI ($p = 0.091$).[8]

Focusing on successful MWCs in Stage 1 of Part 2, proposers included the weak player more than 80% of the time at CIT; see Figure 1. However, at UCI, they included the weak player less than 40% of the time; they were actually more likely to form coalitions with the stronger player. At first this seems extremely surprising, but may be understood as a result of the identity of the weak player being subtle and somewhat counterintuitive, inasmuch as her outside option is 0.90 (which makes her seem strong), while the strong player's outside option is 0.05 (which make him seem weak). We conclude from this, that for this two period game the strategic identification hypothesis is rejected only for the UCI subject pool.

Allocations. Focusing on the first stage of the two-stage bargaining problems, we see that equal division remains relatively uncommon in successful MWCs for the CIT subjects (19%). However, it becomes the modal sharing rule in MWCs for UCI subjects (66%), and the difference is highly significant ($p = 0.004$). One possible explanation is that UCI subjects may lack confidence in their ability to identify the weak partner in the first stage of a two-stage bargaining game, and may implicitly appeal to equity as a hedge against errors in strategic reasoning.

Next we turn to proposer shares in successful MWCs. Relative to one-stage games, we see some attenuation. The proposer share falls from 0.74 to 0.65 for CIT subjects. Attenuation is more striking for UCI students: the proposer share falls from 0.67 to 0.52. Despite this decline, a power index in excess of 2 indicates that the proposers continue to extract significant benefits from their roles.

The discrepancy between these results and the theoretical benchmark is even

[7] We did not do a similar analysis for the one-stage bargaining games because there were almost no observations where a MWC was formed with a strong coalition partner. Similarly, in Stage 2 of Part 2, all the MWC included the weak player.

[8] Regressions show that the marginal effect of proposing to weak rather than strong player increases the probability of a positive vote by 17% in UCI data and by 37% in CIT data, while controlling for the share of the coalition partner.

greater here than for one-shot games. If the parties behaved exactly as theory predicts, the proposer share should be just under 1.00. Elevated rejection frequencies (discussed below) continue to play a role. However, in this context, some proposers - particularly those at UCI - appear to have difficulty reasoning out how to extract surplus most effectively, casting doubt on the strategic exploitation hypothesis.

In cases where subjects form grand coalitions, we continue to see the same divergence between UCI and CIT subjects. The frequency with which UCI subjects implement equal division within grand coalitions is only 22%, roughly the same as in the one-stage problems. In contrast, the corresponding figure for CIT subjects is 90%, even higher than for one-stage games. The difference between the two samples is highly significant. Thus, it once again appears that CIT subjects may use grand coalition as appeals to equity.

Rejections and delays. As in one-stage games, a proposer's ability to extract surplus is limited by the responses of the other parties, which involve rejection of ungenerous offers more frequently than their narrow monetary interests would imply. At UCI, rejection frequency for MWC offers is 32%; at CIT, it is 30%. These figures are not significantly different from their counterparts for one-stage problems in UCI with $p = 0.167$ and only marginally significant at CIT with $p = 0.086$, which possibly is an indication of the increasing complexity of strategic reasoning and the resulting uncertainty concerning others' responses. Rejection rates were again lower for grand-coalition offers than for MWCs: at UCI, 29%; at CIT, 0%. Again, this finding is consistent with the notion that proposers use grand-coalition offers as hedges against strategic uncertainty.

Once again, we compare rejection rates for MWC offers involving strong partners and those involving weak partners. They are, respectively, 36% versus 25% at UCI, which are not significantly different from each other ($p = 0.346$), and 56% vs. 26% at CIT which are significantly different ($p = 0.032$). (We caution that the latter comparison involves only nine offers to strong partners.) These figures are consistent with the interpretation that the theoretically strong partners recognized themselves as stronger, and consequently rejected offers at a higher rate (a property verified above); it also suggests that offers involving MWCs with strong players entailed strategic miscalculations.

Despite the lower acceptance frequencies in stage 1, the overall frequency of impasse for two-stage bargaining problems falls relative to the one-stage problems, to

7% at UCI and 3% at CIT; the declines are statistically significant with $p = 0.002$ for UCI and $p = 0.004$ for CIT. This result is of course a necessary consequence of compounding the acceptance likelihoods over the two stages. However, the existence of the second stage may also account for the greater willingness to reject proposals in the first stage.

In summary, with respect to the first stage of our two-stage games, theory continues to do well qualitatively at CIT in terms of predicting the formation of MWCs with strategically weak partners and high proposer power. It fares considerably less well at UCI. The preponderance of MWCs persists along with a meaningful degree of proposer power, but we see a radical deterioration in the ability to identify weak partners at UCI, even with a modest amount of strategic complexity and despite leading experience.

3 Three-Stage Bargaining

There were three treatments in our three-stage bargaining sessions, which varied the degree of predictability about the proposers in future bargaining stages if all proposals had failed in previous stages. In all three treatments, the bargaining protocol followed a standard Baron-Ferejohn majority-rule bargaining procedure similar to bargaining protocols that have been studied in other laboratory experiments, with two exceptions: (1) voters in bargaining stage t were given either full or partial information about the identity of the stage $t+1$ proposer if agreement were to fail in stage t; (2) the horizon was finite with a maximum of three bargaining stages, with payoffs to all voters equal to zero in the event that proposals fail at all three stages.

3.1 Design and Procedures

There were three treatments in our three-stage bargaining sessions, which varied the degree of predictability about the proposers in future bargaining stages if all proposals had failed in previous stages. In all three treatments, the bargaining protocol followed a standard Baron-Ferejohn majority-rule bargaining procedure similar to bargaining protocols that have been studied in other laboratory experiments, with two exceptions: (1) voters in bargaining stage t were given either full or partial information about the identity of the stage $t+1$ proposer if agreement were to fail in stage t; (2) the horizon was finite with a maximum of three bargaining stages, with payoffs to all voters equal

to zero in the event that proposals fail at all three stages.

For all three treatments, an experimental session consisted of twenty repetitions (called "matches") of the 3-stage bargaining game. In each match, subjects were randomly assigned into committees of 3 voters each and within each committee the voters were randomly assigned a label as either committee member 1, committee member 2, or committee member 3. These committee assignments and committee member number labels were randomly reshuffled at the beginning of every match. At the end of the experiment three matches were randomly selected and each subject was paid the sum of their earnings across those three matches.

Committee member 1 was always the stage-one proposer and submitted a stage-one proposed allocation of a budget by entering it on his or her computer terminal.[9] The stage-one proposed allocation was then broadcast to all the members of the committee, each of whom (including the proposer) independently submitted either a yes vote or a no vote by clicking a button on their computer. If there were two or three yes votes, then the proposed stage one allocation passed, was implemented, and the match ended. If there were zero or one yes votes, then the game moved to the second stage, a proposed allocation was made by the stage two proposer and voted on. If there were two or three yes votes the proposed stage two allocation passed and was implemented and the match ended. If there were zero or one yes votes, then the proposal failed, the game moved to the third and final stage, and a proposed allocation was made by the stage three proposer and voted on. If the stage three proposal failed, the match ended and all three committee members received a payoff of 0. Because there were multiple three person committees operating in parallel during each match and committee assignments were randomized between matches, match $t + 1$ did not begin until all committees had finished match t.

The first match was preceded by an unpaid practice match to familiarize the subjects with the procedures and the computer interface. At the start of the practice match, the experimenter walked the subjects through all the screens that they would see during the experiment, by displaying screenshots and explaining the content of each screen in a uniformly scripted way. See the sample instructions in Appendix C for details. After this was all explained, the subjects completed the practice match on their own.

All three treatments within the three-stage bargaining sessions followed the pro-

[9]The \$18 budget was presented as 90 tokens worth \$0.20 each. Proposed allocations were required to be in non-negative integer amounts, with the three member allocations summing to exactly 90.

cedures described above. The treatments differed only in the information committee members were given at the beginning of in stage t about the identity of excluded proposers in stage $t+1$. If the voters were told that a committee member X was "excluded" as a potential proposer in stage $t+1$, then it means there is zero probability that X would be selected in stage $t+1$. If the stage t proposal fails then the stage $t+1$ proposer is selected randomly from the committee members who had not been excluded as potential proposers in stage $t+1$.

Specifically, the process of selecting a proposer works as follows in the three treatments. In all treatments, the stage 1 proposer is selected randomly from all three committee members. In the NONE treatment, no committee member is ever excluded in period t as a possible proposer in stage $t+1$, for $t = 1, 2$. In the PARTIAL predictability treatment, exactly one committee members is randomly selected at the beginning of period t to be excluded as a potential proposer in stage $t+1$, for $t = 1, 2$. In the PERFECT predictability treatment, exactly two committee members are randomly selected at the beginning of period t to be excluded as a potential proposer in stage $t+1$, for $t = 1, 2$. Notice that in the PERFECT treatment, the identity of $t+1$ proposer in always known with certainty to all voters in period t. Also notice that in all treatments, it is possible that the period t proposer might not be excluded from being the $t+1$ proposer.

We conducted most three-stage bargaining sessions at the ESSL (Experimental Social Science Laboratory) at University of California, Irvine. Subjects were recruited from the general undergraduate population, from all majors. Experiments were conducted using Multistage software, which was developed from the open source Multistage package.[10] Communication between subjects was prohibited. We conducted 6 sessions, two for each treatment, using a total of 138 subjects. Each session included either 21 or 24 subjects. We also conducted three sessions of the PERFECT treatment at SSEL (Caltech). The number of participants in each treatment are summarized in Table 3. No subject participated in more than one session. The experiments lasted, on average, two hours, and subjects' average earnings were \$28, including the \$10 show-up fee.[11]

[10]The open source Multistage experimental software package is available for download at at http://software.ssel.caltech.edu/.

[11]See Appendix for verbatim instructions.

Table 3: Design of Three-Stage Bargaining Sessions

Predictability	# Voters	Horizon	Payoffs if impasse	Subject Pool	#Subjects
NONE	3	Finite (3-period)	(0,0,0)	UCI	42
PARTIAL	3	Finite (3-period)	(0,0,0)	UCI	48
PERFECT	3	Finite (3-period)	(0,0,0)	UCI	48
PERFECT	3	Finite (3-period)	(0,0,0)	CIT	39

Notes: Each session consisted of 20 matches with anonymous random re-grouping between matches. Average earnings were $XX including the $10 showup fee.

3.2 Theoretical benchmarks

We use subgame perfect equilibrium as the theoretical benchmark on which was base our predictions about behavior in the experiment. We also impose three additional assumptions by assuming that players vote as if their vote is pivotal and vote no when indifferent. The first assumption is standard in these voting games and rules out equilibria that use stage-dominated strategies, where all voters vote yes or all voters vote no on certain proposals so no voter is pivotal. The third assumption is symmetry: if a proposer is indifferent about which committee member to offer a positive share, he or she chooses with equal probability. The second assumption rules out equilibria where voters vote yes on a proposal where they are offered nothing. The third assumption is standard.

Table 4 shows the equilibrium proposals in the relevant subgames in each stage. Notice - importantly - that in the PARTIAL game, the equilibrium proposal can depend on exactly which committee members are excluded at stage t from proposing at stage $t+1$. In equilibrium the proposer offers only one other committee member a positive share, equal to the minimum integer that is greater than that member's continuation value. The positive share offer is made to the other committee member with the lower continuation value; or in case the other members have the same continuation value, the proposer randomly selects one of them.

In all three treatments, the continuation value following stage 3 is 0 for every member, so the equilibrium offer in fractional shares is necessarily $(0.99, 0.01, 0.00)$ in stage 3, where the first component specifies the share of the proposer, the second one specifies the share of the coalition partner, and the third one is the share of the remaining member of the committee. Also, in all treatments, no delay is predicted. That is, the bargaining games should always end at the first stage. Furthermore, in equilibrium only two committee members receive positive allocations, i.e., the theory predicts the formation of minimum winning coalitions. The equilibrium logic differs across the three treatments, as follows.

NONE Treatment:

In the zero treatment the continuation value for all players following a proposal failure in either stage 1 or stage 2 is 0.33, by symmetry. Therefore, the equilibrium proposal in both stages is $(0.66, 0.34, 0.00)$.

PERFECT Treatment:

The equilibrium is solved by backward induction. The continuation value for all stage-3 *excluded* players following a proposal failure in stage 2 is 0.01. Hence the equilibrium stage 2 proposal is $(0.99, 0.01, 0.00)$. Similarly, the equilibrium stage 1 proposal is also $(0.99, 0.01, 0.00)$.

PARTIAL Treatment:

Again, the equilibrium is solved by backward induction, but is somewhat more involved. In stage 2, the equilibrium offer depends on whether or not the stage 2 proposer is excluded from proposing in stage 3. If not, then one of the other committee members is excluded from proposing in stage 3, and therefore is the weaker coalition partner, with a continuation value of only 0.01. So, in this case the equilibrium stage 2 proposal is $(0.99, 0.01, 0.00)$. On the other hand, if the stage 2 proposer *is* excluded from proposing in stage 3, then each of the other committee members has a continuation value equal to $0.50 \times 0.99 + 0.50 \times 0.01 = 0.50$. Hence the equilibrium stage 2 offer in this case is equal to $(0.50, 0.50, 0.00)$. Moving to stage 1, if the stage 1 proposer is not excluded from proposing in stage 2, then he offers a positive share to the other committee member who is excluded from proposing in stage 2. That committee member's continuation value is a lottery that depends on whether he will be excluded from proposing in stage 3, which is not known yet, but will be known at the beginning of stage 2 if and when the stage 1 proposal fails. Straightforward calculations show that this continuation value equals 0.078, so the equilibrium stage 1 proposal in this case is equal to $(0.92, 0.08, 0.00)$. On the other hand, if the stage 1 proposer is excluded from proposing in stage 2, then both of the other committee members have the same continuation value of 0.46, so the equilibrium offer is $(0.54, 0.46, 0.00)$. Because the stage 1 proposer is excluded from stage 2 with only 0.33 probability, the *expected* proposer share in the PARTIAL treatment is $0.67 \times 0.92 + 0.33 \times 0.54 = 0.79$.

Table 4: Equilibrium Offers in Three-Stage Bargaining Games

	Treatments		
	NONE	PARTIAL	PERFECT
Stage 1			
Proposer excluded for stage 2	NA	(0.54,0.46,0.00)	(0.99,0.01,0.00)
Proposer not excluded for stage 2	(0.66,0.34,0.00)	(0.92,0.08,0.00)	(0.99,0.01,0.00)
Stage 2			
Proposer excluded for stage 3	NA	(0.50,0.50,0.00)	(0.99,0.01,0.00)
Proposer not excluded for stage 3	(0.66,0.34,0.00)	(0.99,0.01,0.00)	(0.99,0.01,0.00)
Stage 3	(0.99,0.01,0.00)	(0.99,0.01,0.00)	(0.99,0.01,0.00)

Notes: The first component of the offer is the proposer share, the second component is the share to the (weaker) coalition partner, and the third component is the share of the remaining committee member.

The qualitative predictions of the treatment effects on the proposer's share are clear. The proposer should receive the greatest share in the PERFECT treatment, the next greatest (expected) share in the PARTIAL treatment, and the smallest share in the NONE treatment. This property reflects the primary theoretical hypothesis about the comparative statics of predictability of proposers' identities: **greater predictability implies greater proposer power**. A second qualitative prediction is that the proposer share in the PARTIAL treatment is less (greater) than the proposer share in the NONE treatment if the proposer is (not) excluded from being the next round proposer. Notice that all of these qualitative comparisons hold for *both* stage 1 and stage 2 proposers.

3.3 Results

We will begin by examining the validity of the strategic ability hypothesis in three-stage bargaining games by focusing on the PERFECT sessions at CIT and UCI. Then we will consider the effects of varying the degree of predictability by analyzing the other UCI sessions. Our discussion references summary statistics contained in Table 5.

3.3.1 The strategic ability hypothesis: Do people identify and exploit strategic weakness in three-stage barganining?

The addition of a third bargaining stage significantly increases strategic complexity. Here we ask whether it affects the validity of the strategic ability hypothesis. We focus on sessions involving the PERFECT protocol to promote comparability with our results for two-stage problems (which were effectively PERFECT sessions with asymmetric outside options).

The composition of coalitions At Caltech, a high fraction (77%) of successful offers involve MWCs in the first stage of PERFECT three-stage bargaining. However, this frequency drops sharply at UCI, to 51% (versus 74% in the first stage of two-stage bargaining). Almost all of the remaining successful offers were grand coalitions rather than dictatorial. These findings are strictly contrary to theory, which predicts dictatorial outcomes (assuming subjects are narrowly concerned with their own monetary outcomes and play subgame perfect equilibria).

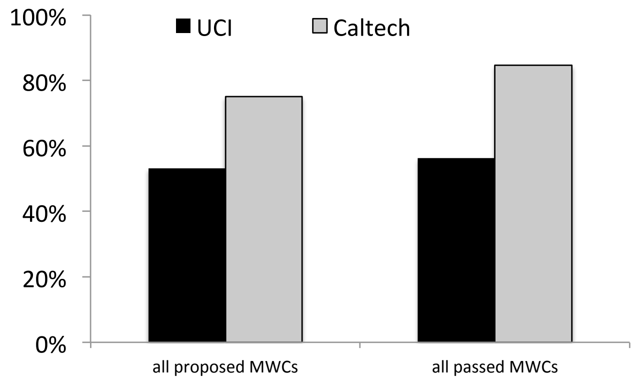
We next examine the frequency with which an experienced proposer invited the weak potential partner (i.e., the one who is not the second-stage proposer) to join a MWC in stage 1 of PERFECT three-stage bargaining games, restricting attention to games in which which the first-stage and second-stage proposers differ; see Figure **??**. Focusing on all submitted MWC proposals, we find that this frequency is 75% at CIT compared to only 53% at UCI. For CIT, we reject the hypothesis that proposers selected partners at random, each with 50% probability ($p < 0.01$). However, we do not reject the same hypothesis for UCI ($p = 0.66$). The same patterns emerge when one focuses only on MWC proposals that passed without delay: 85% and 56% include the weakest committee member at CIT and UCI, respectively, and only the former frequency is statistically distinguishable from 50%. Thus, CIT subjects exhibit a robust ability to recognize weak bargaining positions, but this ability is almost entirely absent among UCI subjects.

Turning to the second stage of PERFECT three-stage bargaining games,[12] we see that a disproportionate fraction (80%) of successful proposals involved MCWs at CIT, while a disproportionate fraction (78%) involved grand coalitions at UCI. Not surprisingly, these results are similar to those obtained for the first round of our two-stage bargaining games.

Allocations Focusing on the first stage of the PERFECT three-stage bargaining problems, we see that within-coalition egalitarianism dominates successful offers among the UCI sample: we observe equal division in 90% of successful MWC offers and 81% of successful grand-coalition offers. These patterns are not surprising in light of our other results: UCI subjects tend to be egalitarian when making MWC offers in the

[12]The number of negotiations reaching the third stage was too small to permit useful analysis.

Figure 2: Frequency with which First-Stage Offers Include Weak Players in MWCs, PERFECT Three-Stage Treatments



Notes: This figure focuses on MWC proposals made in the first stage of the PERFECT treatment, and is limited to experienced games in which the first-stage and second-stage proposers differed. It shows results separately for all submitted MWC proposals and those that passed without delay.

first stage of two-stage bargaining problems; they have even less ability to recognize strategic weakness in three-stage problems, and therefore likely suffer from a high degree of strategic uncertainty. CIT subjects are also drawn to within-coalition egalitarianism, but to lesser degree: we observe equal division in just over half (54%) of successful MWC offers and more than two-thirds (70%) of successful grand-coalition offers. The elevated frequency of equal division among CIT subjects' MWC offers is more surprising, since they do not generally make egalitarian MWC offers in the first stage of two-stage bargaining problems, and they retain the ability to identify weak players in the three-stage setting.[13] One potential explanation is that they lack confidence in their evaluations of strength and weakness, and consequently opt for egalitarianism as a hedge against strategic uncertainty.

Next we turn to proposer shares. With equal division, proposers would receive shares of 0.50 in MWCs and 0.33 in grand coalitions. Focusing on the first stage of the PERFECT three-stage bargaining problems, we see that UCI proposers actually recieve shares of 0.51 in MWCs and 0.35 in grand coalitions, for an overall average of 0.43. Roughly speaking, the half who make successful MWC offers fare better than those who make successful grand coalition offers, but only because equal division is more attractive among two players than among three, and not because proposers have

[13]Recall that CIT subjects do make egalitarian grand-coalition offers with high frequency in the first stage of two-stage bargaining problems.

any ability to target and exploit weakness. CIT proposers perform a bit better, earning shares of 0.54 in MWCs and 0.36 in grand coalitions, for an overall average of 0.50. Note, however, that most of the improvement is attributable to the greater use of MWC offers among UCI subjects, rather than greater success at targeting and exploiting weak players. It is worth reiterating that theory provides a poor quantitative account of proposer shares, since it predicts shares just under 1.00.

Turning to the second stage of PERFECT three-stage bargaining games, we see that, as in the first stage of two-stage bargaining games, successful UCI offers are skewed toward grand coalitions (78%), while successful CIT offers are skewed toward MWCs (80%). At UCI, all of the MWC offers and 93% of the grand coalition offers involved equal division, while at CIT, the corresponding frequencies were 58% and 40%. In both cases, the incidence of egalitarianism was more balanced across MWC and grand-coalition offers than in the first stage of our two-stage games.[14]

Rejections and delays As in one-stage and two-stage games, a proposer's ability to extract surplus is limited by the responses of the other parties. Focusing on the first stage of PERFECT three-stage bargaining games, we see that the rejection frequency for MWC offers is 27% at UCI and 36% at CIT. These figures are comparable to those observed in the first stage of two-stage problems. Consistent with the notion that grand-coalition offers hedge strategic uncertainty, rejected offers were once again less common for grand-coalition offers: the frequency of rejection was 13% at UCI nd 20% at Caltech. Stage 2 rejection rates were generally similar. While 69% of the MWC offers in stage 2 failed at UCI, there were few such offers. With three opportunities to approve a proposal, impasse becomes exceedingly rare. We observe no instances of impasse at UCI, and the CIT impasse rate is only 2%.

Overall, with respect to the first stage of our three-stage games, theory continues to do well at CIT in terms of predicting the formation of MWCs with strategically weak partners and high proposer power. It does not, however, anticipate the use of egalitarian offers nor the associated failure to exploit weakness. It also fares considerably less well at UCI, where we see more extensive use of grand-coalition offers, a penchant for egalitarianism with coalitions, and the absence of any meaningful ability to identify weak partners.

[14]It is worth bearing in mind that we employed different configurations of outside options in the two-stage and three-stage bargaining problems. Accordingly, one would not expect to observe precisely the same behavioral patterns in stage 1 of the two-stage problems and stage 2 of the three-stage problems.

3.3.2 The Effects of Predictability

According to theory, the dissemination of information concerning the identity of the next proposer strongly favors the current proposer. Accordingly, theory suggests that we ought to see dramatic differences across the PERFECT, PARTIAL, and NONE treatments at UCI. While we do observe some small differences between treatments, the major characteristics of bargaining outcomes are largely constant. In particular, we observe similar mixes of MWC and grand-coalition offers, comparably high adherence to equal division within coalitions, similar proposer shares, and infrequent delays.[15] The absence of meaningful treatment effects is not surprising in light of the inability of UCI subjects to recognize strategically weak positions.

The composition of coalitions The differences in the composition of successful first-stage coalitions across the three treatment are just large enough to suggest a potential role for predictability. The frequency of MWCs ranges from 34% in the NONE treatment to 58% in the PARTIAL treatment, and we reject equality ($p = 0.053$). However, moving from the PARTIAL treatment to the PERFECT treatment (also an increase in predictability), this frequency falls to 51%, and the difference between the NONE and PERFECT treatments is not statistically significant ($p > 0.10$). Furthermore, a rather different pattern emerges for successful second-stage coalitions.

From the perspective of evaluating bargaining theory, a more discerning question is whether proposers form MWCs with the weakest potential partner.[16] In both treatments, weakness corresponds to having no chance of being the next proposer. In the PARTIAL treatment, a weak partner exists only when the set of potential proposers for the next period includes the current proposer.

For the PARTIAL treatment, we focus on games in which the first-stage proposer is a potential second-stage proposer, and compute the frequency with which MWC offers include the other potential second-stage proposer. Among all such first-stage MWC proposals, this frequency is 70% (44 out of 63 cases), while among those that

[15]Treatment 1 of Diermeier and Morton (2005) resembles our NONE protocol except that it involves a 5-stage horizon instead of a 3-stage horizon and slightly unequal recognition probabilities. Unfortunately, only 12 subjects participated in the treatment. Close to half of the accepted proposals were grand coalition allocations; minimum winning coalitions often shared the pie equally between the proposer and the other member; immediate agreement occurred about 70% of the time; and the proposer share averaged less than 50%. While we do not place too much weight on these findings due to the tiny sample, the broad similarities to our findings are notable.

[16]Technically, theory implies that the proposer in the PERFECT treatment should obtain an outcome we would classify as dictatorial, rather than as a MWC. However, the dictatorial allocation would pass with the support of the weakest player.

passed without delay, it is 69% (33 out of 48 cases). Thus, more often than not, the first-stage proposer invites the stronger player, rather than the weaker player, to join a MWC, contrary to theory. For the PERFECT treatment, we compute the frequency with which first-stage MWC offers include the second-stage proposer. Among all first-stage MWC proposals, this freuency is 47% (22 out of 47 cases), while among those that passed without dealy, it is 44% (14 out of 32 cases). In both cases, the observed frequency is not significantly different from 50% ($p = 0.66$ for all first-stage MWC proposals and $p = 0.49$ for all successful first-stage MWC allocations).

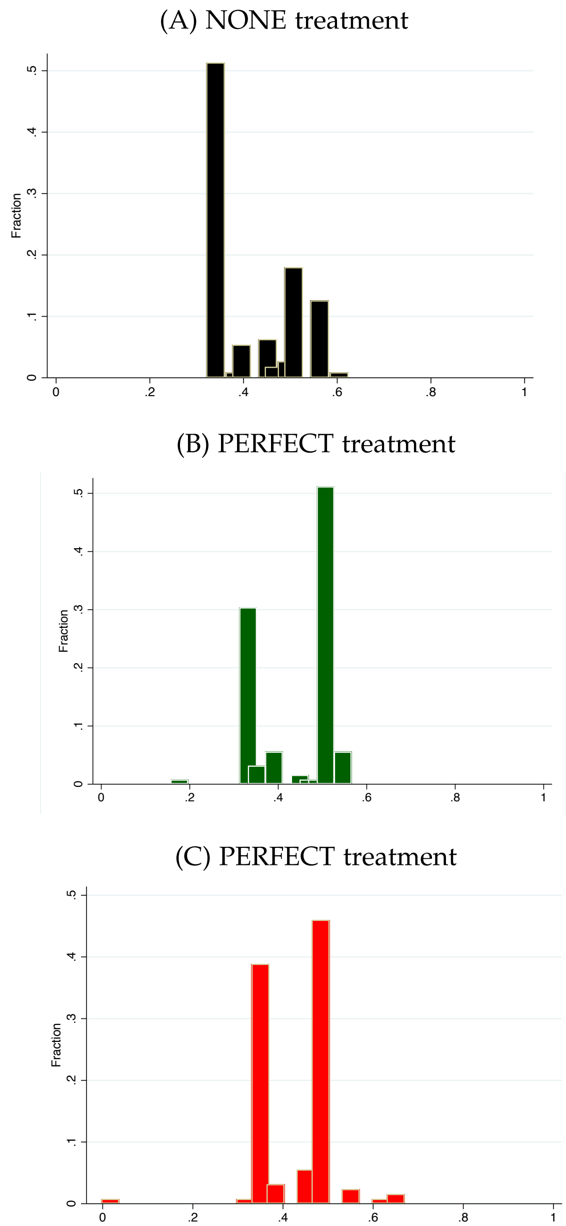
In light of the fact that UCI subjects cannot identify weak players in these settings, we can infer that they are likely unable to capitalize on the predictability of recognition orders. The next step in our analysis corroborates this inference.

Allocations In all three treatments, within-coalition egalitarianism is the dominant pattern for first-stage offers, whether MWCs or grand coalitions. The NONE treatment yields a lower frequency of equal division (58%) among MWC offers than either the PARTIAL (90%) or PERFECT (91%) treatments, but otherwise this frequency hardly varies across treatments.

Not surprisingly, the average proposer's share is far smaller than theory predicts. Moreover, the range of variation across treatments (41% to 44%) is minimal. To drive this point home, Figure 3 depicts the distribution of proposers' shares for each treatment, focusing on allocations that were approved without delay in the first stage. It is difficult to discern systematic differences between these distributions, and a Kolmogorov-Smirnov test fails to reject the hypothesis that they are identical ($p = 0.815$ for NONE versus PARTIAL treatments and $p = 0.261$ for NONE versus PERFECT treatments). Accordingly, neither partial nor perfect predictability had any discernable effect on the ability of the first-stage proposers to appropriate higher shares of resources.

Theory also predicts that proposers should be able to extract better deals when weaker partners are available. In the first stage of the PARTIAL treatment, proposers should therefore fare better when they themselves belong to the set of potential second-stage proposers (in which case one of their potential first-stage partners is in a weak strategic position), than when they do not belong to that set. In contrast, in the PERFECT treatment, theory implies that there is always a maximally weak potential partner in stage 1, so proposers should extract the same share (essentially 100%) regardless of who is the next proposer. We assess the validity of these implications by

Figure 3: Distribution of Proposer's Shares for Three-Stage Bargaining Games



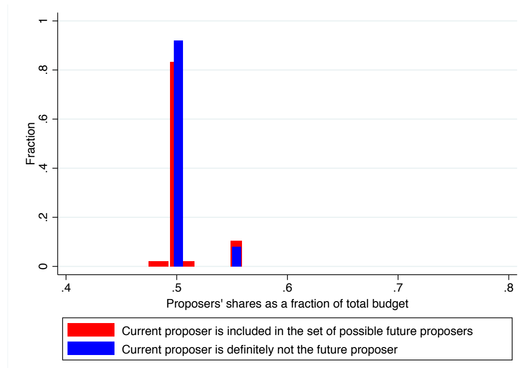
Notes:This figure is based on experienced games, and pertains to proposals that were approved without delay in the first stage.

examining the distributions of proposer shares, focusing on first-stage MWC offers that passed without delay in the PARTIAL and PERFECT treatments; see Figure 4.

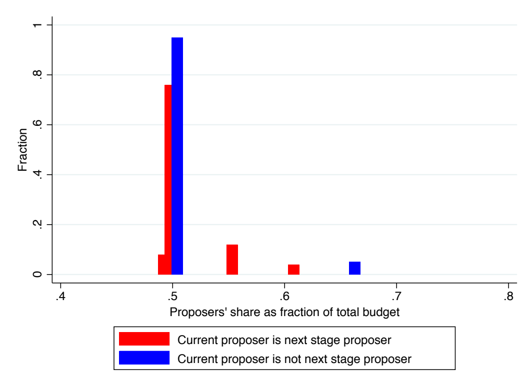
As the figure shows, the first-stage proposer's share does not depend on her prospects for making the second-stage offer in either treatment. Statistical analysis confirms this assessment ($p = 0.40$ for the PARTIAL treatment, and $p = 0.90$ for the

Figure 4: Conditional Distribution of Proposer's Shares for Three-Stage Bargaining Games

(A) PARTIAL treatment



(B) PERFECT treatment



Notes: This figure is based on experienced games, and pertains to MWC proposals that passed without delay in the very first bargaining stage.

PERFECT treatment). With respect to the PARTIAL treatment, this finding is inconsistent with theory. In the PERFECT treatment, this particular pattern matches the theoretical prediction, but for the wrong reason, inasmuch as first-stage proposers do not appropriate all (or nearly all) resources.

Rejections and delays The rejection rate for first-stage proposals is low and constant across all treatments (21%). While we see greater variation in the second and third rounds, impasse is rare in all cases. Once again, there is no meaningful difference across treatments.

In summary, theoretical predictions concerning the role of predictable recognition orders find little if any support in the UCI data. The explanation appears to be that

UCI subjects are unable to recognize weak players in these modestly complex environments, and hence cannot exploit information about the recognition order.

4 Bargaining with an Indefinite Horizon

As we have seen in the previous sections, bargaining theory fails to provide even a qualitatively useful account of behavior in three-stage bargaining games. While there is considerable support for the strategic intent hypotheses in The one- and two-stage bargaining games, the strategic ability hypothesis is, for the most part, soundly rejected. One natural explanation is that subjects struggle to parse strategic problems when the solutions involve backward recursion Accordingly, in this section, we turn our attention to open-ended (indefinite horizon) bargaining.

To an economist, an indefinite horizon introduces even greater mathematical complexity. However, the assumption of an indefinite horizon permits consideration of problems with stationary structures, and stationarity invites both logical and heuristic shortcuts. To illustrate, consider an indefinite-horizon Baron-Ferejohn bargaining problem in which the agents always learn the identities of proposers one period in advance. Provided a subject entertains the possibility that the proposer might keep the entire prize, she may also notice that this outcome is self-sustaining (technically, a Markov-perfect equilibrium): if proposer for the next round keeps the entire prize, then the current proposer can also keep the entire prize by forming a MWC with the third committee member, who will acquiesce for (almost) nothing. Thus, bargaining theory could in principle prove more successful in settings with open-ended bargaining.

In this section, we demonstrate that, on the contrary, bargaining theory also struggles to account for observed behavior in indefinite-horizon problems. UCI subjects have an easier time recognizing the benefits of forming MWCs than in three-stage games, but they take only slight advantage of coalition partners, and consequently do not fare much better than if they had simply agreed to equal division with a single partner. They achieve slightly higher shares with predictability of the next proposer than without, but primarily because predictability promotes the formation of MWCs, possibly because it introduces prominent asymmetry between the prospective partners. Increasing the number of negotiators from three to five yields more striking anomalies, especially in settings where some potential partners are stronger than others.

4.1 Experimental design

Our analysis of indefinite-stage bargaining is based on modified versions of the NONE and PERFECT three-stage bargaining games described in Section 3.1. The most important modification pertains to the horizon. We informed the players that, if they failed to reach agreement in any round, the game would end with 5% probability,[17] in which case each player would receive a payoff of zero. Games continued until agreement or random termination, whichever came first. The second modification is that we allow committee members to freely communicate with each other in every stage before the proposal is submitted. Communication was open and unstructured and was implemented using chat boxes on each member's computer interface. Messages could be sent either privately to specific committee members or broadcast to the whole committee. The chat phase terminated as soon as the proposer submitted a proposal. Other studies have found that open communication enhances proposer power, reduces delay, and brings outcomes into closer alignment with theoretical predictions.[18] Thus, the second modification likely makes the bargaining environment more favorable to theory while at the same time adding realism. Third, we studied both three-player and five-player games. Increasing the number of players adds complexity to the task of assembling a MWC in settings with asymmetric bargaining power. We conducted five sessions involving a total of 113 subjects at UCI. Table 6 summarizes the design. We also conducted two sessions with 5-player bargaining games; see Appendix for details, including design features and a summary of results.

4.2 Results

Table 7 reports first-stage bargaining outcomes for all four indefinite-horizon treatments. As discussed below, delay is relatively uncommon, so the first stage usually dictates the outcome. Following the approach we have taken in other sections, we focus on experienced games, meaning the last 8 matches out of the 15 played in each session.

The composition of coalitions We begin with the NONE treatments, which employ the standard Baron-Ferejohn bargaining protocol. Note that the majority of both proposed and passed allocations in stage 1 are MWCs; the rest are grand coalitions. This

[17]The stationary termination probability for the 5-person committees was 20%.
[18]See Agranov and Tergiman (2014) and Baranski and Kagel (2015).

finding replicates results from previous lab experiments. Interestingly, the frequency with which proposers attempt to form MWCs is significantly higher in 5-player games than in 3-player games (79% versus 59%).

Next we turn to the PERFECT treatments, in which players learn the identities of proposers one period in advance. As before, this feature introduces large differences in future bargaining strengths. In three-player games, we see a sizable increase in the frequency of MWCs relative to the NONE treatment, from 59% to 89% ($p = 0.07$). However, for five-player games, providing players with information regarding the identity of the next-stage proposer *decreases* the frequency of MWCs precipitously, from 79% to 30% ($p < 0.01$). The latter finding is surprising given that the proposer has more to gain from forming an MWC when she can identify weak players. Possibly the introduction of a prominent asymmetry between one potential partner and the rest may increase in the salience of MWCs in three-player settings where the proposer only needs to select a single partner, while reducing the salience of MWCs in five-player settings where the proposer needs to select two partners.

Allocations In all four treatments, equal division predominates among successful grand coalition offers; its frequency ranges from 70% to 88%. As a result, the average proposer shares in successful grand coalitions are only slightly above the equal division benchmarks, and insensitive to the provision of information regarding the identity of the next proposer (37% and 36% versus a benchmark of 33% for the three-member committee treatments; 22% and 21% versus a benchmark of 20% for the five-member committee treatments).

In contrast, egalitarianism within successful MWC coalitions is relatively rare in both of the three-member committee treatments (frequencies of 14% and 21%), as well as in the five-player NONE treatment (0%). We therefore see greater elevation of the proposer's share among MWC offers relative to the equal division benchmarks (58% and 56% versus a benchmark of 50% for the three-member treatments; 59% versus a benchmark of 33% for the five-member NONE treatment). While the provision of information regarding the identity of the next proposer has almost no effect on either the frequency of equal division or the average proposer share in successful MWCs for three-member committees, it substantially increases the frequency of equal division (from 0% to 50%), and as a result dramatically reduces the average proposer share(from 59% to 40%) in successful MWCs for five-member committees. Note, however, that proposers' shares remain meaningfully elevated relative to the equal division benchmark (40% versus 33%). Thus, to some extent, proposers take advantage of MWC partners in all treatments, as theory predicts.

The overall average proposer share exhibits relatively little variation across the three-member committee treatments and the five-member committee NONE treatment. With three members, it is slightly higher in the PERFECT treatment than in the NONE treatment (53% versus 49%). The difference is statistically insignificant ($p = 0.16$), much smaller than theory predicts, and entirely attributable to the increased use of MWC offers, rather than to an enhanced ability to identify and exploit weak partners. In contrast, with five-member committees, providing advance information regarding the identity of the next-stage proposer dramatically *decreases* the proposer's average share (from 52% for the NONE treatment to 26% for the PERFECT treatment), contrary to theory. This difference reflects both the steep decline in the frequency of MWC offers and the precipitous drop in average payoffs for those offers.

Rejections and delays Delays are relatively rare in all four treatments irrespective of committee size. Grand coalition proposals pass 100% of the time in all four treatments and only slightly more than 10% of the time for MWC proposals overall. Such infrequency of delay has also been observed in other legislative bargaining experiments with pre-proposal chat. Given the rarity of rejected proposals, it is not surprising that we find no statistical difference between the frequency of delays in the NONE and PERFECT treatments conditional on the committee size ($p = 0.42$ for 3-person and $p = 0.32$ for 5-person committees).

Communication Communication between subjects during the bargaining games provide an additional window into their thought processes. Significantly, subjects did not discuss the identities of the next-stage proposers, nor did they describe the bargaining positions of particular voters as strong or weak. Most comments pertained to the current-stage proposals, and either encouraged non-proposers to compete for inclusion in a MWC, or appealed to notions of fairness involving inclusion and egalitarianism. In other words, subjects did discuss relevant aspects of the game, but did not mention the consideration (future proposal power) that determines bargaining strength.

5 Discussion and Conclusions

The object of this study was to test two general hypotheses concerning majority-rule bargaining within committees in situations where standard game theory implies sharp time-dependent asymmetries in the bargaining power of the committee members. First, that people wish to identify and exploit others who find themselves in strategically weak positions (the strategic intent hypothesis); second, that people have the ability to recognize and exploit strategically weak positions (the strategic recognition and strategic exploitation hypotheses, respectively). To the extent these hypotheses have merit, even a small degree of predictability concerning future influence (e.g., through temporary control of agenda setting) can, *in theory,* concentrate virtually all power in the hands of the first proposer (see Ali et al. 2019). We employed two distinct subject pools, one of which (CIT) displays greater quantitative aptitude and skill than the other (UCI). We find support for the strategic intent hypothesis in both samples. Evidence concerning the strategic ability hypothesis is mixed, especially as it regards using information about future proposers to identify weak coalition partners. The ability to exploit coalition partners who are identified is also mitigated, according to a mechanism similar to the difficulty of extracting full surplus in ultimatum games.

For the CIT sample, we find qualified support for the strategic ability hypothesis. CIT subjects exhibit a robust ability to identify and target the players who find themselves in strategically weak positions. However, as the bargaining environment becomes more complex, they shift toward equal division within coalitions, and as a result extract far less surplus than theory implies. We conjecture that this tendency reflects their strategic uncertainty – either their lack of confidence concerning their own assessment of weakness, or their uncertainty that the targeted individual appreciates the weakness of her position. In contrast, UCI subjects exhibit little, if any, ability to identify strategic weakness even in modestly complicated strategic environments. As complexity increases, they also shift toward equal division within coalitions, but unlike CIT subjects, they tend to form grand coalitions rather than MWCs.

In closing, we will mention a few potential directions for subsequent research. First, it would be useful to develop a theoretical account of observed behavior. We strongly suspect that bounded rationality would need to play a central role in any such theory. Second, there is unquestionably more to learn concerning the behavior of negotiators with strong quantitative aptitude and skills. Our findings invite the interpretation that these individuals might adhere more closely to theoretical benchmarks if they gained enough experience to meaningfully reduce their strategic uncertainty. If that is the case, then bargaining theory might well prove applicable in practice, at least in cases involving professional negotiators.

Table 5: Outcomes for Three-Stage Bargaining Games

	CIT	UCI		
	PERFECT	PERFECT	PARTIAL	NONE
	(n = 130 obs)	(n = 160 obs)	(n = 160 obs)	(n = 140 obs)
COALITION TYPES				
Allocations passed in stage 1				
Dictator	0.00 (0.00)	0.01 (0.01)	0.00 (0.00)	0.00 (0.00)
MWC	0.77 (0.10)	0.51 (0.05)	0.58 (0.06)	0.34 (0.08)
with equal division	0.54 (0.13)	0.91 (0.02)	0.90 (0.06)	0.58 (0.09)
Grand	0.23 (0.10)	0.48 (0.05)	0.42 (0.06)	0.66 (0.08)
with equal division	0.70 (0.22)	0.81 (0.02)	0.80 (0.14)	0.78 (0.001)
COALITION TYPES				
Allocations passed in stage 2				
Dictator	0.03 (0.03)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
MWC	0.80 (0.06)	0.22 (0.06)	0.53 (0.20)	0.40 (0.10)
with equal division	0.58 (0.14)	1.00 (0.00)	1.00 (0.00)	0.75 (0.06)
Grand	0.17 (0.06)	0.78 (0.06)	0.47 (0.20)	0.60 (0.10)
with equal division	0.40 (0.32)	0.93 (0.08)	0.71 (0.20)	0.67 (0.06)
PROPOSERS' SHARES (of total budget)				
in all allocations passed in stage 1	**0.50** (0.01)	**0.43** (0.01)	**0.44** (0.01)	**0.41** (0.01)
in MWCs passed in stage 1	0.54 (0.007)	0.51 (0.002)	0.51 (0.03)	0.52 (0.001)
in Grand coalitions passed in stage 1	0.36 (0.010)	0.35 (0.010)	0.34 (0.01)	0.35 (0.001)
in all allocations passed in stage 2	**0.57** (0.02)	**0.37** (0.01)	**0.44** (0.03)	**0.42** (0.03)
in MWCs passed in stage 1	0.59 (0.010)	0.50 (0.000)	0.50 (0.001)	0.53 (0.020)
in Grand coalitions passed in stage 1	0.39 (0.006)	0.34 (0.005)	0.37 (0.020)	0.35 (0.004)
REJECTION PROBABILITIES				
Proposals in stage 1				
if proposal is MWC	36%	27%	23%	25%
if proposal is Grand	20%	13%	17%	18%
Proposals in stage 2				
if proposal is MWC	27%	69%	16%	47%
if proposal is Grand	29%	30%	19%	14%
DELAYS IN BARGAINING DECISIONS				
no delay (decision reached in stage 1)	0.67	0.79	0.79	0.79
frequency of reaching stage 2	0.23	0.11	0.18	0.14
frequency of reaching stage 3	0.08	0.10	0.03	0.06
frequency of impasse	0.02	0.00	0.00	0.01

Notes: All statistics in this table pertain to experienced games. We report average outcomes and the robust standard errors when appropriate in the parenthesis, where observations are clustered at the session level. Coalition types are defined based on the number of members that receive positive shares $\geq 5\%$. Dictator coalition comprises one member only, MWC (minimum winning coalition) comprises two members, while Grand Coalition includes all players. The entries for equal division of resources are conditional frequencies.

Table 6: Design of Indefinite-Stage Bargaining Sessions

Predictability	Horizon	Discount	# Voters	Equilibrium	# Subjects
NONE	Infinite	0.95	3	(0.68,0.32,0.00)	21
PERFECT	Infinite	0.95	3	(0.99,0.01,0.00)	42
NONE	Infinite	0.80	5	(0.68,,0.16,,0.16,0.00,0.00)	25
PERFECT	Infinite	0.80	5	(0.98,0.01,0.01,0.00,0.00)	25

Notes: Each session consisted of 15 matches with anonymous random re-grouping between matches. Average earnings were $28 including the $10 showup fee.

Table 7: Outcomes for Indefinite-Stage Bargaining Games

	Treatment			
	3 player		**5 player**	
	NONE (n = 56 obs)	PERFECT (n = 112 obs)	NONE (n = 40 obs)	PERFECT (n = 40 obs)
COALITION TYPES				
Allocations passed in stage 1				
Dictator	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
MWC	0.59 (0.07)	0.89 (0.09)	0.79 (0.07)	0.30 (0.07)
with equal division	0.14 (0.07)	0.21 (0.03)	0.00 (0.00)	0.50 (0.15)
Grand	0.41 (0.07)	0.11 (0.09)	0.21 (0.07)	0.63 (0.08)
with equal division	0.70 (0.11)	0.82 (0.12)	0.88 (0.13)	0.80 (0.08)
PROPOSERS' SHARES				
(out of total budget)				
in all allocations passed in stage 1	**0.49** (0.02)	**0.53** (0.02)	**0.52** (0.02)	**0.26** (0.02)
in MWCs passed stage 1	0.58 (0.010)	0.56 (0.004)	0.59 (0.003)	0.40 (0.010)
in Grand passed stage 1	0.37 (0.010)	0.36 (0.020)	0.22 (0.020)	0.21 (0.004)
REJECTION PROBABILITIES				
(proposals in stage 1)				
if proposal is MWC	17%	14%	3%	0%
if proposal is Grand	0%	0%	0%	0%
DELAYS				
no delay	0.89 (0.04)	0.87 (0.02)	0.98 (0.03)	1.00 (0.00)

Notes: All statistics in this table pertain to experienced games. We report average outcomes and the robust standard errors when appropriate in the parenthesis, where observations are clustered at the session level. Coalition types are defined based on the number of members that receive positive shares $\geq >$ 5%. Dictator coalition comprises one member only, MWC (minimum winning coalition) comprises two members, while Grand Coalition includes all players. The entries for equal division of resources are conditional frequencies.

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