AN EXPERIMENTAL STUDY ON DIVIDING GAINS THROUGH POLITICS

Li-Chen Hsu*, Kamhon Kan**, C.C. Yang*,**,*** and Chun-Lei Yang**

Abstract

This article offers experimental evidence to examine an important case in politics where a monopolistic proposer seeks a majority’s consent from competitive responders to split the gain. The unique subgame perfect equilibrium prediction is that the side of trade with a monopoly will exploit the side of trade with competition to reap almost all of the gain. Our experimental evidence reveals that while responders do compete with each other to race to the bottom (consistent with the prediction), the monopolistic proposer settles down to offer a ‘fair’ share of the pie to those from whom he or she seeks majority support (contrary to the prediction).

I Introduction

How to divide the gain from trade or cooperation is a common problem that people encounter in their daily life. Human beings have developed many institutions to deal with this problem. According to North (1990, p. 3), ‘Institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction’. In various circumstances, the outcome of the division of the gain largely relies on the rules or institutions.

For concreteness, let us consider the division of the gain between a monopolist on one side and several competitors on the other side. Economic reasoning predicts that ‘Bertrand’ competition between competitors will drive them to race to the bottom and, as a result, it will enable the monopolist to reap almost all of the gain and leave little to competitors. This prediction has largely been borne out by Roth et al. (1991), Güth et al. (1997), Grosskopf (2003), and Fischbacher et al. (2009), which experimentally contrast the ‘ultimatum game’ (UG) with the ‘ultimatum game with competition’ (UG-C).

The institutions or rules of UG are as follows: (1) a fixed gain is divided between one proposer and one responder, (2) the proposer makes a proposal to split the gain with the responder, and (3) the responder either rejects the

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proposal so that both players receive nothing and remain at their respective status quo, or accepts the proposal so that it is implemented.\footnote{For a literature survey on UG, see Camerer (2003).} The rules of UG-C are identical to those of UG, except for the introduction of competition: either several proposers simultaneously and independently make proposals to a monopolistic responder or several responders simultaneously and independently decide whether to accept or reject the proposal made by a monopolistic proposer.\footnote{UG-C is related to, say, a number of sellers who compete for the right to supply a single item, or a number of buyers who compete to bid for an indivisible object owned by a seller. Frequently used auctions such as the English, the Dutch, and the first-price sealed-bid auctions are concrete examples of UG-C.}

All of the papers mentioned above find that regardless of whether it is present or absent, competition exerts a dramatic impact on experimental outcomes. In the case where competition is absent, the proposer often offers an average of about 40\% of the total amount to the responder. However, once competition is present, the monopolist receives most and even almost all of the gain, as economic theory predicts.

Ultimatum game constitutes the last round of the finite-horizon version of the renowned bilateral bargaining à la Rubinstein (1982). A natural counterpart of UG in politics is the so-called ‘majoritarian ultimatum game’ (MUG), which constitutes the last round of the finite-horizon version of the majority bargaining developed by Baron and Ferejohn (1989). As emphasized by Baron and Ferejohn, a fundamental question in politics concerns how to divide the gain among members who have differing and sometimes conflicting preferences.\footnote{The Baron-Ferejohn model has become the workhorse for the study of a variety of issues in political economics; see, for example, Persson and Tabellini (2000).}

The institutions or rules of MUG are as follows: (1) a fixed gain is divided between one proposer and several responders, (2) the proposer seeks a majority’s consent to split the gain among the players, (3) the responders decide whether to accept or reject the proposer’s proposed split, and (4) the proposal is adopted if it wins the support of a majority and is defeated otherwise; when defeated, the status quo allocation will be implemented.

Diermeier and Gailmard (2006) and Hsu et al. (2008) have conducted experiments on MUG where players’ status quo are exogenously given. In Diermeier and Gailmard (2006) the proposer’s status quo varies across treatments but the two responders’ status quo largely remain the same. With self-interested players, the theory predicts that all the treatments have the same equilibrium in which the proposer should offer the responder with the lower status quo his or her assigned status quo and grasp the rest of the pie regardless of the proposer’s assigned status quo. Their findings indicate the importance of entitlements – subjects seem to consider the assigned status quo as determining an entitlement and are willing to accept a lower offer if the proposer’s assigned status quo is high. Differing from the setting in Diermeier and Gailmard’s (2006) experiment where only positive-sum games are consid-
ered, Hsu et al. (2008) contrast the positive-sum game experiment with the zero-sum game experiment and find that significantly more proposers adopt a minimum-winning coalition strategy in the former game than in the latter game. Despite the differences in their experimental designs, both papers show that although the proposer obtains a higher share of the gain because of his or her proposing power, the responders’ share of the gain is substantially above zero. This experimental result for MUG is arguably similar to that found in UG.

Now consider an augmented MUG wherein responders are allowed to choose their own status quos. This augmentation introduces competition between responders. The economic reasoning goes as follows. To ensure being part of a majority coalition or, to put it differently, to avoid being excluded from the majority and receiving nothing, a responder has an incentive to choose a status quo lower than other responders so as to make his or her vote cheaper to buy. This incentive pushes responders into ‘Bertrand’ competition and drives the chosen status quo to zero for all responders in equilibrium. The rules of ‘MUG with competition’ (MUG-C) are identical to MUG, except for the presence of competition: responders compete with each other by choosing the lower status quos in order to become the proposer’s coalition partner in the majority formation.

Majoritarian ultimatum game with competition has been studied in several theoretical works, including Ferejohn (1986), Chari et al. (1997), Persson et al. (2000), and Helpman and Persson (2001). Ferejohn (1986) considers a political setting in which voters use elections as a device to discipline an incumbent. To elicit a voter’s yes vote for reelection, the incumbent must give the voter some surplus that is not less than a chosen cutoff level. However, Ferejohn shows that when voters have heterogeneous preferences, the incumbent is entirely uncontrollable and all voters will receive a zero amount of surplus in equilibrium. The logic behind this result is that only a majority of yes votes is required for reelection and, therefore, the incumbent can play off the voters against each other and drive down the cutoff level of the surplus to zero for all voters. Chari et al. (1997) and Persson et al. (2000) consider strategic delegation between voters and their political agents (legislators). An agenda setter (a proposer) in the legislature will seek a majority support in the cheapest way. As a result, a low voter demand imposed upon a legislator is actually beneficial to voters because it raises the likelihood of their elected legislator being included in the majority coalition in the legislature. Realizing this, voters in each district will have an incentive to set a lower demand for their legislator than other districts. This underbidding causes a race to the bottom and results in a corner solution in equilibrium: all voters, except for those in the agenda setter’s district, will choose the lowest demand to discipline their political agents. Strategic delegation is replaced by lobbying in Helpman and Persson (2001), which shows that intergroup competition between lobbies to be...
the coalition partner of the agenda setter will allow the agenda setter to capture all or almost all of the gain.

Although contexts vary across different papers, a central prediction common to all these theoretical works is that, due to competition between responders, the monopolistic proposer will receive almost all of the gain under majority rule. This prediction of MUG-C is identical to the prediction of UG-C in quality. In other words, regardless of whether the division of the gain is resolved through the ‘market’ or ‘politics’, the subgame perfect equilibrium (SPE) prediction is that the side of trade with the monopoly will exploit the side of trade with competition to reap almost all of the gain.

The theoretical prediction of UG-C has been borne out by the experimental work of Roth et al. (1991), Güth et al. (1997), Grosskopf (2003), and Fischbacher et al. (2009). That is, irrespective of the division of the gain in UG, the monopolist will receive most or even almost all of the gain once competition between either proposers or responders is introduced to UG. This finding of UG vs. UG-C may make one believe a priori that, irrespective of the division of the gain in MUG, the theoretical prediction of MUG-C will hold as well. If so, as far as dividing gains is concerned, there would be no difference between ‘politics’ and the ‘market’ in essence once competitive forces are present. Is this true? The main purpose of this paper is to make an attempt to answer this question by means of experiments.

We examine experimentally an important case in politics, namely, where a monopolistic proposer seeks a majority’s consent from competitive responders to split a gain. Our experiments demonstrate that ‘Bertrand’ competition does drive competitors to race to the bottom in their chosen status quos as the theory predicts. However, one should not jump to the conclusion that the monopolistic side of trade will reap almost all of the gain, whereas the competitive side of trade will receive almost nothing in the case of MUG-C. Our central result reveals that although responders compete with each other and race to the bottom in their chosen status quos (consistent with the theoretical prediction), the monopolistic proposer settles down to offer a ‘fair’ share of the pie to those from whom he or she seeks majority support (contrary to the theoretical prediction). We discern and isolate possible sources of the consistency and the contradiction through experiments.

The remainder of the paper is organized as follows. Section II describes our experimental design and procedure. Section III reports the experimental results and Section IV concludes.

II Experimental Design and Procedure

Our focus is on MUG-C. However, we also conduct experiments on UG-C as a benchmark for comparison. For simplicity, we consider the three-player case in both MUG-C and UG-C.
Design

There are three stages in our MUG-C experiment. First, a player, named A, is randomly ‘recognized’ and assigned a status quo exogenously, while the other two players, named B and C, choose their own status quos. Second, after learning all three players’ status quos, player A makes a proposal to divide a fixed pie among the three players. Third, facing and knowing A’s proposal, each and every player (including A) decides whether to cast a ‘yes’ or ‘no’ vote to the proposal. If a majority (i.e., two or three out of the three players) agrees with the proposal, the pie is divided accordingly. If a majority disagrees, each player receives his or her own status quo. The MUG experiments of Diermeier and Gailmard (2006) and Hsu et al. (2008) are confined to the second and the third stages of the MUG-C experiment in which players B and C’s status quos are exogenously given rather than endogenously chosen.

In our UG-C experiment, we basically impose the same rules of the game as Roth et al. (1991). The game consists of two stages. The first stage of UG-C is identical to the first stage of MUG-C, that is, a player, named A, is randomly ‘recognized’ and assigned a status quo exogenously, while the other two players, named B and C, choose their own status quos. In the context of UG-C, players B and C’s chosen status quos represent the shares of the fixed pie that B and C plan to keep for themselves (and so the rest of the pie is offered to A). In the second stage of UG-C, A is committed to make a binary yes or no choice: to either accept the proposal that has the lower status quo out of B and C’s proposals, or to reject this proposal. In the former case the player who chooses the lower status quo obtains his or her status quo and player A obtains the rest of the pie. In the latter, each of player A, player B, and player C obtains his or her status quo.

Suppose that players are self-interested and maximize their own monetary payoffs, and that this characteristic is common knowledge among all players. Based on these assumptions, seeking the support of either player B or player C but not both is enough for player A to form a coalition. Furthermore, to maximize A’s own monetary payoff, A will choose the player (out of players B and C) who chooses the lower status quo and will offer him or her just a little bit more than his or her chosen status quo. Hence, the SPE prediction for the MUG-C experiment is the following: In the first stage players B and C will undercut each other and race to the bottom (that is, zero or close to zero points) in their chosen status quos. In the second stage, player A will offer player B or player C (depending on who chooses the lower status quo) just a

The random recognition of a proposer follows Baron and Ferejohn (1989), who argue that random recognition is a neutral benchmark since it does not bias the bargaining outcomes in favor of any player.

A tie is broken randomly. To be consistent with our MUG-C, players A, B and C will receive their respective status quos in our UG-C if A rejects all proposals. This rule differs from the Roth et al. game, in which all players receive nothing if A rejects all proposals. As far as our article is concerned, this difference is insignificant in that rejections occur only five times out of 180 trials and, more importantly, our UG-C duplicates the main result of the Roth et al. market game, that is, outcomes converge to the equilibrium prediction that player A receives almost all of the pie.
little bit more than his or her chosen status quo and A will obtain the rest of the pie. In the third stage, player A and the player who receives A’s offer will agree with A’s proposed division of the pie and then the pie will be divided accordingly.

The UG-C experiment has the same SPE prediction as the MUG-C experiment, except that the last stage of voting is absent. The rationale for the same SPE prediction is that competition still exists between player B and player C in UG-C. Since player B and player C can only choose a status quo with no more than 40 points, player A will always accept the proposal with the lower status quo. By doing so A will obtain at least 120–40 points, which are more than 30 points (A’s status quo) that A can obtain if he or she rejects the lower status quos of B and C. B and C will thus discern that A will choose the one with the lower status quo and, therefore, they will race to the bottom, just as based on the prediction in MUG-C.

Despite giving rise to the same SPE prediction, it is of critical importance to recognize that the rules of MUG-C have two key deviations from those of UG-C. First, player A has the discretion to make a proposal to players B and C (the second stage of MUG-C), and second, players B and C have the discretion to cast ‘yes’ or ‘no’ votes in relation to player A’s proposal (the third stage of MUG-C). Both discretions are absent in UG-C. Our experiment is designed to investigate whether these two deviations in institutions do not produce any significant differences.

To discern and isolate possible sources of the differences between MUG-C and UG-C in experimental outcomes, if there are any, we introduce a game between MUG-C and UG-C, which we call the ‘in-between game’ (IG) for convenience. The first stage of IG is identical to the first stage of both UG-C and MUG-C. For the rest of its stages, the institutions or rules of IG possess two distinct features. First, player A in IG is given the discretion to decide how to split the pie. In fact, player A in IG has the same degree of discretion in his or her choice of splitting the pie as player A in MUG-C. More specifically, if player A offers either player B or player C or both at least their respective status quos, then the pie is divided among the three players accordingly. If the amounts of points that player A offers players B and C are both lower than B and C’s respective status quos, then all three players obtain their status quos. Second, while players B and C in MUG-C are given the discretion to cast ‘yes’ or ‘no’ votes to A’s proposal, players B and C in IG are deprived of such discretion, in that they must commit to agree as long as A’s proposal to them equals or exceeds their chosen status quos. In fact, players B and C must commit to agree in the same way as players B and C in UG-C.

It is clear that IG also has the same SPE prediction as MUG-C, except that a voting stage appears in MUG-C, but not in IG. More specifically, in IG players B and C will race their chosen status quos to zero or almost zero points. Player A will only offer the player (out of players B and C) who chose the lower status quo an amount that is a little bit more than this chosen status quo, and will offer zero to the other player. The pie is then divided according to A’s proposal.
Based on our experimental design, if there are any differences in the outcome between IG and UG-C, they must stem from player A’s discretion in his or her choice of splitting the pie in IG but the commitment in his or her choice in UG-C; on the other hand, if there are any differences in the outcome between MUG-C and IG, they must stem from players B and C’s discretion to cast ‘yes’ or ‘no’ votes in MUG-C but the commitment to cast ‘yes’ or ‘no’ votes in IG. The differences between MUG-C and UG-C, if there are any, must stem from either the difference between IG and UG-C or the difference between MUG-C and IG, or both.

Procedure

Three treatments (UG-C, MUG-C, and IG) were conducted in this research. Each treatment involved six sessions, and nine subjects were recruited for each session, for a total of 162 subjects participating in the experiments. To save time and to prevent subjects from inferring who were in their groups, two independent sessions for the same treatment were conducted at the same time, and subjects were unaware of this setting. The nine subjects in the same session were randomly and anonymously divided into three groups of three.

In each group, a fixed pie of 120 points was divided between a randomly recognized player (coded as A) and the other two players (coded as B and C). Subjects played the game for thirty rounds. When a new round started, the nine subjects were randomly re-matched and re-assigned new codes. Random re-matching took place in every round to minimize potential repeated game effects. The purposes of the new-code assignment in every round were two-fold. First, switching roles of players may help their understanding of the game from the other players’ perspectives and may prompt rapid learning toward the equilibrium. Second, switching roles can prevent emotional reactions aroused by extremely unequal income distributions as we can expect that players who were coded A would grasp almost all of the gain.

MUG-C

At the beginning of each round, players B and C chose their own status quos, which were confined to an integer between 0 and 40 points (including 0 and 40). Player A’s status quo was exogenously given at 30 points and this was public information. After observing B and C’s chosen status quos, player A proposed a division of 120 points among the three-member group. As soon as A had made the proposal, a voting sheet appeared on each subject’s computer screen, in which each member’s status quo and A’s proposed division were disclosed. Each of players the A, B, and C then cast a ‘yes’ or ‘no’ vote on A’s proposal. If two or more members of the group agreed with A’s proposed division of 120 points, each member received what A proposed; otherwise, each member received his or her own status quo. At the end of each round, each subject was informed from his or her computer screen of a summary

\[\text{This procedure was to ensure that memory lapses have no chance of affecting the voting decision. This also emulates the perfect-recall property.}\]
report, which contained information including each group member’s status quo, A’s proposed division, the subject’s voting decision, whether A’s proposal passed or not, the subject’s payoff for this round, and the subject’s cumulative payoff until this round.

**UG-C**
The experimental procedure was the same as that of the MUG-C treatment, except for the following difference. After observing B and C’s chosen status quos, player A decided whether to accept the lower of the two status quos (a tie was broken randomly). If A accepted, the player (out of B and C) who had the lower status quo received his or her status quo, A received the rest of the 120-point pie, and the other player received nothing. If A rejected the lower status quo, then each member received his or her own status quo.

**IG**
The experimental procedure was the same as that of the MUG-C treatment, except for the following difference. After observing B and C’s chosen status quos, A decided on the amount of points offered to B and C, respectively. A could offer positively to either B or C or both. As long as the offer to B was no less than B’s chosen status quo or the offer to C was no less than C’s chosen status quo, B and C received what A offered and A received the rest of the pie; otherwise each member received his or her own status quo.

All subjects were undergraduate students at National Chengchi University in Taiwan. They participated in the experiments voluntarily and none of them had participated in any experiments related to the ultimatum game, market game, or voting game before. The experiment was conducted in the computer lab of the Department of Public Finance at National Chengchi University. In all sessions, subjects were given written instructions. The experimenter read the instructions aloud, and answered any questions raised by the subjects. The MUG-C sessions each lasted about 80 minutes; the UG-C and IG sessions each lasted about 60 minutes. A point earned by subjects was exchanged for NT$1 at the end of the experiment. The average payoff (including a participation fee of NT$100) for all participants was NT$574.86 (with a standard deviation of NT$28.59, a maximum of NT$640.40, and a minimum of NT$468.80).8

### III Experimental Results

In this section we report the experimental results and discuss the validity of the theoretical predictions regarding the three treatments, MUG-C, UG-C and IG. The SPE predictions for all the treatments are the same qualitatively: ‘Bertrand’ competition between players B and C will drive them to race to the bottom and, as a result, it will enable the monopolist, player A, to reap

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8 NT$ denotes New Taiwan dollar and the exchange rate was around NT$33 per US$. The part-time hourly wage rate for an undergraduate student in Taiwan was about NT$120 at the time our experiment was conducted (in the year 2009).
almost all of the gain and leave little to competitors, players B and C. This prediction implies that in equilibrium both players B and C will: (1) choose a status quo close to zero, (2) earn a payoff close to zero, and (3) receive a premium close to zero. We address each of these three zero implications in turn.

Zero status quo

‘Bertrand’ competition between responders B and C will drive their chosen status quos to zero in equilibrium for all treatments. The results from our experiment largely support this prediction.

Figure 1 exhibits the mean of the lower of players B and C’s chosen status quos in a given treatment, denoted by Low SQ. It is clear from the figure that the levels of Low SQ in all treatments decline across rounds in the experiment. In particular, Low SQ for the UG-C treatment reaches a very low average value of 3.167 (SD = 1.65), 3.56 (SD = 2.12), 2.61 (SD = 2.09), 3.83 (SD = 4.82), and 4.67 (SD = 5.68) in rounds 26–30. However, the session-level one-sided Wilcoxon signed rank sum test suggests that the medians of Low SQ in the last five rounds of the experiment are significantly greater than zero ($p < 0.0000$). This suggests that our experimental results depart slightly from the theoretical prediction of zero status quo in the case of UG-C.

![Figure 1. Sample mean of Low SQ in each round of the experiment.](image)

As mentioned in the Experimental Design, random re-matching was manipulated between the nine subjects in the same session. Because their choices may not be independent, we use session-level data for the Wilcoxon signed rank sum test. That is, the average of the nine subjects’ choices in each round is used as the round observation and the average of the round observations over a certain period is used as the observation for that period. The subject level one-sided Wilcoxon signed rank sum test reaches the same conclusion.
Now we turn to Low SQ for the IG treatment. It reaches an average value of 9.50 (SD = 2.31), 9.11 (SD = 2.89), 9.17 (SD = 3.07), 8.06 (SD = 2.36), and 7.06 (SD = 3.15) in rounds 26–30. These average values are obviously not close to zero. The one-sided Wilcoxon signed rank sum test suggests that the medians of Low SQ in the last five rounds of the experiment are significantly above zero ($p < 0.0000$). This is also true for the MUG-C treatment, in which the average values of Low SQ are 18.72 (SD = 9.18), 17.78 (SD = 9.72), 17.39 (SD = 9.46), 16.94 (SD = 10.45), and 15.06 (SD = 10.54) in rounds 26–30. The session-level one-sided Wilcoxon signed rank sum test indicates that the medians of the levels of Low SQ in the last five rounds of the experiment are significantly greater than zero ($p < 0.0000$).

Although the lower of B and C’s status quos displays a downward trend in all treatments, it is interesting to observe that the gap in Low SQ between any two treatments persists. Figure 1 shows that the mean of Low SQ chosen by B and C in IG is significantly higher than that in UG-C right from the beginning, and that their gap persists until the last few rounds. Figure 1 also shows that the mean of Low SQ chosen by B and C in MUG-C is significantly higher than that in IG right from the beginning, and that their gap persists until the last few rounds. Adding up these two differences is the difference between MUG-C and UG-C. These gaps suggest that subjects in the role of player B or C understand the differences in the institutional setting of our experiments.

To sum up, we state:

**RESULT 1.** The lower of B and C’s status quos for all of three treatments exhibits a downward trend. While the lower of B and C’s status quos reaches a low level for the UG-C and IG treatments, it reaches a significantly higher value for the MUG-C treatment.

We estimate the following model by ordinary least squares to see what determines changes in the status quo across rounds. By letting subscript $i$ represent subject and $r$ denote round, the regression equation is set as follows:

$$
\Delta SQ_{ir} = \beta_0 + \Delta^{B,C} SQ_{ir-j}^{+} \beta_1 + \Delta^{B,C} SQ_{ir-j}^{-} \beta_2 + \text{Tied SQ}_{ir-j} \beta_3 + \text{MWC}_{ir-j} \beta_4 \\
+ \text{CC}_{ir-j} \beta_5 + \text{Premium}_{ir-j}^{+} \beta_6 + \text{Premium}_{ir-j}^{-} \beta_7 + \eta_r + \mu_i + u_{ir},
$$

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10 The session-level Wilcoxon signed rank sum test suggests that the levels of Low SQ for the IG and UG-C treatments have different medians in rounds 1–2 (with a test statistic of 17.318 and a $p < 0.0000$). The gap narrows in rounds 29–30, but is still significantly different from zero (with a test statistic of 6.453 and a $p$-value of 0.0111).

11 The session-level Wilcoxon signed rank sum test suggests that the median of Low SQ for MUG-C is significantly different from that for IG in rounds 1–2 (with a test statistic of 4.167 and a $p < 0.0000$).

12 The session-level Wilcoxon signed rank sum test suggests that the gap is significantly different from zero in rounds 1–2 (with a test statistic of 17.363 and a $p < 0.0000$) and in rounds 29–30 (with a test statistic of 9.927 and a $p$-value of 0.0016).

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where $\Delta^{B,C}_{ir-j}SQ^+_\text{ir-j}$ and $\Delta^{B,C}_{ir-j}SQ^-_{ir-j}$, respectively, stand for the difference between subject $i$’s and his or her counterpart’s status quos in round $r-j$ (i.e., the most recent past round when subject $i$ was player B or C) when it is positive and negative, Tied SQ$_{ir-j}$ indicates whether or not players B and C’s status quos are the same in round $r-j$, MWC$_{ir-j}$ indicates whether player A in round $r-j$ used the ‘minimum winning coalition’ strategy, CC$_{ir-j}$ indicates whether player A in round $r-j$ used the ‘cheapest coalition’ strategy, Premium$_{ir-j}^+$ and Premium$_{ir-j}^-$, respectively, indicate whether there is a positive and a negative difference between the proposal offered to subject $i$ and his or her status quo in round $r-j$ , $\eta_r$ is a round specific fixed effect capturing unobserved factors affecting subjects’ behavior in each round, and $\mu_i$ is a subject-specific fixed effect capturing unobserved individual heterogeneity. The definitions of variables used in this section

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC$_{ir-j}$</td>
<td>A binary indicator indicating whether player A in round $r-j$ used the ‘cheapest coalition’ strategy.</td>
</tr>
<tr>
<td>MWC$_{ir-j}$</td>
<td>A binary indicator indicating whether player A in round $r-j$ used the ‘minimum winning coalition’ strategy.</td>
</tr>
<tr>
<td>Tied SQ$_{ir}$</td>
<td>The status quo of player $i$, who is a responder, is the same as the status quo of the other responder.</td>
</tr>
<tr>
<td>Low SQ$_{ir}$</td>
<td>The lower of the status quos chosen by players B and C.</td>
</tr>
<tr>
<td>High SQ$_{ir}$</td>
<td>The higher of the status quos chosen by players B and C.</td>
</tr>
<tr>
<td>$\Delta^{B,C}<em>{ir-j}SQ^+</em>\text{ir-j}$</td>
<td>The difference between subject $i$’s and his or her counterpart’s status quos in round $r-j$, if it is positive. $\Delta^{B,C}<em>{ir-j}SQ^+</em>\text{ir-j}$ equals zero if the difference is negative.</td>
</tr>
<tr>
<td>$\Delta^{B,C}<em>{ir-j}SQ^-</em>{ir-j}$</td>
<td>The difference between subject $i$’s and his or her counterpart’s status quos in round $r-j$, if it is negative. $\Delta^{B,C}<em>{ir-j}SQ^-</em>{ir-j}$ equals zero if the difference is positive.</td>
</tr>
<tr>
<td>Proposal$_{ir}$</td>
<td>The amount proposed by player A for player B or C.</td>
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<tr>
<td>Low Proposal$_{ir}$</td>
<td>The lower of Proposal$_{ir}$ for players B and C.</td>
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<tr>
<td>High Proposal$_{ir}$</td>
<td>The higher of Proposal$_{ir}$ for players B and C.</td>
</tr>
<tr>
<td>Premium$_{ir}$</td>
<td>The difference between Proposal$_{ir}$ and the player’s status quo.</td>
</tr>
<tr>
<td>Low Premium$_{ir}$</td>
<td>The higher of players B and C’s Premium$_{ir}$.</td>
</tr>
<tr>
<td>High Premium$_{ir}$</td>
<td>The lower of players B and C’s Premium$_{ir}$.</td>
</tr>
<tr>
<td>Premium$_{ir-j}^+$</td>
<td>A binary indicator indicating whether there is a positive difference between the proposal offered to subject $i$ and his or her status quo in round $r-j$.</td>
</tr>
<tr>
<td>Premium$_{ir-j}^-$</td>
<td>A binary indicator indicating whether there is a negative difference between the proposal offered to subject $i$ and his or her status quo in round $r-j$.</td>
</tr>
<tr>
<td>Payoff$<em>{A}^{B,C}</em>{ir}$</td>
<td>Player A’s payoff.</td>
</tr>
<tr>
<td>Low Payoff$<em>{B,C}^{B,C}</em>{ir}$</td>
<td>The lower of the payoffs of players B and C.</td>
</tr>
<tr>
<td>High Payoff$<em>{B,C}^{B,C}</em>{ir}$</td>
<td>The higher of the payoffs of players B and C.</td>
</tr>
<tr>
<td>Passed$_{ir}$</td>
<td>Whether or not player A’s proposal is supported by at least one of the players B and C.</td>
</tr>
</tbody>
</table>

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Table 1

Definitions of variables$^a$

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$a$ $i$ indexes subjects and $r$ indexes rounds. $r-j$ refers to the most recent past round in which subject $i$ was player B or C.
are summarized in Table 1. Table 2 reports the results from the above regression.

It is found that in all treatments, if a subject’s chosen status quo in the role of player B or C was higher than that of his or her counterpart in the most recent past round, he or she will adjust his or her current round status quo downward, and vice versa. Observe that while the effects of $D_{B,C}^{SQ_{ir-j}^{+}}$ and $D_{B,C}^{SQ_{ir-j}^{-}}$ are close to each other in magnitude in the MUG-C treatment, they are quite different in the IG and UG-C treatments. The magnitude of $D_{B,C}^{SQ_{ir-j}^{+}}$ is around 2 times the magnitude of $D_{B,C}^{SQ_{ir-j}^{-}}$ in the case of IG, and it is around 3.5 times in the case of UG-C. In both the IG and UG-C treatments, $D_{B,C}^{SQ_{ir-j}^{+}}$ has a much larger negative impact on $\Delta SQ_{ir}$ than $D_{B,C}^{SQ_{ir-j}^{-}}$ does. This indicates that subjects in the role of players B and C felt much stronger competitive pressure in the IG and UG-C treatments than in the MUG-C treatment. The pressure of competition is especially felt by subjects in the UG-C treatment.

Zero payoff

The prediction of a zero payoff for both players B and C receives support from the UG-C and IG treatments, but not from the MUG-C treatment. This is true although our data largely support the prediction that competition drives responders’ chosen status quos to zero in all treatments.
To see if the zero-payoff prediction holds, it is sufficient to check whether the higher of the two amounts proposed by player A to players B and C (denoted by High Proposal) converges to zero.\textsuperscript{13} Player A has no discretion to propose in UG-C. However, as player A has the option to reject in UG-C, we shall for convenience interpret his or her acceptance in UG-C as his or her proposal to players B and C as well.

Figure 2 shows that the mean of High Proposal is far from zero in the MUG-C treatment. Although High Proposal displays a declining trend in the initial rounds of the experiments, it becomes quite stable and remains high in the last five rounds of the experiments, where the average value of High Proposal is 36.50.\textsuperscript{14} This amount of High Proposal clearly rejects the prediction that both players B and C will receive a payoff close to zero. Figure 3 demonstrates the High Proposal separately for accepted and rejected proposals in the MUG-C treatment.

By contrast, High Proposal is quite low near the end of the experiment for the IG treatment (with a mean of 7.1111 in round 30). Moreover, although the median of High Proposal in the last five rounds of the experiment for the IG treatment is statistically different from zero based on the one-sided

\textsuperscript{13} The higher amount proposed is typically the higher of the two payoffs received by players B and C. If there is a tie in the two amounts proposed, High Proposal can be either one.

\textsuperscript{14} The Spearman’s rank correlation coefficient between High Proposal and round numbers is 0.0177 (which has a p-value of 0.81), suggesting that High Proposal in MUG-C does not exhibit a downward trend.

Figure 2. Sample mean of High Proposal in each round of the experiment.
Wilcoxon signed rank sum test (with a test statistic of 8.8333), it is low and on a clearly declining trend.\textsuperscript{15}

To sum up, we state:

**RESULT 2.** The experimental results are, to a large extent, consistent with the zero-payoff prediction for the IG and UG-C treatments, but not for the MUG-C treatment. While player A’s lower offer to player B or C reaches a very low value (although not exactly equal to zero) in the IG and UG-C treatments, it remains high and stable in the MUG-C treatment.

Contrasting Figure 2 with Figure 1 clearly shows that the pattern of High Proposal in IG is almost completely dictated by the pattern of their respective Low SQ.\textsuperscript{16} However, the pattern of High Proposal in MUG-C deviates substantially from the pattern of its corresponding Low SQ. This latter result represents the central finding of our paper, pointing to the power and weakness of competitive forces in ‘politics’. Power is in the sense that a Low SQ in MUG-C does race to the bottom, but weakness is in the sense that High Proposal in MUG-C does not behave in the same way as Low SQ does.

The indifference in the zero-payoff outcome between IG and UG-C suggests that whether or not player A is given the discretion in dividing gains does not

\textsuperscript{15} The Spearman’s rank correlation coefficient between High Proposal and round numbers is $-0.4587$ (with a $p < 0.011$).

\textsuperscript{16} Due to the experimental design of the UG-C treatment, Low SQ and High Proposal are identical.

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\textsuperscript{5} The Spearman’s rank correlation coefficient between High Proposal and round numbers is $-0.4587$ (with a $p < 0.011$).

\textsuperscript{16} Due to the experimental design of the UG-C treatment, Low SQ and High Proposal are identical.
matter much. By contrast, the difference in the zero-payoff outcome between IG and MUG-C suggests that whether or not players B and C are given the discretion to cast ‘no’ votes to player A’s proposal is crucial. Comparing the average value of High Proposal in the last five rounds of the MUG-C treatment with that of the IG and UG-C treatments, we see that the discretion of players B and C to reject player A’s proposal results in additional payoffs of 27.67 and of 32.93, respectively. Given that High Proposal of the IG treatment is still declining even in the last few rounds of the experiment, the difference in High Proposal between the MUG-C and IG treatments is likely to be even larger if more rounds of the experiment are undertaken.

It is interesting to observe that the average value of High Proposal in the last five rounds of the MUG-C treatment equals 36.50, which happens to be close to one third of the total pie of 120 to be divided. This seems to suggest that player A in MUG-C settles down to offering a ‘fair’ share of the pie to the responder from whom he or she seeks a yes vote.

To know more about the behavior of High Proposal, we estimate the following model by OLS using individual subjects’ choices as observations.

\[
\text{High Proposal}_{ir} = \beta_0 + \text{High SQ}_{ir}\beta_1 + \text{Low SQ}_{ir}\beta_2 + \text{MWC}_{ir}\beta_3 + \text{CC}_{ir}\beta_4 \\
+ \text{Tied SQ}_{ir}\beta_5 + \eta_r + \mu_i + u_{ir},
\]

where High SQ\(_{ir}\) and Low SQ\(_{ir}\), respectively, stand for the lower and the higher of the status quos set by players B and C, \(\eta_r\) is a round specific fixed effect, and \(\mu_i\) is a subject specific fixed effect. Table 3 reports the results from the above regression.

It is found that the coefficients of CC\(_{ir}\) in both the MUG-C and IG treatments are negative and statistically significant. This is straightforward to interpret. If player A adopts the cheaper coalition strategy, he or she will target the responder with a lower status quo and hence this will result in a lower High Proposal. By contrast, the coefficient of MWC\(_{ir}\) is positive and statistically significant only for the MUG-C treatment. That is, in the MUG-C treatment player A will offer more to the responder from whom he or she is seeking support if he or she allocates nothing to the other responder. There is no such property for the IG treatment. This can be attributed to player A’s adherence to the zero-premium strategy in the IG treatment (see the next subsection). The regression result also shows that a higher status quo leads to a higher High Proposal. Thus, it would be beneficial to players B and C if some collusion to coordinate their chosen status quos were possible.

---

17 The session-level Wilcoxon signed rank sum test rejects the null hypothesis that the medians of High Proposal for IG and UG-C are the same in rounds 1–2 of the experiment (with a test statistic of 17.280 and a \(p < 0.0000\)), but accepts it in rounds 29–30 (with a test statistic of 1.084 and a \(p\)-value of 0.2987).

18 The session-level Wilcoxon signed rank sum test rejects the null hypotheses that the medians of High Proposal are the same initially and in the final round (with both test statistics equal to 8.308).
Finally, we take a closer look at player A’s proposing behavior by examining the lower of his or her proposal to players B and C. Consistent with the theoretical prediction, Figure 4 shows that for both the MUG-C and IG treatments, Low Proposal converges to zero very rapidly.\(^{19}\) The near-zero Low Proposal is evident for both treatments, confirming the theoretical expectation.

Table 3

<table>
<thead>
<tr>
<th>Determinants of High Proposal (^a)</th>
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<tbody>
<tr>
<td><strong>Dependent variable: High Proposal(_i)</strong></td>
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<tr>
<td><strong>MUG-C</strong></td>
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<tr>
<td>-----------------</td>
</tr>
<tr>
<td>CC(_i)</td>
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<tr>
<td>MWC(_i)</td>
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<td>Low SQ(_i)</td>
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<td>$R^2$</td>
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<tr>
<td>$F$-statistic</td>
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<tr>
<td>Number of observations</td>
</tr>
<tr>
<td>Number of subjects</td>
</tr>
</tbody>
</table>

\(^a\) Results of estimating (2) by OLS. The notation *** denotes the 1% significance level and ** denotes the 5% significance level. $t$-statistics are in parentheses.

Finally, we take a closer look at player A’s proposing behavior by examining the lower of his or her proposal to players B and C. Consistent with the theoretical prediction, Figure 4 shows that for both the MUG-C and IG treatments, Low Proposal converges to zero very rapidly.\(^{19}\) The near-zero Low Proposal is evident for both treatments, confirming the theoretical expectation.

\(^{19}\) In the UG-C treatment, player A does not need to make proposals to players B and C.
Proposal also suggests that player A correctly understood that the game involved a two-way split of the gain.

**Zero premium**

The premium is defined as the larger of the difference between player A’s proposal to players B and C, and the two players’ status quos in each round. To be precise,

\[
\text{Premium}_{ir} = \sup \{\text{Proposal}_{irB} - SQ_B, \text{Proposal}_{irC} - SQ_C\}.
\]

Premium can be regarded as an index that measures player A’s effort in soliciting a yes vote from player B or C.

A zero payoff obviously implies a zero premium. RESULT 2 shows that High Proposal is far from zero for the MUG-C treatment, but that it is close to zero in the UG-C treatment and seems to be approaching zero in the IG treatment. Whether the zero premium is applicable to player A’s proposal is the key responsible for the differences. Note that the zero premium must be true in UG-C. By the rules of the game of UG-C, player A never offers a positive premium to his or her responders.

Based on our experimental design, a responder in the IG treatment is committed to cast a ‘yes’ vote to a proposal as long as the proposed payoff is greater than or equal to his or her status quo. By contrast, in the MUG-C treatment, a responder has the discretion to reject a proposal even if the proposed payoff is greater than or equal to his or her status quo. This institutional difference between IG and MUG-C has a great impact on player A’s proposing behavior even in the presence of competition.

As shown in Figure 5, Premium offered by player A is pretty high in the MUG-C treatment. In anticipation of player B or C’s discretion in rejecting an ‘unfair’ proposal, player A offers an amount which is well above what B or C has requested in terms of their chosen status quos. It is particularly interesting to note that Premium rises over time. This rise in the MUG-C treatment is mainly due to the fact that while players B and C’s chosen status quos drop rapidly as rounds proceed, player A’s High Proposal remains somewhat stable. As we have noted earlier, player A seems to settle down to offering a ‘fair’ share of the pie to the responder from whom he or she seeks a ‘yes’ vote.

One may conjecture that the rise of Premium over time in MUG-C is due to the more aggressive rejection exercised by responders over time. This conjecture is not borne out according to our data (see Figure 6), which show that the acceptance rates are high and stable across rounds.

Premium in the IG treatment is also plotted in Figure 5, which indicates that player A offers almost nothing beyond what B or C has requested in terms of their chosen status quos right from the very beginning of the experiment. That is, player A in the IG treatment sticks quickly to the zero premium strategy.

To sum up, we state:
RESULT 3. While zero premium is a rule of the game in the UG-C treatment, it is an option for player A in the MUG-C and IG treatments. While zero premium is rarely obeyed in the...
MUG-C treatment, it is almost always adopted in the IG treatment.

The contrast in player A’s behavior between the IG and the MUG-C treatments regarding Premium strongly suggests that a proposer’s markup offer above the status quo in MUG-C arises from the presence of the rejection power possessed by his or her responders. This markup offer is almost completely absent in IG.

There is the so-called ‘dictator game’ (DG), which is identical in structure to UG except that the responder’s option of rejection is removed so that the proposer can unilaterally determine the allocation of the gain. Forsythe et al. (1994) compare the offers in UG and DG, finding that amounts allocated to responders are much lower in DG than in UG. However, as commented by Fehr and Schmidt (2006, p. 622), the presence of the rejection power in UG is only part of the explanation as many subjects offer something substantial to responders in DG. In other words, the proposer’s behavior in DG is arguably not entirely attributed to the fact that the responders’ rejection discretion is absent in DG. Dana et al. (2005), List (2007), Bardsley (2008), and Andreoni and Bernheim (2009) conduct experiments on DG with different variants. Their results all indicate that subjects seem more concerned to appear fair than to be fair in DG. The role of player A in IG is similar to the role of the dictator in DG, in the sense that responders have no discretion to cast ‘no’ votes to player A’s offer. As such, our IG may be interpreted as DG-C, that is, dictator games with competition among responders. RESULT 3 is then a result derived from contrasting MUG-C and DG-C.

The ability to make commitments has long been recognized as an advantage relative to discretion in dividing the gain for a proposer. Van Huyck et al. (1995) find experimental evidence in support of it. However, our experimental evidence shows little difference in Premium between player A’s discretion in IG and his or her commitment in UG-C. The zero premium is the rule of the game in UG-C. Despite the presence of discretion, player A in IG almost always adopts the zero-premium strategy with regard to the responder from whom he or she seeks majority support.

Since Baron and Ferejohn (1989), there has been the so-called ‘proposer power’ such that a substantial premium results for proposers relative to responders. Diermeier and Gailmard (2006) and Hsu et al. (2008) have conducted experiments on MUG where players’ status quos are exogenously given. Both papers show that although the proposer obtains a higher share of the gain because of his or her proposing power, the responders’ share of the gain is substantially above zero. Our contribution here is to fortify this result by showing that it holds even if there is competition among responders. Unlike the findings in Roth et al. (1991), Güth et al. (1997), Grosskopf (2003), and Fischbacher et al. (2009) which show that there is a dramatic difference in dividing the gain between UG and ‘UG with competition’, we find that the difference in dividing the gain between MUG and ‘MUG with competition’ is not dramatic.
IV Conclusion

Several important works on political economics, including Ferejohn (1986), Chari et al. (1997), Persson et al. (2000), and Helpman and Persson (2001), offer theoretical models to predict that ‘MUG with responder competition’ will drive competitive responders to race to the bottom and, as a result, will enable the monopolistic proposer to reap almost all of the gain. We conduct experiments to examine this theoretical prediction. Our evidence reveals that ‘Bertrand’ competition does drive competitive responders to race to the bottom in their chosen status quo as the theory predicts; however, the monopolistic proposer settles down to offer a ‘fair’ share of the pie to those from whom he or she seeks majority support. We show that the key leading to the contradiction of the theory does not lie in the monopolistic proposer’s discretion in splitting the pie, but in his or her responders’ discretion in casting ‘no’ votes. Our finding pinpoints the power and weakness of using competitive arguments in politics. Power is in the sense that competitors do race to the bottom, but weakness is in the sense that racing to the bottom does not necessarily imply that competitors will receive nothing.

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