Journal of Economic Behavior & Organization 68 (2008) 498–510

Contents lists available at ScienceDirect

Journal of Economic Behavior & Organization

journal homepage: www.elsevier.com/locate/econbase

Positive- versus zero-sum majoritarian ultimatum games: An experimental study

Li-Chen Hsu [a], C.C. Yang [a,b,d,*], Chun-Lei Yang [c]

[a] Department of Public Finance, National Chengchi University, Wenshan, Taipei 116, Taiwan
[b] Institute of Economics, Academia Sinica, Nankang, Taipei 115, Taiwan
[c] Research Center for Humanities and Social Sciences, Academia Sinica, Nankang, Taipei 115, Taiwan
[d] Institute of Economics, National Sun Yat-sen University, Kaohsiung 80424, Taiwan

ARTICLE INFO

Article history:
Received 22 July 2005
Accepted 27 January 2007
Available online 11 September 2008

JEL classification:
C78
C91
D72

Keywords:
Majoritarian bargaining
Minimum winning coalition
Experiment

ABSTRACT

Politics can involve a movement from a position off the Pareto frontier to a point on it (a positive-sum game as exemplified in the classic [Buchanan, J.M., Tullock, G., 1962. The Calculus of Consent. University of Michigan Press, Ann Arbor] work), or a movement along the Pareto frontier (a zero-sum game as exemplified in the classic [Riker, W., 1962. The theory of political coalitions. Yale University Press, New Haven] work). In this paper we shed light on their differentiation experimentally by making a comparison between a positive-sum and a zero-sum majoritarian ultimatum game. Our main findings include (i) the fraction of subjects who adopted minimum winning rather than oversized coalitions increases significantly as the game form varies from positive-sum to zero-sum, (ii) oversized coalitions are attributable to non-strategic considerations, and (iii) subjects who choose to adopt the minimum winning coalition have a tendency to seek cheaper responders as their partners in the zero-sum game, but there is no evidence of such a tendency in the positive-sum game. Overall, the weight of the evidence revealed by our experimental data indicates that relative scarcity (embodied in the zero-sum game) promotes behavior more in line with the predictions of economics.

1. Introduction

Baron and Ferejohn (1989) have developed a so-called "majoritarian bargaining" model, which extends the two-player bargaining game invented by Stahl (1972) and Rubinstein (1982) to an n-player bargaining setting under majority rule. While players alternate in making offers in the two-player bargaining game, players are randomly recognized and empowered to put forward their preferred motions in the majoritarian bargaining game. The Baron–Ferejohn model has become a workhorse for the analysis of a variety of political issues, including legislative voting rules (Baron and Ferejohn), pork-barrel politics (Baron, 1991), split-ticket voting between Congress and the President (Chari et al., 1997), government formation and termination in parliamentary democracies (Diermeier and Merlo, 2000), and distinctions between the presidential and the parliamentary system (Persson et al., 2000).[1]

It should be obvious that a complete understanding of the last round of a dynamic game is critical to the understanding of the whole dynamic game, regardless of whether the game in question is a two-player bargaining game or an n-player majoritarian bargaining game. Indeed, when the reasoning of the backward induction applies, the last round constitutes,

* Corresponding author at: Institute of Economics, Academia Sinica, Nankang, Taipei 115, Taiwan.
E-mail address: ccyang@econ.sinica.edu.tw (C.C. Yang).

[1] For more applications and references, see Persson and Tabellini (2000).

0167-2681/$ – see front matter
doi:10.1016/j.jebo.2007.01.004

so to speak, the backbone of a dynamic game. There is a large experimental literature on the so-called "ultimatum" game, which is the last round of the two-player (finite-horizon) bargaining game.[2] In contrast, relatively little work has been done on the last round of the majoritarian (finite-horizon) bargaining game, or the "majoritarian ultimatum" game (hereafter, MUG). This is surprising, especially in view of the increasing applications of the majoritarian bargaining model to a variety of political issues.[3]

This paper attempts to fill in the gap by reporting a three-player experimental study on the MUG. Our focus is on examining whether the major aspects of the theoretical prediction of the MUG are consistent with the experimental data we gather. This experimental focus, according to Roth (1995a), belongs to the category of "Speaking to Theorists" in the use of experimentation, since it is intended to feed back into the theoretical literature. Of course, experimentation is not the only way of "Speaking to Theorists." A possible advantage of experimentation, as emphasized by Crawford (1995), is the identification of the relationship between behavior and the environment in a controlled lab. This advantage may become decisive when the identification with field data is fraught with difficulties.

Persson and Tabellini (2000, p. 38) neatly summarize the two major aspects of the theoretical prediction (the subgame-perfection solution) for a three-player MUG[4]:

> "*First, it illustrates the principle of minimum winning coalitions, which goes back to Riker (1962). When setting the agenda, each group seeks the support of only one other group: giving both the other groups at least their status quo allocations would be a waste of resources. Thus, the equilibrium allocation must always give zero to one player. Second, it shows that any agenda setter seeks majority support in the cheapest way, offering the status quo amount (plus epsilon to break tie) to the group with the worst status quo.*"

The status quo allocation will be implemented if a proposal fails to receive majority support. It is of crucial importance to recognize that the two major predictions of the MUG above are equally applicable in theory, regardless of variations in players' status quo allocations.

Our experiment is to address the following three hypotheses in a three-player MUG:

1. *The principle of the minimum winning coalition (MWC)*: Players will seek a MWC and give the zero allocation to one player whenever they make proposals.
2. *The principle of the cheapest MWC*: Players who seek a MWC will seek the support of the player with the lower status quo and offer the status quo amount (plus epsilon to break tie) to that player.
3. *The principle of cheaper MWC*: Players who seek a MWC will seek the support of the player with the lower status quo.

The principle of the cheapest MWC may be too stringent to satisfy. Thus, we also consider its weaker version (the cheaper MWC), which only requires that players seek "cheaper" partners when forming a MWC.

Our main interest is not in the strength of these three principles per se, however. Politics can involve a movement from a position off the Pareto frontier to a point on it (say, the provision of public goods or externality elimination as exemplified in the classic Buchanan and Tullock work), or a movement along the Pareto frontier (say, a redistribution of income or pure conflict as exemplified in the classic Riker, 1962 work). A stylized difference between these two types of politics is that the former is a positive-sum game in which *there exist solutions beneficial to all players*, whereas the latter is a zero-sum game in which *no mutually beneficial opportunities are available to all players*. Despite this stylized difference, redistributive politics under majority rule appears to make no difference, at least in theory. For example, both the works of Buchanan and Tullock (1962) and Riker (1962) concluded that the majority will benefit themselves at the expense of the minority and predicted that majorities will be of the barest possible size. As another example, Baron and Ferejohn basically confirmed Riker's MWC principle in the context of a positive-sum rather than zero-sum game. Mueller (2003, p. 80) also contended that, even in the case of public good provision, majorities will redefine the issue through the quantity of public goods, the tax shares, or both in an attempt to make minorities expendable as far as their consciences or the constitution allow.

Indeed, according to the subgame-perfection solution as previously summarized by Persson and Tabellini (p. 38), one should expect the strength of the three principles above to remain the same regardless of whether the MUG in question is positive-sum or zero-sum. This is so because, as will be explained later on, the positive-sum and the zero-sum MUG can be envisioned as corresponding to two different structures of status quo allocations so that one is associated with a positive-sum surplus and the other with a zero-sum surplus. We test whether the expectation of no difference between the positive-sum and the zero-sum MUG is borne out in our experimental data.

Our main findings are summarized as follows. First, contrary to the theoretical prediction, the strength of the principle of MWC differs substantially, depending upon whether the MUG involved is a positive-sum or a zero-sum game. When the MUG involved has a positive-sum surplus, our experimental data reveal that the fraction of subjects who obey the MWC principle is less than 24%. However, the fraction jumps up to more than 55% when the MUG involved is associated with a zero-sum surplus. The difference between them is very significant in the statistical sense.

[2] See Roth (1995b) and Camerer (2003) for literature surveys on ultimatum games.
[3] We review related work in the next section.
[4] These two predictions can be generalized to a MUG in which the number of players is more than three.

Second, when the analysis is confined to the data where the MWC principle is violated, it is found that while the middle offers in the positive-sum game are significantly lower than those in the zero-sum game, the least offers in the positive-sum game do not differ from those in the zero-sum game. The least offers in the zero-sum game, as will be seen, are clearly attributable to altruism or non-strategic considerations. Thus the lack of a difference in the case of the least offers between positive- and zero-sum games suggests that the least offers in the positive-sum game are attributable to non-strategic considerations as well. This finding of non-strategic oversized coalitions is inconsistent with Riker's celebrated strategic argument for oversized coalitions.

Putting these two findings together, it is interesting to observe that the pure conflict of the zero-sum game in our data is displayed not in terms of a decrease in the degree of non-strategic considerations by subjects who violated the MWC principle, but in terms of an increase in the fraction of subjects who obeyed the MWC principle.

Third, one can confidently reject the principle of the cheapest MWC based on our data: few players adopt this principle, and those who do follow the principle receive nay votes from their responders. As to the principle of the cheaper MWC, we find that players who choose to obey the MWC principle have a tendency to seek responders with a lower status quo as their partners in the zero-sum game, but there is no evidence of such a tendency in the positive-sum game.

Overall, the weight of the evidence revealed by our experimental data suggests to us that, contrary to the theoretical prediction of no difference, the MWC principle and related concepts are much more powerful in the zero-sum than the positive-sum majoritarian bargaining.

The remainder of the paper is organized as follows. Section 2 provides a brief overview of the related experimental literature. Section 3 describes our experimental design, and Section 4 reports the results of our experiment. Section 5 concludes.

2. Related experimental literature

Suppose there are two players: a proposer and a responder. The proposer offers a division of the fixed sum of money to the responder. If the responder accepts the offer, the money is divided accordingly. If the responder rejects the offer, both players receive their respective status-quo payoffs (typically nothing). This “divide-the-dollar” game is known as the ultimatum game, which is a simple but frequently studied game.[5] This game is important because it helps to crystallize more complicated bargaining games.

Our MUG is also a “divide-the-dollar” game, except that (i) there are three players: a proposer and two responders; and (ii) the dollar is divided under majority rule: any two out of the three players can determine how the fixed sum of money should be split.

When the MWC principle applies, a three-player MUG will de facto reduce to a two-player ultimatum game: the proposer offers nothing to one of the two responders and concentrates on bargaining with the other. However, instead of being exogenously given, the ultimatum games here are endogenously generated as subgames of the MUG.

There are several papers that study three-person ultimatum games experimentally. They include Knez and Camerer (1995), Güth et al. (1996), Güth and van Damme (1998), Kagel and Wolfe (2001), and Bereby-Meyer and Niederle (2005). The foci of these papers are quite different from ours, and in particular, none of them explores the import of majority rule in a bargaining setting as we do in this paper.

A few papers have performed experimental tests on the theoretical predictions of Baron and Ferejohn's majoritarian bargaining model. Their findings are mixed. Fréchette et al. (2003) conducted a five-player infinite-horizon majoritarian bargaining game and found qualitative support for the Baron–Ferejohn model.[6] In a series of papers, Fréchette et al. (2005a,b,c) made comparisons between the Baron–Ferejohn model, Gamson's Law (1961), and the demand bargaining model of Morelli (1999). The predictions of the Baron–Ferejohn model have overall received a reasonable level of support in these experiments. McKelvey (1991) ran experiments on a stochastic version of the Baron–Ferejohn model with three or four predetermined alternatives for players to choose from. The equilibrium of this game involves mixed strategies. McKelvey found that the experimental data do not match the predictions of the theory well. Diermeier and Morton (2005) performed experiments on a three-player finite-horizon majoritarian bargaining game and found little support for the Baron–Ferejohn model.[7]

In view of the mixed and conflicting results above, further investigations on the issue seem useful. In particular, as Bolton (1998) strongly recommended, it will be productive to pare down a game to its essence and untangle the behavior in a simpler, more rudimentary environment before returning to the more complex case. We follow this recommendation. Specifically,

---

[5] The seminal work is Güth et al. (1982). For literature surveys, see Roth (1995b) and Camerer (2003).

[6] The focus of the Fréchette et al. (2003) work is on examining the differential effects of open versus closed rules in the framework of the Baron–Ferejohn model. A motion is voted on immediately under the closed rule, while amendments can be offered to the motion under the open rule. Most experimental studies are confined to the closed rule. Of course, the MUG belongs to the category of the closed rule.

[7] In fact, Diermeier and Morton reached opposite conclusions on almost every important count to those in Fréchette et al. (2003, 2005a,b,c). First, most proposals are accepted without delay in the latter papers, but a significant percentage of first-round proposals are rejected in the former paper. Second, subjects' play converges toward the MWC principle over time in the latter papers, whereas there is no such convergence in the former paper. Third, while there is some support for the hypothesis that benefits allocated are proportional to relative vote shares within the winning coalition in the former paper, the hypothesis receives a decisive rejection in the latter papers.

instead of studying the infinite-horizon version of the Baron–Ferejohn model as in the Fréchette et al. papers or the finite-horizon version of the Baron–Ferejohn model as in the Diermeier–Morton paper, we focus on the majoritarian "ultimatum" game, that is, on the last round of the Baron–Ferejohn (finite-horizon) model. Just as ultimatum games can help to crystallize standard bargaining games, our MUG may also help to crystallize majoritarian bargaining games. A player's reservation value is typically assumed to be zero in ultimatum games. The prime innovation of our experimental design is to vary the sum of the players' reservation values so that subjects face a positive-sum game in one treatment, but a zero-sum game in the other treatment.

Diermeier and Gailmard (2006, hereafter D&G) ran a three-player experiment on the MUG with a similar setup as our paper.[8] However, the key design features and the questions asked are quite different. Their focus is to assess the three competing behavioral hypotheses: the selfish, egalitarian and inequality-averse hypotheses.[9] The prime innovation of D&G's experimental design is to vary the proposer's reservation value ("status quo" in our terminology), which allows them to obtain different implications from each hypothesis. D&G found that none of the three hypotheses fit their data well enough. In particular, the variation in the proposer's reservation value is supposed to be strategically irrelevant in the MUG, but they found otherwise: when the reservation value is exogenously increased from about 5% of the pie to 90%, proposers allocate a significantly higher share to themselves, and responders are more accepting of the unequal offers. D&G argued that subjects interpret their assigned reservation values as a basic form of entitlement and, all else being equal, are more accepting of unequal offers if the proposer's reservation value is higher.

While the key design variable in D&G is the variation in the proposer's reservation value, our key design variable is the sum of the three players' reservation values so that subjects face a positive-sum game in one treatment, but a zero-sum game in the other treatment. We ask whether the standard subgame-perfection solution, as the theory predicts, applies to the positive-sum and the zero-sum majoritarian bargaining equally. Taken together, our findings suggest that the more conflicting the bargaining environment is, the closer the subjects' behavior will fit the selfish hypothesis. Due to the differences in the design focus, the D&G study and ours are complementary.

3. Experimental design

There are three players who must decide how to divide a NT$400 pie among themselves.[10] A proposal for allocating NT$400 is chosen (the chosen rule will be specified later). The money will be divided accordingly if the proposal receives majority support (two or three yea votes). A pre-specified and publicly known status quo allocation will be implemented if the proposal fails to receive majority support.[11]

3.1. Positive- vs. zero-sum game

The focus of this study is on the effects of the status quo. We consider three different status quo allocations: (NT$0, NT$0, NT$0), (NT$80, NT$55, NT$25) and (NT$200, NT$130, NT$70) (in brief, (0, 0, 0), (80, 55, 25) and (200, 130, 70)). The allocation (0, 0, 0) corresponds to the typical experimental setup where all three subjects get nothing when bargaining fails. This case will serve as the benchmark in our study.

Politics can involve a movement from a position off the Pareto frontier to a point on it (say, the provision of public goods), or a movement along the Pareto frontier (say, a redistribution of income). As mentioned before, a stylized difference between these two types of politics is that the former is a positive-sum game in which there exist solutions beneficial to all players, whereas the latter is a zero-sum game in which no mutually beneficial opportunities are available to all players. Our experimental design, via variations in status quo allocations, has this stylized difference built in within the context of majoritarian bargaining.[12] This can be seen by noting that NT$400 > NT$(80 + 55 + 25) in the case of the status quo allocation (80, 55, 25), while NT$400 = NT$(200 + 130 + 70) in the case of the status quo allocation (200, 130, 70).[13]

[8] The D&G paper came to our attention after we finished writing our own paper.

[9] The selfish hypothesis is related to the principle of MWC and related concepts. The egalitarian hypothesis includes the strong version (allocate money equally among all players) and the weak version (allocate money equally at least among all members of the coalition). The inequality-averse hypothesis is based on Fehr and Schmidt (1999) and Bolton and Ockenfels (2000). D&G also touched upon the efficiency hypothesis proposed by Charness and Rabin (2002).

[10] NT$ denotes New Taiwan dollars and the exchange rates were around NT$33+ per US$.

[11] Presumably the proposer will cast a yea vote to her own proposal. This is indeed confirmed in our experimental data, except for a single case. The nay vote occurred in this singleton because the subject in question realized after making the proposal that she could actually earn more money by casting a nay vote (her assigned status quo is larger than the proposed amount of money for herself). Our results remain unaffected regardless of whether we include or exclude this particular sample.

[12] Fey et al. (1996) experimentally studied the so-called "constant-sum" centipede game and made a comparison with the "growing-sum" centipede game of McKelvey and Palfrey (1992). This comparison is analogous to our comparison between positive-sum and zero-sum games, in the sense that while Pareto improvements are available in the growing-sum game, they are not available in the constant-sum game.

[13] It presupposes that players take their assigned status quos as the reference point. As will be seen, this presupposition is confirmed in our data.

Table 1
Number of subjects recruited.

Treatment	(0, 0, 0)	(80, 55, 25)	(200, 130, 70)	Total
Session 1	18	36	36	90
Session 2	39	27	27	93
Total	57	63	63	183

Note: Sessions 1 and 2 were conducted on March 8 and 10, 2004, respectively.

3.2. "Cold" vs. "hot" mode

At the beginning of the last round of the *n*-player (finite-horizon) Baron–Ferejohn bargaining model (i.e. the MUG), the player role as to who will act as the proposer and who will act as the responders is not predetermined. The proposer is randomly recognized from the players. Baron and Ferejohn argued that this random recognition rule is a neutral benchmark since it does not bias the bargaining outcomes in favor of any player. We adopt the random recognition rule in our experiment. However, there are two possible ways of implementing it: (i) the so-called "cold" mode, in which every player submits a proposal but only one of them is picked to become the standing proposal that is voted on, and (ii) the so-called "hot" mode, in which a player is chosen to become the proposer who makes the standing proposal, and nobody ever makes any hypothetical decision. Depending on the games, the cold and the hot modes may induce different behaviors (see Brandts and Charness, 2000 and Brosig et al., 2003 for diametrical results). The "cold" mode is generally considered more favorable to the standard hypothesis of selfish individuals.

As to previous studies on majoritarian bargaining, Fréchette et al. (2003) and Fréchette et al. (2005a,b,c) adopted the "cold" mode while D&G (2006) and Diermeier and Morton (2005) the "hot" mode. In this paper we follow the cold mode. Note that our main concern is not with a particular treatment but comparison across treatments (positive-sum versus zero-sum). As long as the same experimental procedure is applied to all treatments, the different experimental outcomes across treatments should be attributed to the different treatments rather than to the (same) experimental procedure. Note also that we obtain more independent samples from the preciously limited subject pool by adopting the cold mode.

3.3. Experimental procedures

A total of 183 subjects from National Chengchi University in Taiwan voluntarily participated in the experiment. The subjects were primarily sophomores and juniors in intermediate economics classes. Each subject was randomly matched with two anonymous opponents. The subjects' identities were kept anonymous from the experimenter. We ran two sessions of the experiments, and both sessions took place in a large lecture hall with sufficient space so that the participants could be kept at a good distance from each other. To maximize the size of the independent samples with a limited subject pool, each subject took part in exactly one single-shot game.[14] Table 1 summarizes the distribution of subjects across sessions and treatments in this study.

The experimental procedures were as follows. First, the subjects were given an instruction sheet as reproduced in the Appendix. The experimenter read the instructions aloud and answered any questions raised by the subjects. To make sure that the subjects understood the game well, we ran the game twice according to the procedures stated in the instructions before the subjects made real decisions. All the numbers used in these two demos (including the status quo allocations and the proposals) were picked randomly from the pages of a book. The reason for the random pick was to minimize on the part of the subjects any perception as to what their assigned status quo allocations would be and any hint as to what their offered proposals should be. We illustrated all possible voting outcomes based on these randomly picked numbers.

Second, after we had made sure that nobody had any questions regarding the game rules, the subjects were given a *proposal form* in which an assigned status quo allocation and a code (either A or B or C) were specified. In each status quo allocation (i.e. each treatment), one third of the subjects were designated the same code. All subjects were asked to fill out the proposal form for allocating the NT$400. It was required that subjects propose only integers that add up to NT$400 in total.

Third, after all completed proposal forms were collected, a random pick among the letters A, B and C determined the standing proposals. The subjects were then given a *voting form* on which both a standing proposal and the subject's own proposal were posted.[15] All subjects were asked to cast yea or nay votes to the standing proposals they faced. After voting, the subjects were immediately paid and dismissed.

Both sessions lasted about 50 min. Subjects were paid their actual monetary earnings from the experiment plus a participation fee of NT$100. The average amount earned by the subjects was NT$229, while the wage for on-campus jobs was around NT$90 per hour.

[14] Repetitions allow subjects to learn the rules of the game. The downside of this practice is that subjects' decisions within a session are necessarily correlated. To obtain sufficient numbers of independent samples, many more sessions need to be conducted (for this argument, readers may refer to Keser and van Widen, 2000).

[15] This is to make sure that memory lapses have no chance of affecting the final voting decision. This also emulates the perfect-recall property that a PC-based experiment will typically entail.

Table 2
Descriptive statistics.

Status quo	(0, 0, 0) B-treatment			(80, 55, 25) P-treatment			(200, 130, 70) Z-treatment		
	Total	MWC	NMWC	Total	MWC	NMWC	Total	MWC	NMWC
Number of subjects	57	16 28.1%	41 71.9%	63	15 23.8%	48 76.2%	63	35 55.6%	28 44.4%
Average amount (and % of NT$400) allocated to the proposer	221.37 55.4% (67.39)	248.75 62.2% (50.58)	210.68 52.7% (70.58)	206.14 51.5% (60.71)	249.67 59.9% (41.19)	195.67 48.9% (62.13)	213.25 53.3% (54.94)	242.31 60.6% (47.50)	176.93 44.2% (40.32)
Average amount (and % of NT$400) allocated to the middle offer	117.72 29.4% (46.26)	151.25 37.8% (50.58)	104.63 26.2% (37.56)	127.76 31.9% (41.27)	160.33 40.1% (42.19)	117.58 29.4% (35.67)	147.87 37.0% (41.47)	157.69 39.4% (47.51)	$135.61 33.9% (28.74)
Number of standing proposals	19	5	14	21	7	14	21	11	10
Number of nay votes received	14	5	9	12	7	5	26	13	13
Number of standing proposals rejected	2	0	2	0	0	0	5	2	3
Number of subjects who violated the principle of cheaper MWC	–	–	–	–	4 4/15 = 26.7%	–	–	4 4/35 = 1.4%	–
Share of surplus allocated to responders in MWC	–	37.8% (12.6)	–	–	37.6% (13.3)	–	–	33.3% (24.3)	–

Note: Numbers in parentheses denote standard deviations.

4. Results

Table 2 summarizes the data resulting from each of the three treatments.[16] We divide the data into those who obeyed the MWC principle and those who violated the principle (NMWC). For brevity and convenience, throughout the rest of the paper we refer to the treatment (0, 0, 0) as the B-treatment (B represents "benchmark"), the treatment (80, 55, 25) as the P-treatment (P represents "positive sum"), and the treatment (200, 130, 70) as the Z-treatment (Z represents "zero sum"). Our main comparison is between the P- and Z-treatments. However, whenever relevant, we will also make a comparison among the B-, P- and Z-treatments.[17] Our study focus will be on the hypotheses related to the MWC principle. We discuss proposing and voting behavior in turn.

4.1. Proposing behavior

4.1.1. MWC

The MWC principle dictates that a proposer in a three-person MUG will offer no money to one of her two responders, *regardless of variations in the subjects' status quo allocations*. This theoretical prediction fails largely in our data. While the fraction of subjects who chose to obey the MWC principle is 23.8% (15 out of 63) in the P-treatment, the fraction jumps up to 55.6% (35 out of 63) in the Z-treatment. A binomial test shows that the latter fraction is significantly higher than the former one ($p = 0.000$). The fraction is also significantly higher in the Z-treatment than the B-treatment ($p = 0.001$). However, the difference between the B- and P-treatments is insignificant ($p = 0.595$).

One may suspect that the significantly higher fraction for MWC in the Z-treatment is mainly attributable to subjects' behavior associated with some particular status quo, say NT$200. This is not true. Of the 35 subjects who adopted MWC in the Z-treatment, 13 subjects had the status quo of NT$200, 11 had the status quo of NT$130, and 11 had the status quo of NT$70. We employ a binomial test to examine the null hypothesis that the numbers of subjects who obeyed the MWC principle across status quos in the Z-treatment are the same. The test statistics shows that the difference between them is insignificant.[18]

As we have argued before, the P-treatment can be envisioned as a positive-sum game and the Z-treatment as a zero-sum game. Contrary to the theoretical prediction of no difference, our experimental data reveal that the number of subjects who obeyed the MWC principle in the case of the zero-sum game is significantly higher than in the case of the positive-sum game.

Deviations between theoretical predictions and observed behaviors have been detected in a variety of experiments such as public good contribution, prisoners' dilemma, ultimatum and trust games (see Camerer). A possible explanation for these deviations is that, contrary to the standard narrow self-interest assumption in economics, many subjects are altruistic/cooperative to a degree and are willing to share benefits with other subjects non-strategically.[19] Subjects' propensity toward altruism/cooperation may be a result of the process of socialization such as education and upbringing or may be due to the enforcement of social norms in subjects' everyday life.[20] At any rate, these may give rise to deviations between theoretical predictions and observed behaviors. *What we have found here is that the deviation is much smaller in the case of a zero-sum game than in the case of a positive-sum game. Putting differently, relative scarcity* (*embodied in the zero-sum game*) *promotes behavior more in line with the predictions of economics*. This subtle result, to our knowledge, has not heretofore been recognized in the literature.

Let us define "surplus" as being equal to the "payoff" minus the "status quo." According to our data, a subject will never be willing to accept a *negative* surplus. This is true for both responders and proposers. First, all responders rejected offers that were below their status quos. Second, no proposer offered herself an amount lower than her assigned status quo, except for a single case. In this exceptional singleton, however, the subject remedied her previous mistake by casting a nay vote to her own proposal.

As noted earlier, D&G ran a three-player experiment on the MUG with a setup similar to ours. An increase in the proposer's status quo is supposed to be strategically irrelevant in the MUG, but they found that proposers allocate a significantly higher share to themselves and responders are more accepting of the unequal offers. D&G argued that subjects interpret their assigned status quo as a basic form of entitlement and, all else being equal, are more accepting of unequal offers if the proposer's status quo becomes higher. A similar entitlement argument can be applied to our data as well, since no proposer

---

[16] All the resulting data can be found on the website: http://pf.nccu.edu.tw/Faculty/Hsu/research/dataMWC.pdf.

[17] It is obvious that the B-treatment is silent regarding the principle of the cheapest or cheaper MWC.

[18] $p = 0.531$ between the status quos NT$200 and NT$130 and between the status quos NT$200 and NT$70, and $p = 1$ between the status quos NT$130 and NT$70. On the other hand, of the 15 subjects who followed the MWC principle in the P-treatment, 6 subjects had the status quo NT$80, 2 had the status quo NT$55, and 7 had the status quo NT$25. Only the difference between the status quos NT$55 and NT$25 is significant ($p = 0.049$), and this difference may be due to the small size of the sample.

[19] The canonical selfishness-based model fails in all of the 15 small-scale societies studied by Henrich et al. (2005). Andreoni and Miller (1993) ran experiments on the prisoners' dilemma and found that there is a consistent pattern of cooperation that does not deteriorate, even after 200 single shots. They interpreted this finding as evidence that many players are of the altruistic type. Miller and Oppenheimer (1982) reported experimental evidence of a cooperative search for unanimous alternatives in voting games.

[20] Henrich et al. (2005) found that there exists a close relationship between subjects' experimental behavior and their everyday life. As Hoffman et al. (1998, p. 350) vividly put it, "A one-shot game in the laboratory is part of a life-long sequence, not an isolated experience from one's reputational norm."

offered herself an amount that was below her assigned status quo, and no responder voted for an offered amount that was below her assigned status quo.

D&G's entitlement argument suggests that subjects are in much greater conflict with one another in the *zero surplus* Z-treatment as compared with the *positive surplus* P-treatment. More specifically, by taking the assigned status quo as the reference point, there exist proposals that are beneficial to *all* players in the P-treatment whereas there exists no such a proposal in the Z-treatment. The pure conflict in the Z-treatment greatly restricts the exercise of altruism/cooperation and forces proposers to be more selfish in a sense. Such a pure conflict is lacking in the P-treatment as well as the B-treatment. This contrast may well explain why the MWC principle is much more powerful in the zero-sum game than in the positive-sum game.

Fréchette et al. (2003) found in their closed-rule experiment that subjects' play will converge toward the MWC principle over time as subjects gain experience. Fréchette et al. (2005a,b) also found that experienced subjects have a higher frequency of obeying the MWC principle than inexperienced ones. We complement these findings by showing that the MWC principle will be much more forceful even in the absence of subjects' experience if the game form is by nature zero-sum as opposed to being positive-sum.

When a MWC is formed, there will be a surplus available to the two coalition members. In the Z-treatment, for example, if a subject with the status quo NT$200 seeks another subject with the status quo NT$130 as her coalitional partner, then there will be a surplus of NT$70 available to them. We calculate the division of the surplus between proposers and responders in the MWC across treatments. It is interesting to observe that the average shares of the surplus allocated to responders in the MWC do not vary a great deal across treatments (see the last row of Table 2). Indeed, one cannot reject the null hypothesis that the shares of the surplus are the same across treatments (Kruskal–Wallis test, $\chi^2 = 3.81$, d.f. = 2, $p = 0.149$). Although the conflict is much greater in the zero-surplus than the positive-surplus treatment, our subjects seem to share a common "fair" norm regarding the division of the surplus once a MWC is formed.

One-sided Mann–Whitney tests show that the shares of the surplus allocated to responders in MWC across treatments are all significantly lower than those allocated to proposers.[21] This result tends to support the "proposer power" hypothesis of the Baron–Ferejohn model and is consistent with the findings in Fréchette et al. (2003) and Fréchette et al. (2005a,b). The result remains true if the analysis is confined to the accepted standing proposals only. As we have observed, the degree of the "proposer power" does not vary much with players' assigned status quo allocations when a MWC is formed.

4.1.2. NMWC

In view of the fact that no responder accepted an offer that was below her status quo, one should anticipate that the least offer that violated the MWC principle in the Z-treatment would not be above the responder's assigned status quo. This anticipation is confirmed in our data: of the 28 subjects who did not follow the MWC principle in the Z-treatment, none (0 out of 28) of the least offers are above their responders' status quos. By contrast, of the 48 subjects who did not follow the MWC principle in the P-treatment, 89.58% (43 out of 48) of the least offers are above their responders' status quos.

What motives drive players to disobey the MWC principle? Riker (p. 48) provided a celebrated answer:

> "*Since the members of a winning coalition may be uncertain about whether or not it is winning, they may in their uncertainty create a coalition larger than the actually minimum winning size*."

This argument for oversized coalitions is not inconsistent with our experimental data in the P-treatment. Since most of the least offers in this case are above the responders' status quos, it is difficult a priori to rule out the possibility that many proposers, in addition to the non-monetary considerations suggested earlier, made attempts to buy extra votes from their responders in our positive-sum game. In fact, out of 14 standing NMWC proposals in the P-treatment, 9 least offers (64%) elicited yea votes from their responders.

However, Riker's argument is definitely implausible in explaining our experimental data in the Z-treatment. The reasons are (i) all but one of the least offers in this case are below the responders' status quos,[22] and (ii) all the offers that are below the responders' status quos are rejected in the data. The least offers here did not intend to elicit yea votes from their responders. It seems that altruism or consolation alone may be more plausible in explaining the violation of the MWC principle observed in our zero-sum game.

To examine the issue further, we compare the middle and the least offers across treatments in the NMWC data to see if there exist any differences between them. The average shares of the middle offers (out of NT$400) for the B-, P- and Z-treatments equal, respectively, 26.2, 29.4 and 33.9 percent (see Table 2). The Mann–Whitney tests show that the middle offers in the Z-treatment are significantly higher than those in the P-treatment ($z = 2.8213$ and $p = 0.0023$) (as well as those in the B-treatment; $z = 3.6538$ and $p = 0.0001$). Since the assigned status quo allocation is higher in the Z-treatment than the other two treatments, this finding indicates that the proposer in the Z-treatment did make efforts to secure a yea vote from one of her two responders.

The average shares of the least offers (out of NT$400) for the B-, P- and Z-treatments equal, respectively, 21.1, 21.7 and 21.9 percent. Both the Mann–Whitney and Kolmogorov–Smirnov tests show that the least offers do not exhibit significant

[21] $z = -3.9008$ and $p = 0.0000$ in the B-treatment; $z = -3.6293$ and $p = 0.0001$ in the P-treatment; and $z = -4.7983$ and $p = 0.0000$ in the Z-treatment.

[22] The single case in which the least offer was not below the responders' status quos happened to offer the exact status quo allocation.

differences between any two treatments. In particular, there is no difference between the P- and the Z-treatment.[23] If the least offers in the Z-treatment are, as we have argued, attributable to altruism/consolation and not intended to elicit yea votes from their responders, then this no-difference finding suggests that the yea votes elicited by the least offers in the P-treatment are likely to occur accidentally rather than intentionally. In other words, the no-difference finding here is not incompatible with the hypothesis that the least offers in the P-treatment, like those in the Z-treatment, are also attributable to altruism/consolation rather than to strategic considerations.

As we have pointed out before, Riker's strategic argument for oversized coalitions may be right and many proposers, in addition to non-strategic considerations, made attempts to buy extra yea votes from their responders. A problem with this argument is that it seems difficult to explain why the least offers from the additional strategic consideration in the B- and P-treatments do not differ significantly from the least offers from the purely non-strategic consideration in the Z-treatment.

There is the so-called "dictator" game, which is identical in structure to the ultimatum games except that the responder's power to reject the proposer's offer is removed.[24] Diermeier and Morton suggested that the proposer's coalition member in a three-player MUG is like the responder in ultimatum games, while the proposer's non-coalition member is similar to the other player in dictator games. We study the validity of this suggestion in the context of our data.

Camerer (Chapter 2) complied the results of many studies on ultimatum games and reported that the mean ultimatum offers are 30–40 percent of the pie. The average shares of the surplus for the B-, P- and Z-treatments when the MWC principle applies equal, respectively, 37.8, 37.6 and 33.3 percent (the last row of Table 2). All of these three numbers are within the range of the mean ultimatum offers reported in Camerer.

A significant fraction of players offer nothing to the other player in dictator games. To compare the least offers in our data with the offers in dictator games, we put together the least offers in the MWC data (i.e. those allocated no money) with those in the NMWC data. The average shares of the least offers (out of NT$400) for the B-, P- and Z-treatments in the overall data equal, respectively, 15.2, 16.5 and 9.7 percent. The Mann-Whitney tests show that there is no difference between the B- and the P-treatment, but the least offers in the Z-treatment are significantly lower than those in the B- and P-treatments.[25] As we have noted, the least offers in the NMWC data do not exhibit significant differences between any two treatments. This implies that the significantly lower mean of the least offers of the Z-treatment in the overall data stem from the fact that a significantly higher fraction of subjects chose to obey the MWC principle in the Z-treatment as compared to the B- and P-treatments. Thus, the pure conflict of the zero-sum game in our data is displayed not in terms of a decrease in the degree of altruism/cooperation by subjects who violated the MWC principle, but in terms of an increase in the fraction of subjects who obeyed the MWC principle.

The co-existence of players who exhibit selfish behavior and players who do not has been found in many experimental studies (see, for example, Fehr and Gächter, 1998 and Andreoni and Miller, 2002). What we have found here is that the fraction of the selfish-type players (i.e. subjects who obeyed the MWC principle) is not exogenously given by nature, but is determined by the institutional environment (i.e. positive- or zero-sum games).

Güth and van Damme ran a three-person game that combines ultimatum and dictator games, in the sense that a proposer offers a division of the pie to an active responder (who can reject the offer, leaving everyone nothing, or accept it both for herself and on behalf of the inactive recipient who does nothing). They considered different information conditions to study the active responder's response and the proposer's proposing behavior. In the treatment where the active responder knew the shares allocated to her and the inactive recipient (the treatment that is comparable to our paper), Güth and van Damme found that the proposer offered 30–40 percent of the pie to the active responder, and left only 5–10 percent to the inactive recipient. It is interesting to observe that the mean shares of the least offers in our overall data (about 9–16%) are located between the mean shares of the offers in dictator games (above 20% according to Forsythe et al., 1994) and those offered to the inactive recipient in Güth and van Damme. This comparison somewhat suggests that the proposer in our MUG sees her non-coalitional member neither the same as the other player in dictator games nor the same as the inactive recipient in Güth and van Damme's experiment.

As we have reported, there exists a consistent pattern of surplus division between proposers and responders across treatments when the MWC principle applies. One may wonder if there also exists some consistent pattern of surplus division between proposers and responders across treatments when the MWC principle fails to apply. In seeking answers, we encounter a fundamental problem: while there is a positive surplus for players to divide in the B- or P-treatment, the surplus for players to divide in the Z-treatment is equal to zero by definition. This difference in nature between positive-sum and zero-sum games suggests that it is difficult, if not impossible, to come up with a criterion that can consistently measure how players would divide their "surplus pie" across the three treatments in our NMWC data.

Instead of focusing on surplus division, if we take the least offer that is no less than NT$100 as a criterion, a proposal pattern does emerge. Of the 41 subjects who adopted NMWC in the B-treatment, 23 subjects' offers satisfy the criterion; of

[23] The Mann–Whitney tests show that $z = 0.071$ and $p = 0.943$ between the B- and the P-treatment, $z = -0.075$ and $p = 0.941$ between the B- and the Z-treatment, and $z = -0.093$ and $p = 0.926$ between the P- and the Z-treatment. The Kolmogorov–Smirnov tests show that $z = 0.772$ and $p = 0.591$ between the B- and the P-treatment, $z = 0.863$ and $p = 0.445$ between the B- and the Z-treatment, and $z = 0.476$ and $p = 0.977$ between the P- and the Z-treatment.

[24] For a survey on dictator games, see Camerer.

[25] $z = -0.3179$ and $p = 0.7505$ between the B- and the P-treatment, $z = 2.5619$ and $p = 0.0038$ between the B- and the Z-treatment, and $z = 2.9470$ and $p = 0.0011$ between the P- and the Z-treatment.

the 48 subjects who adopted NMWC in the P-treatment, 27 subjects' offers satisfy the criterion; and of the 28 subjects who adopted NMWC in the Z-treatment, 16 subjects' offers satisfy the criterion. Binominal tests show no significant difference between any two treatments.[26] Once again, it seems that the degree of altruism/consolation by subjects who violated the MWC principle remains constant across treatments.

4.1.3. Cheapest MWC

Of the subjects who obeyed the MWC principle, there are only two cases whose proposal behavior could be considered to be close to the principle of the cheapest MWC. They are in the Z-treatment. The subjects in both cases had the assigned status quo NT$200, and they offered NT$75 and NT$80 respectively to their partners whose status quos were both NT$70. Only the NT$80 offer became a standing proposal. It received a nay vote from the subject's coalition partner, however.[27]

On the basis of these results, one can confidently reject the principle of the cheapest MWC. This rejection of the subgame-perfection prediction is consistent with previous results found in the experimental literature on ultimatum games (see Roth, 1995b and Camerer, 2003). It is also consistent with the finding by Fréchette et al. (2003) that subjects consistently reject benefit allocations close to the (stationary) subgame-perfection prediction of the Baron–Ferejohn model.

A finding common to Fréchette et al. (2003), Fréchette et al. (2005a,b), and Diermeier and Morton (2005) is that proposers allocate much less money to themselves than predicted by the Baron–Ferejohn model. Because the principle of the cheapest MWC is violated, our finding here is similar.

4.1.4. Cheaper MWC

Although the principle of the cheapest MWC fails to hold, subjects may still seek the responder with a lower status quo as their partner when forming a MWC. This is the principle of the cheaper MWC, which is weaker than the principle of the cheapest MWC.

As far as seeking cheaper MWC is concerned, Diermeier and Morton found that the prediction of the Baron–Ferejohn model is no better than a coin flip in their experiment.[28] We examine whether this is true in our data.

Consider the P-treatment. There are 15 subjects who chose to follow the MWC principle. Of them, 4 out of 15 (26.7%) violated the principle of the cheaper MWC.[29] On the other hand, there are 35 subjects who chose to follow the MWC principle in the Z-treatment. Of them, 4 out of 35 (11.4%) violated the principle of the cheaper MWC.[30] A binominal test shows that the former's behavior does not differ significantly from a coin flip ($p = 0.118$), whereas the latter's does ($p = 0.000$), even though a direct comparison yields no significant difference between the two ratios ($p = 0.227$). In other words, subjects who chose to obey the MWC principle have a tendency to seek responders with a lower status quo as their partners in the zero-sum game, but there is no evidence of such a tendency in the positive-sum game.

An interesting implication of the theoretical predictions of the MUG, as illustrated in Persson and Tabellini, is that a lower status quo in the MUG is actually beneficial because it raises the likelihood of being included in the winning coalition and getting at least the status quo allocation. This implication is in stark contrast to that in a two-player bargaining, in which a player's bargaining power is increasing with respect to her own status quo position. This sharp difference is derived from the fact that each player possesses veto power in the two-player bargaining game, whereas no player has veto power in the MUG.

However, this interesting implication appears mixed in the light of our experimental data. It is true that a lower status quo will raise the likelihood of being included in the MWC in a zero-sum game, but it is not true in a positive-sum game since there is no evidence in this case that subjects have a tendency to seek responders with a lower status quo as their partners when forming a MWC.

Consistent with the finding in regard to the MWC principle, the principle of the cheaper MWC works much better in the case of a zero-sum game than in the case of a positive-sum game. Again, the much greater conflict in the Z-treatment as compared to the P-treatment may have made our subjects behave more in line with the standard paradigm in economics.[31]

[26] $p = 0.988$ between the B- and P-treatments, $p = 0.931$ between the B- and Z-treatments, and $p = 0.94$ between the P- and Z-treatments.

[27] There are two standing MWC proposals that received rejection in the Z-treatment (see Table 2). The other one is the case where the proposer with the assigned status quo NT$200 offered NT$100 to her partner whose status quo equaled NT$70.

[28] One cannot test the principle of the cheaper MWC in the framework of Fréchette et al. (2003) since their players always received the zero allocation when a motion failed to collect a simple majority. In Diermeier and Morton, continuation values varied across players before the last period. This allowed them to test the principle of the cheaper MWC. In a different setup, Fréchette et al. (2005a, Conclusion 6) found that their subjects tend to seek the "correct" coalition partner.

[29] Two subjects had the status quo NT$80, and two subjects had the status quo NT$55 and NT$25, respectively.

[30] Two subjects had the status quo NT$200, and two subjects had the status quo NT$130 and NT$70, respectively.

[31] One may like to know whether subjects with lower status quos enjoyed better offers within the NMWC data. There were 48 subjects who disobeyed the MWC principle in the P-treatment. Of them, 13 out of 48 (27%) enjoyed better offers when their status quos were lower. On the other hand, there were 28 subjects who disobeyed the MWC principle in the Z-treatment. Of them, 14 out of 28 (50%) enjoyed better offers when their status quos were lower. The ratio is almost twice as high in the Z-treatment as in the P-treatment. A binomial test shows that the ratio in the P-treatment is significantly below a coin flip ($p = 0.0002$) so that subjects with a lower status quo tended to face a worse rather than better offer. In contrast, the ratio in the Z-treatment does not differ significantly from a coin flip ($p = 1$), so there is no evidence of such a tendency for subjects with a lower status quo.

Table 3
Probit estimates of voting behavior (dependent variable $y = 1$ if vote yes, $y = 0$ otherwise).

Variable	(1)	(2)	(3)	(4)	(5)
x (1 = MWC, 0 = NMWC)	−.497** (.237)	−.246 (.684)	−1.138** (.535)	−.246 (.684)	−.124 (.684)
x_1 (1 = inclusion in MWC, 0 = otherwise)	—	3.071*** (.592)	3.071*** (.592)	3.071*** (.592)	2.760*** (.695)
x_2 (1 = above status quo in NMWC, 0 = otherwise)	—	2.330*** (.537)	—	1.629*** (.631)	1.536** (.637)
x'_2 (difference between offer and status quo in NMWC if offer is above status quo, 0 = otherwise)	—	—	.020*** (.005)	.011** (.005)	.011* (.005)
x_3 (own share in standing proposal minus proposed share to self in non-standing proposal)	—	—	—	—	.0017 (.0021)
Constant	.443*** (.149)	−1.465*** (.505)	−.573** (.271)	−1.465*** (.505)	−1.179* (.609)
Number of observations (exclude proposers' own votes)	122	122	122	122	122
Pseudo R^2	.027	.453	.434	.481	.484
Log likelihood	−79.98	−44.97	−46.52	−42.68	−42.37

Note: Standard errors are in parentheses. Statistical significance at the *10%, **5% and ***1% level.

4.2. Voting behavior

The voting behavior across treatments in our data is summarized in Table 2. Note that all the standing MWC proposals in both the B- and P-treatments received exactly a two-vote support. There are two standing MWC proposals in the Z-treatment that did not receive a yea vote from their coalition members (the number of standing proposals is 11, while the number of nay votes received equals 13). As to the standing NMWC proposals, the rejection rate is much higher in the Z-treatment than the P-treatment. This result is not surprising in view of our previous observation that the least offers in NMWC behaved quite differently between the P- and Z-treatments.

Knez and Camerer added an outside option to ultimatum games and found that, due to self-serving bias in judgments of fairness, responders' rejection rates turn out to be much higher—nearly 50 percent, as compared with 10–15 percent in most ultimatum game experiments. This outcome of high rejection rates is no longer true in our MUG when the MWC principle applies so that ultimatum games become endogenous. In fact, all standing MWC proposals in the P-treatments (as well as in the B-treatment) received a yea vote from their coalition partners, and only 18.2 percent (2 out of 11) of standing MWC proposals in the Z-treatment were rejected. This result to some extent suggests that the MUG differs qualitatively from ultimatum games even if the principle of MWC applies. As emphasized by Fréchette et al. (2005a), the key driving force in majoritarian bargaining games is the exclusion of some players from the winning coalition. Our subjects tend to cast yea votes to the proposals as long as they are included in the winning coalition. Such a force of exclusion or inclusion does not exist in the standard ultimatum games.

Except for a single case, a proposer always casts a yea vote to her own proposal in our data. In view of this, we exclude the proposers' own votes in the analysis of voting behavior. There are 122 observations (responders' votes) in total. To account for responders' voting behavior across all treatments in our data, we consider the following probit model:

$$y = \alpha + \beta x + \beta_1 x_1 + \beta_2 x_2 + \beta'_2 x'_2 + \varepsilon$$

where y is the dependent variable that takes on the value 1 if a responder casts a yea vote to the standing proposal and 0 if she casts a nay vote; x takes on the value 1 if the standing proposal is a MWC and 0 if the standing proposal is a NMWC; x_1 takes on the value 1 if the standing proposal is a MWC *and* the responder is included in the MWC, and 0 otherwise; x_2 takes on the value 1 if the standing proposal is a NMWC *and* the offer to the responder is above the responder's status quo, and 0 otherwise; x'_2 takes on the value of the difference between the offer to the responder and the responder's status quo if the standing proposal is a NMWC *and* the offer to the responder is above the responder's status quo, and 0 otherwise; and ε is a normally distributed random variable with zero mean and unit variance.

Note that there are four possibilities for (x, x_1, x_2) in our data: (1, 1, 0), (1, 0, 0), (0,0,1) and (0, 0, 0). These four possibilities are first categorized by the criterion of whether the standing proposal is a MWC or a NMWC, that is, whether $x = 1$ or $x = 0$. The two possibilities (1, 1, 0) and (1, 0, 0) correspond to the case where $x = 1$, while the other two possibilities (0, 0, 1) and (0, 0, 0) correspond to the case where $x = 0$. Within the category of $x = 1$, there are two subcases, depending on whether a responder is included in the MWC or not, that is, whether $x_1 = 1$ (i.e. (1, 1, 0)) or $x_1 = 1$ (i.e. (1, 0, 0)). Within the category of $x = 0$, there are also two subcases, depending on whether the offer to a responder is above her status quo or not, that is, whether $x_2 = 1$ (i.e. (0, 0, 1)) or $x_2 = 1$ (i.e. (0, 0, 0)). Thus, the coefficient β in the probit model is associated with the responder's propensity to cast a yea vote if she is offered a MWC rather than a NMWC. Given that a MWC is offered, the coefficient β_1 is associated with the responder's propensity to cast a yea vote if she is included in rather than excluded from the MWC. Given that a NMWC is offered, the coefficient β_2 is associated with the responder's propensity to cast a yea vote if the offer to the responder is above rather than equal to or below her status quo.

The variable x'_2 is a refinement of the variable x_2, in the sense that it takes into consideration the quantity difference between the offer to a responder and the responder's status quo once the offer is above the status quo.

Table 3 reports the estimated coefficients for the explanatory variables. Column (1) of Table 3 (Model 1) reports the regression results when we categorize the data simply by the dichotomous criterion of whether responders face a MWC or a NMWC standing proposal. It shows that a responder who faces a MWC proposal tends to cast a nay vote relative to a responder who faces a NMWC proposal. This result reflects our data feature that 25 out of 46 responders (54%) vote no in the MWC proposals, while 26 out of 76 responders (34%) vote no in the NMWC proposals.

Column (2) of Table 3 (Model 2) reports the regression results when we further categorize the MWC data based on the criterion of whether a responder is included in or excluded from a MWC, and the NMWC data based on the criterion of whether a responder is offered a payoff above or below her status quo. First, note that there is a substantial increase in pseudo R^2 from Model 1 to Model 2. Next, although the estimated coefficient for the x variable remains negative, it is no longer significantly different from zero. The estimated coefficients for the x_1 and x_2 variables are both positive and different from zero at the 1% significance level, which suggests the existence of threshold effects.

Column (3) of Table 3 (Model 3) reports the regression results when we replace the discrete variable x_2 in Model 2 by the continuous variable x_2'. The estimated coefficients for the x_1 and x_2' variables are still positive and different from zero at the 1% significance level. However, note that replacing x_2 with x_2' reduces pseudo R^2 from 0.453 to 0.434.

Column (4) of Table 3 reports the regression results from our probit model (Model 4). The estimated coefficients for x_1, x_2 and x_2' are all positive and significantly different from zero. The estimated coefficient for x_1 remains the same as those in Models 2 and 3 (i.e. 3.07). However, the estimated coefficients for x_2 and x_2' decrease from 2.33 in Model 2 and 0,02 in Model 3 to 1.63 and 0.01, respectively, in Model 4. The total effect captured by the single variable x_2 in Model 2 or x_2' in Model 3 is decomposed into the threshold effect and the quantity effect in Model 4. Note that the pseudo R^2 of 0.481 in Model 4 is higher than those in Models 1–3.

One may speculate that some aspect of the responders' own offers in non-standing proposals will affect the responders' tendency to vote "yes" or "no" to the offers in standing proposals. For example, if responders are of a "fair" type, they may be more likely to reject an "unfair" offer. We construct more than a dozen variables in an attempt to measure the responders' type in this regard. One such variable considers the possibility that the difference between a responder's own share in a standing proposal and her proposed share to herself in a non-standing proposal will affect the responder's tendency to vote yes to the standing proposal.[32] However, as indicated in column (5) of Table 3, adding the variable (i.e. x_3) does not add explanatory power to our probit model. In fact, none of the variables that we construct to measure the responders' type are significant.[33] This result may not be surprising in view of Knez and Camerer's finding that different players tend to interpret "fair" differently in the presence of outside options. This result is also consistent with those found in Fréchette et al. (2003), Table 2 and Fréchette et al. (2005a, Conclusion 4) that subjects' voting for or against a proposal is mainly out of concern for their own share of the pie, with minimal concern for the shares of other players.

5. Conclusion

Politics can involve a movement from a position off the Pareto frontier to a point on it (say, the provision of public goods) or a movement along the Pareto frontier (say, a redistribution of income). A stylized difference between these two types of politics is that the former is a positive-sum game in which there exist solutions beneficial to all players, whereas the latter is a zero-sum game in which no mutually beneficial opportunities are available to all players. Our experimental design on the MUG, via variations in the status quo allocations, has this stylized difference built within the context of majoritarian bargaining. The main findings include (i) the MWC principle is much more forceful in the zero-sum game than the positive-sum game, (ii) oversized coalitions are attributable to non-strategic considerations, which is inconsistent with Riker's (1962) strategic argument for oversized coalitions, (iii) the pure conflict of the zero-sum game as compared with the positive-sum game is displayed not in terms of a decrease in the degree of altruism/cooperation by subjects who violated the MWC principle, but in terms of an increase in the fraction of subjects who obeyed the MWC principle, and (iv) when forming a MWC, subjects have a tendency to seek responders with a lower status quo as their partners in the zero-sum game, but there is no evidence of such a tendency in the positive-sum game. Overall, the weight of the evidence revealed by our experimental data suggests to us that, contrary to the theoretical prediction of no difference, the MWC principle and related concepts do not apply equally to the positive-sum and the zero-sum majoritarian bargaining.

At the end of their experimental paper, Roth et al. (1991, p. 1094) concluded,

> "*Thus, these data suggest to us that, while the problem of developing descriptively powerful theory for games of this sort does not call for anything like the wholesale abandonment of the apparatus of game theory, neither is it likely that game-theoretic analysis unaided by empirical observation will lead to reliable models of behavior*."

This conclusion seems equally applicable here.

---

[32] Note that the so-called "share" can be interpreted in terms of payoff or surplus. The surplus interpretation results if we subtract the status quo from the own payoff in the standing proposal and the proposed own payoff in the non-standing proposal, respectively.

[33] Other variables we construct include that a MWC standing proposal is considered to be fair to a responder if the responder obtains at least 35% of the surplus pie available between the proposer and the responder, and a NMWC standing proposal is considered to be fair to a responder if the responder obtain at least 30% of the surplus pie available between the proposer and the responder (the number 35% is about the average share of surplus allocated to the coalitional partner across all MWC proposals, see the last row of Table 2; and the number 30% is a discount of 35% after taking into account altruism or consolation in the NMWC proposals).

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.jebo.2007.01.004.

References

Andreoni, J., Miller, J.H., 1993. Rational cooperation in the finitely repeated prisoners' dilemma: experimental evidence. Economic Journal 103, 570–585.
Andreoni, J., Miller, J.H., 2002. Giving according to GARP: an experimental study of rationality and altruism. Econometrica 70, 737–753.
Baron, D., 1991. Majoritarian incentives, pork barrel programs, and procedural control. American Journal of Political Science 35, 57–90.
Baron, D., Ferejohn, D., 1989. Bargaining in legislatures. American Political Science Review 83, 1181–1206.
Bereby-Meyer, Y., Niederle, M., 2005. Fairness in bargaining. Journal of Economic Behavior and Organization 56, 173–186.
Bolton, G.E., 1998. Bargaining and dilemma games: from laboratory data towards theoretical synthesis. Experimental Economics 1, 257–281.
Bolton, G.E., Ockenfels, A., 2000. ERC: a theory of equity, reciprocity, and competition. American Economic Review 90, 166–193.
Brandts, J., Charness, G., 2000. Hot vs. cold: sequential responses and preference stability in experimental games. Experimental Economics 2, 227–238.
Brosig, J., Weimann, J., Yang, C.-L., 2003. The hot versus cold effect in a simple bargaining experiment. Experimental Economics 6, 75–90.
Buchanan, J.M., Tullock, G., 1962. The Calculus of Consent. University of Michigan Press, Ann Arbor.
Camerer, C.F., 2003. Behavioral Game Theory: Experiments in Strategic Interaction. Princeton University Press, Princeton NJ.
Chari, V.V., Jones, L.E., Marimon, R., 1997. The economics of split voting in representative democracies. American Economic Review 87, 957–976.
Charness, G., Rabin, M., 2002. Understanding social preferences with simple tests. Quarterly Journal of Economics 117, 817–869.
Crawford, V.P., 1995. Theory and experiment in the analysis of strategic interaction. In: Kreps, D.M., Wallis, K.F. (Eds.), Advances in Economics and Econometrics: Theory and Applications, Seventh World Congress, vol. I. Cambridge University Press, Cambridge, pp. 206–242.
Diermeier, D., Gailmard, 2006. Self-interest, inequality, and entitlement in majoritarian decision-making. Quarterly Journal of Political Science 1, 327–350.
Diermeier, D., Merlo, A., 2000. Government turnover in parliamentary democracies. Journal of Economic Theory 94, 46–79.
Diermeier, D., Morton, R., 2005. Experiments in majoritarian bargaining. In: Austen-Smith, D., Duggan, J. (Eds.), Social Choice and Strategic Decisions: Essays in Honor of Jeffrey S. Banks. Springer, Berlin, pp. 201–236.
Fehr, E., Gächter, S., 1998. Reciprocity and economics: the economic implications of homo reciprocans. European Economic Review 42, 845–859.
Fehr, E., Schmidt, K., 1999. A theory of fairness, competition, and cooperation. Quarterly Journal of Economics 114, 769–816.
Fey, M., McKelvey, R.D., Palfrey, T.R., 1996. An experimental study of constant-sum centipede games. International Journal of Game Theory 25, 269–287.
Forsythe, R., Horowitz, J.L., Savin, N.E., Sefton, M., 1994. Fairness in simple bargaining experiments. Games and Economic Behavior 6, 347–369.
Fréchette, G.R., Kagel, J.H., Lehrer, S.F., 2003. Bargaining in legislatures: an experimental investigation of open versus closed amendment rules. American Political Science Review 97, 221–232.
Fréchette, G.R., Kagel, J.H., Morelli, M., 2005a. Nominal bargaining power, selection protocol and discounting in legislative bargaining. Journal of Public Economics 89, 1497–1517.
Fréchette, G.R., Kagel, J.H., Morelli, M., 2005b. Behavioral identification in coalitional bargaining: an experimental analysis of demand bargaining and alternating offers. Econometrica 73, 1893–1937.
Fréchette, G.R., Kagel, J.H., Morelli, M., 2005c. Gamson's Law versus non-cooperative bargaining theory. Games and Economic Behavior 51, 365–390.
Gamson, W.A., 1961. A theory of coalition formation. American Sociological Review 26, 373–382.
Güth, W., Huck, S., Ockenfels, P., 1996. Two-level ultimatum bargaining with incomplete information: an experimental study. Economic Journal 106, 593–604.
Güth, W., Schmittberger, R., Schwarze, B., 1982. An experimental analysis of ultimatum bargaining. Journal of Economic Behavior and Organization 3, 367–388.
Güth, W., van Damme, E., 1998. Information, strategic behavior, and fairness in ultimatum bargaining: an experimental study. Journal of Mathematical Psychology 42, 227–247.
Henrich, J., Boyd, R., Bowles, S., Camerer, C., Fehr, E., Ginits, H., McElreath, R., Alvard, M., Barr, A., Ensminger, J., Henrich, S.N., Hill, K., Gil-White, F., Gurven, M., Marlowe, F., Patton, J.Q., Tracer, D., 2005. 'Economic man' in cross-cultural perspective: behavioral experiments in 15-small-scale societies. Behavioral and Brain Sciences 28, 795–855.
Hoffman, E., McCabe, K., Smith, V., 1998. Behavioral foundations of reciprocity: experimental economics and evolutionary psychology. Economic Inquiry 36, 335–352.
Kagel, J.H., Wolfe, K.W., 2001. Tests of fairness models based on equity considerations in a three-person ultimatum game. Experimental Economics 4, 203–219.
Keser, C., van Widen, F., 2000. Conditional cooperation and voluntary contributions to public goods. Scandinavian Journal of Economics 102, 23–39.
Knez, M.J., Camerer, C.F., 1995. Outside options and social comparison in three-player ultimatum game experiments. Games and Economic Behavior 10, 165–194.
McKelvey, R.D., 1991. An experimental test of a stochastic game model of committee bargaining. In: Palfrey, T.R. (Ed.), Laboratory Research in Political Economy. University of Michigan Press, Ann Arbor, pp. 139–167.
McKelvey, R.D., Palfrey, T.R., 1992. An experimental study of the centipede game. Econometrica 60, 803–836.
Miller, G.J., Oppenheimer, J.A., 1982. Universalism in experimental committees. American Political Science Review 76, 561–574.
Morelli, M., 1999. Demand competition and policy compromise in legislative bargaining. American Political Science Review 93, 809–820.
Mueller, D.C., 2003. Public Choice III. Cambridge University Press, Cambridge.
Persson, T., Roland, G., Tabellini, G., 2000. Comparative politics and public finance. Journal of Political Economy 108, 1121–1161.
Persson, T., Tabellini, G., 2000. Political Economics: Explaining Economic Policy. MIT Press, Cambridge.
Riker, W., 1962. The Theory of Political Coalitions. Yale University Press, New Haven.
Roth, A.E., 1995a. Introduction to experimental economics. In: Kagel, J.H., Roth, A.E. (Eds.), Handbook of Experimental Economics. Princeton University Press, Princeton NJ, pp. 3–109.
Roth, A.E., 1995b. Bargaining experiments. In: Kagel, J.H., Roth, A.E. (Eds.), Handbook of Experimental Economics. Princeton University Press, Princeton NJ, pp. 253–348.
Roth, A.E., Prasnikar, V., Okuno-Fujiwara, M., Zamir, S., 1991. Bargaining and market behavior in Jerusalem, Ljubljana, Pittsburgh, and Tokyo: an experimental study. American Economic Review 81, 1068–1095.
Rubinstein, A., 1982. Perfect equilibrium in a bargaining model. Econometrica 50, 97–109.
Stahl, I., 1972. Bargaining Theory. Economics Research Unit, Stockholm.