Discussion and the Fairness of Majority Rule

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Abstract

We conduct a laboratory experiment to investigate how communication affects the fairness of majority decisions. With discussion, a minority might to try to persuade the majority to take their interests into account, making fairness considerations more salient. Alternatively, communication may facilitate coordination, thereby enhancing the formation of majority coalitions and increasing inequality. Our participants must choose between a fair allocation and one or more unfair allocations, and in our design we elicit social preferences and manipulate the difficulty majorities face in coordinating on unfair allocations. This allows us to distinguish communication used for coordination from communication used to persuade others to consider fairness. Communication increases fairness in the absence of coordination problems, but promotes majority tyranny when coordination is difficult. We find that discussion affects behavior even though subjects' messages are mostly brief and instrumental, devoid of substantive meaning, and rarely mention fairness. Our results also suggest a behavioral consequence of introducing a coordination problem: voters overreact and choose fair outcomes more often than their underlying social preferences would predict. In an additional experiment, we find ways to reduce the fairness of majority outcomes.

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1 Introduction

Is majority rule fair? Procedurally, majority rule is fair in the sense that a rule of "one person, one vote" grants every citizen an equal voice in contributing to collective decisions. But when the material self-interest of voters is at stake, majority rule can also enable a majority to exploit the minority. This concern that in democracies the poor will "soak" the rich dates back to Aristotle.[1] Later, democratic thinkers including Tocqueville[2], Burke[3], and Madison[4] were similarly apprehensive about the "tyranny of the majority." This logic is formalized by the median voter theorem and is central to many political economy models (Acemoglu and Robinson, 2001; Meltzer and Richard, 1981).

Of course, there is more to democracy than voting. For example, citizens can talk and discuss the merits of the issues before they vote. Normative political theorists have recently emphasized this deliberative component as being essential to democracy. They argue that a "deliberative democracy" with public, rational discourse prior to voting not only produces better informed, more legitimate choices, but is also more likely to generate outcomes that are more egalitarian, fair, or most consistent with an idea of the common good (Cohen, 1989; Gutmann and Thompson, 1996; Habermas, 1996; Landemore, 2012). In practice, though, deliberative democracy has mostly been studied by political scientists in settings where the material self-interest of voters is not at stake (e.g., deliberative issue polls, Fishkin, 2011), so strategic considerations are typically absent.[5] Indeed, communication need not be as substantive or principled as deliberative theorists envision. If used for strategic purposes, discussion and communication may undermine the benefits of deliberation.

Motivated by these considerations—that majorities may tyrannize the minority, that discussion may enhance fairness, but that strategic uses of communication may undermine it—we designed and conducted a controlled laboratory experiment. Our investigation addresses two broad questions. First, does majority rule produce fair outcomes? Second, how does communication enhance or diminish the fairness of individual behavior and group decisions?

[1] "But both views [oligarchy and democracy] involve inequality and injustice; for if the will of the few is to prevail, this means a tyranny, since if one man owns more than the other rich men, according to the oligarchic principle of justice it is just for him to rule alone; whereas if the will of the numerical majority is to prevail, they will do injustice by confiscating the property of the rich minority, as has been said before." (*Politics*, 1318a, 18-26)

[2] "A majority taken collectively is only an individual, whose opinions, and frequently whose interests, are opposed to those of another individual, who is styled a minority. If it be admitted that a man possessing absolute power may misuse that power by wronging his adversaries, why should not a majority be liable to the same reproach? Men do not change their characters by uniting with one another; nor does their patience in the presence of obstacles increase with their strength." (*Democracy in America*, 1835, vol. 1, 330)

[3] "If this I am certain, that in a democracy, the majority of the citizens is capable of exercising the most cruel oppressions upon the minority, whenever strong divisions prevail in that kind of polity, as they often must; and that oppression of the minority will extend to far greater numbers, and will be carried on with much greater fury, than can almost ever be apprehended from the dominion of a single sceptre." (*Reflections on the French Revolution*, 1790, 216)

[4] "It is of great importance in a republic not only to guard the society against the oppression of its rulers but to guard one part of the society against the injustice of the other part. If a majority be united by a common interest, the rights of the minority will be insecure." (*The Federalist Papers*, No. 51)

[5] Of course, strategic considerations are central in jury experiments (e.g., Goeree and Yariv, 2011) and other game theoretic experiments emphasizing informational problems, such as those reviewed by Martinelli and Palfrey (2017).

We explore these questions in an exceptionally sparse experimental environment. We do so in order to focus analytically on the interaction between voting and communication, abstracting away from a variety of other factors such as proposal power or entitlements. Throughout the experiment, groups choose between two kinds of exogenously given allocations: fair allocations that are completely equal for everyone and unfair allocations that give more to each member of a majority than to a minority. We then vary how group decisions are made. First, we observe how members make choices as random dictators. This allows us to determine the extent to which subjects' choices reflect their underlying social preferences, in particular their degree of inequity aversion. Next, group members vote between two alternatives, where the majority and minority members are randomly assigned. This pairwise voting environment entails no strategic complexity. Last, we increase the number of unfair options, holding payoff values constant but where each unfair option involves a different majority subset of the group. The latter situation introduces a coordination problem, our main strategic consideration of interest. In addition, we vary whether majority payoffs are symmetric or asymmetric, where asymmetry is meant to increase majority rule instability and exacerbate the coordination problem.

The communication technology we use involves the free-form electronic chat messages common in experimental studies. Comparing majority decisions with and without communication in the pairwise voting environment allows us to gauge whether there is any kind of social or psychological effect of discussion, rather than a strategic one. In contrast, the voting environment with multiple alternatives involves a moderate degree of strategic complexity due to the coordination problem, and we expect communication in this environment to make it easier for majority coalitions to form and thereby tyrannize a minority. Thus, in our experiment, discussion has the potential to either promote or undermine fairness.

In our simple distributive experiment, majority rule often leads to fair outcomes. Indeed, we find that there is more fairness than what we would predict based on the inequity aversion subjects express when they make individual rather than collective choices. It is also greater than what we expect by introducing a coordination problem that makes fair outcomes focal. Discussion increases individual willingness to vote for fair outcomes in the pairwise voting environment, but has no effect on group decisions. Communication has this effect even though the messages are mostly brief and instrumental, rarely mentioning fairness. By contrast, in the voting environment with multiple alternatives, the more self-interested group members use discussion to form majority coalitions, increasing the prevalence of majority tyranny without affecting the likelihood that individuals vote for fair outcomes and irrespective of the coalitional stability or instability of the set of alternatives. In an additional experiment, we induce subjects to construct messages that are more likely to appeal to decision criteria, including fairness as well as payoff maximization, and we are also able to reduce the fairness of majority decisions.

2 Related Literature

Our study is related to several experimental literatures. A common finding across these literatures is that voting decisions are driven in part by a combination of self-interest and fairness preferences, in addition to strategic concerns. The experiments that are most closely related to our design are those on committee decision making (Isaac and Plott, 1978; Eavey and Miller, 1984; Sauermann and Kaiser, 2010). These are primarily concerned with testing the predictive power of the core as a solution concept (as in, e.g., Fiorina and Plott, 1978), and show that fair alternatives are often chosen in games containing a unique majority rule core, contrary to what is predicted by simple self-interested utility maximization. Eavey and Miller (1984), building on the design of Isaac and Plott (1978), found that when the core and the fair alternative were distinct, groups frequently selected the fair alternative. However, their experiments were conducted face-to-face (with open-ended discussion) and used procedures that gave a single member proposal power, and it is unclear how much these factors contributed to the observed levels of fairness. The experiment designed by Sauermann and Kaiser (2010) eliminates both of these procedural elements and finds evidence for fairness behavior consistent with the "equity-reciprocity-competition" model of Bolton and Ockenfels (2000).[6] In contrast to this literature, we consider settings without a unique core (or without a core at all), and we explicitly manipulate the availability of communication.

Experiments on redistribution also show that voting behavior reflects concern for others rather than pure self-interest (Ackert, Martinez-Vazquez and Rider, 2007; Tyran and Sausgruber, 2006). These effects, however, can be modified by pivot probabilities (Tyran and Sausgruber, 2006), whether the income is earned (Balafoutas et al., 2013), and the underlying distribution of income (Höchtl, Sausgruber and Tyran, 2012). In particular, Höchtl et al. find that fairness-oriented inequity aversion is more likely to matter if the "rich" are in the majority. By contrast, when the majority is "poor," redistribution outcomes look as if all voters were exclusively motivated by self-interest. Paetzel, Sausgruber and Traub (2014) obtain a similar result: individuals who stand to gain from economic reforms will vote against if they are sufficiently inequity averse. In contrast to this literature, our environment is ex ante symmetric, which allows us to abstract away from issues of entitlement. Because entitlements can bias behavior against redistribution, our setup presents a harder test for fairness.[7]

Our paper also relates to the experimental literature on legislative bargaining. These studies employ the divide-a-dollar game with groups of more than two members and some version of the bargaining protocol of Baron and Ferejohn (1989). Studies in this literature emphasize distributional issues more than the committee voting experiments above and generally focus on testing the predictions of stationary subgame perfect equilibria. Just like in committee decision-making experiments, the outcomes of bargaining in these experiments are more egalitarian than equilibrium theories predict (Diermeier and Morton, 2005; Fréchette, Kagel and Lehrer, 2003).

The introduction of communication into the legislative bargaining framework, however, can lead to greater inequality, with outcomes closer to equilibrium predictions. In Agranov and Tergiman (2014), proposers extract a significantly higher share of resources with private communication than without communication. The effect is primarily through voters competing with each other to get the proposer to include them in the winning coalition, while arguing for a zero allocation for redundant voters. In a related experiment, with a

[6]Also see Sauermann (2017) in a spatial setting like that in Fiorina and Plott (1978).

[7]For example, Diermeier and Gailmard (2006) demonstrate that entitlements matter in a majoritarian bargaining experiment.

communication setting where it is easier for blocking coalitions to form, Baranski and Kagel (2015) find an even stronger effect. The communication protocol also matters in a setting with repeated decisions: Baron, Bowen and Nunnari (2017) find that public communication leads to more universal coalitions. Our study differs from bargaining experiments in that we focus purely on voting with exogenously given alternatives, thus eliminating complexities that arise due to strategic aspects of designing proposals (i.e., proposer and amendment power).

In social dilemma and public goods environments, voting and communication have also been found to increase efficiency while also increasing equality. The effect of communication on efficiency is well established (e.g., Dawes, McTavish and Shaklee, 1977; Isaac and Walker, 1988; Ostrom, Walker and Gardner, 1992). In terms of voting, Walker et al. (2000) find that majority rule generates fair, symmetric contributions rather than minimal winning coalitions. Hamman, Weber and Woon (2011) also surprisingly find that electing a dictator by majority rule generates full efficiency and hence full equality, rather than majority tyranny, and that the effect of voting is more persistent than that of communication alone. In a setting combining communication with proposals and direct voting, Pronin and Woon (2017) find that groups initially choose efficient, universal allocations but that majority tyranny emerges over time as the more selfish members of each group learn to coordinate with each other.

The positive effect of communication in the public goods literature on cooperation and other-regarding behavior can be contrasted with the role of communication in team play experiments, where the results are generally more mixed but behavior is often consistent with equilibrium and self-interest (as in the legislative bargaining experiments). For example, teams learn to play strategically faster than individuals (Cooper and Kagel, 2005) and are generally more cognitively sophisticated and, as a consequence, more self-interested (Charness and Sutter, 2012). But other work finds that teams can be dominated by the more altruistic member (Cason and Mui, 1997) and that teams tend to be less spiteful, more altruistic, and less inequity averse in the domain of disadvantageous inequality (Balafoutas et al., 2014). Our setting falls somewhere between these extremes of single-group public goods games and competitive team games.

3 Experimental Design and Procedures

3.1 Overview

The experiment consists of three parts, and in each part there is a series of rounds. Subjects are randomly assigned to groups of $N = 5$ in each round, and groups are randomly rematched in every round (with replacement). Payoffs throughout the experiment are denominated in "points," and the decision task in each round is to choose an allocation of points for the group. Each point is worth \$0.75 (U.S. dollars), and we use a random round payment mechanism (where one round is randomly selected for payment). In addition, subjects are paid a fixed bonus of \$2 for completing the experiment and a \$5 show-up fee, so the minimum payment is \$7 for subjects who complete the experiment but earn 0 points.

The design features both within and between subjects manipulations. Within sessions, each part of the experiment varies the decision mechanism. We refer to the decision mechanism in Part 1 as the *Random Dictator* mechanism (10 rounds), in Part 2 as the *Pairwise Voting* mechanism (10 rounds), and in Part 3 as the *Coalition Voting* mechanism (16 rounds). The only difference between sessions is in the availability of free-form communication. In the *Chat* treatment, subjects have 75 seconds to communicate via a free-form public chat window prior to each vote, whereas no such communication is possible in the baseline *No Chat* condition. Other than the possibility of communication, all of the other details of the experiment (e.g., order and number of parts, etc) are exactly the same in each session.

We conducted our experiment at the Pittsburgh Experimental Economics Laboratory (PEEL) in April 2018 and programmed the interface in z-tree (Fischbacher, 2007). Participants were drawn from PEEL's subject pool and were primarily undergraduates recruited from a variety of classes taught in the University of Pittsburgh's Dietrich School of Arts and Sciences. We conducted three sessions (two sessions with 15 subjects, one session with 10 subjects) of each treatment, with 40 subjects in each treatment, for a total of 80 subjects.

3.2 Random Dictator

The purpose of the *Random Dictator* mechanism in Part 1 is to elicit subjects' social preferences in the absence of collective choice or any other strategic considerations. Measuring preferences is important for two reasons. First, it allows us to compare dictator choices to the same choices in voting situations to assess whether the procedural or social context has any behavioral effect on individual choices. Second, having individual measures of social preferences will allow us to control for unobserved heterogeneity in the composition of our small groups that is likely to affect group decisions.

Each participant chooses between two options, a *fair* allocation and a *majority* allocation. The fair allocation is an equal division that gives a payoff of y to every group member. The majority allocation is an unequal division that benefits a majority of group members at the expense of a minority. There are two possible kinds of majority allocations. A *symmetric* majority allocation provides x to three group members and z to two group members, where $x > y > z$. An *asymmetric* majority allocation gives a higher amount $w > x$ to one group member, x to two group members, and z to the remaining group members, where $w > x > y > z$.

There are a total of 10 rounds in Part 1, 6 rounds where the majority allocation is symmetric and 4 rounds where it is asymmetric. In every round in Part 1, each subject is always assigned the payoff x for the majority allocation, so a strictly payoff-maximizing subject will always prefer the majority allocation to the fair allocation. As discussed below, varying the relative values of w, x, y and z allows us infer a subject's degree of inequity aversion from their set of Part 1 choices. We hold the total sum of points for majority allocations constant across all rounds of the experiment such that $3x+2z = w+2x+2z = 110$, and vary y varies such that sometimes y maximizes social welfare ($y = 24$) and sometimes it is inefficient ($y = 20$). All subjects make a decision in every round, and each group member is equally likely to be selected as the dictator if a round from Part 1 counts for payment. If they are not selected as the dictator, then they are randomly assigned to one of the other payoffs from the allocation.[8]

[8]That is, if the random dictator i chooses the majority allocation, then each $j \neq i$ has a $\frac{1}{2}$ chance of

Subjects receive no feedback in Part 1, so they do not know whether or not they are the dictator or what the choices of other group members were. This ensures that no subject knows anything else about the preferences of other subjects when they begin Part 2. Furthermore, there is no communication in Part 1 regardless of treatment, and other than knowing that the experiment has multiple parts, subjects are not provided any details of the voting procedures in Parts 2 and 3. Thus, we also ensure that we obtain measures of social preferences that are not affected by either voting or communication.

3.3 Pairwise Voting

In Part 2, groups face a choice between a fair allocation and a majority allocation in each round, as they did in Part 1, with the group's allocation decided by a majority vote rather than by a random dictator. The main purpose of using the pairwise voting mechanism is to investigate the effect of communication in the absence of coalition and coordination incentives (or other strategic considerations). Before each round, each member in a group is randomly assigned to one of the payoffs for the majority allocation (i.e., three to x and two to z in the symmetric case, one to w, two to x, and two to z in the asymmetric case). Thus, any given subject will sometimes be assigned to the majority and sometimes to the minority. Subjects simultaneously vote for one of the two options and abstentions are not allowed, so each group only needs to take one vote in each round. Subjects do not receive any feedback about the outcomes of the votes or about how any other group members voted.[9]

3.4 Coalition Voting

In Part 3, we introduce a coordination problem by expanding the number of alternatives from two to six. Of the six options, one is the fair allocation and the other five are majority allocations that vary which group members receive the higher majority payoffs. Each group member is assigned a majority payoff for three of the majority allocations and the low minority payoff for two of them. The upper portion of Table 1 shows an example of the configuration of alternatives when the majority allocations are symmetric. When majority allocations are asymmetric, there is exactly one alternative that gives each member a payoff w and two that give the payoff x; this is shown in the bottom portion of Table 1.

Voting is simultaneous, and group decisions in Part 3 require an absolute majority of the group to vote for the same option. This is the same voting rule as in Part 2 except that the expansion of the choice set from two to six alternatives means that it is possible that no alternative receives a majority. The *Coalition Voting* procedure gives groups two chances to reach a majority decision so that coordination is not impossible. If there is no majority on the first ballot, a group takes a second vote. If there is no majority on the second ballot,

receiving x and $\frac{1}{2}$ chance of receiving z if the allocation is symmetric, and a $\frac{1}{4}$ chance of receiving w, a $\frac{1}{4}$ chance of receiving x, and a $\frac{1}{2}$ chance of receiving z if the allocation is asymmetric.

[9]Once communication is introduced, it is clearly not possible to prevent subjects having information about other group members exchanged via the chat messages. While a subject could talk about their voting history, such information is nevertheless cheap talk and unverifiable, so we are not concerned that such informational differences between the *Chat* and *No Chat Pairwise Voting* mechanisms would have any significant effect on observable differences between the *Chat* and *No Chat Coalition Voting* outcomes.

Table 1: Example of Alternatives for Coalition Voting (Part 3)

Symmetric Majorities (Weak Stability)

	Red	Green	Blue	Yellow	Grey
Option A	30	30	30	10	10
Option B	10	30	30	30	10
Option C	10	10	30	30	30
Option D	30	10	10	30	30
Option E	30	30	10	10	30
Option F	20	20	20	20	20

Asymmetric Majorities (Strong Instability)

	Red	Green	Blue	Yellow	Grey
Option G	34	28	28	10	10
Option H	10	34	28	28	10
Option I	10	10	34	28	28
Option J	28	10	10	34	28
Option K	28	28	10	10	34
Option L	20	20	20	20	20

then the default allocation is 0 points for each group member. After each ballot, subjects receive feedback about the number of votes cast for each alternative but do not learn how any individual group members voted.

While our design provides some opportunities to coordinate, we took great care to ensure that subjects would not be able to rely on simple cues, labels, or irrelevant features of the environment to do so. First, members of each group are assigned a color to identify them rather than a number. This prevents subjects from forming coalitions based on numerical patterns (e.g., 1-2-3, or 3-4-5). Second, we randomly assigned letters to label the alternatives in each round to disrupt any possibility that subjects could coordinate on a specific label. Third, we varied the order of the rows and columns when presenting the options to each group member. This prevents subjects from using the player or row order as a coordinating device (e.g., players in the first three columns forming a coalition). We also varied the order of the rows in such a way that subjects could not coordinate by voting for the top-most (or bottom-most) alternative in which they were a member of the majority coalition; if they did so, each alternative would receive exactly one vote.

4 Theoretical Discussion and Hypotheses

4.1 Social Preferences and Inequality Aversion

Subjects strictly motivated by material self-interest will always prefer to choose or vote for a majority outcome as long as they are assigned to a majority payoff, since $w > x > y$.

However, it is plausible that subjects may choose the fair outcome at the expense of their own monetary payoff if they have sufficiently strong preferences for fairness. Such preferences are also likely to exhibit considerable heterogeneity, which our design accounts for by using the *Random Dictator* choices to measure preferences as well as by varying the payoff values in different rounds.

We adopt the model of inequity aversion proposed by Fehr and Schmidt (1999, hereafter FS), which has been applied to voting and group decision making in previous experimental studies (e.g., Tyran and Sausgruber, 2006). In the FS model, an individual i's preference for an allocation depends on their own payoff x_i and the differences between their own payoff and others' payoffs x_j, $j \neq i$, represented by the utility function

$$u_i(x) = x_i - \frac{1}{n-1} \sum_{j \neq i} (\alpha_i \max\{x_j - x_i, 0\} + \beta_i \max\{x_i - x_j, 0\}) \tag{1}$$

where n is the number of group members, α_i is a parameter that captures the degree of aversion to disadvantageous inequality (envy), and β_i parameterizes aversion to advantageous inequality (guilt).

Given the majority payoff x, minority payoff z, and the fair payoff y, an individual will prefer the fair outcome to the symmetric majority outcome if

$$y \geq x - \beta_i \left(\frac{x - z}{2} \right) .$$

If individual i chooses the fair outcome, then we can infer from that choice that $\beta_i \geq \beta^*$, while we can infer from the choice of majority outcome that $\beta_i \leq \beta^*$, where

$$\beta^* = \frac{2x - 2y}{x - z} . \tag{2}$$

The payoff values for each round of the *Random Dictator* task are shown in Table 2, with the corresponding values of β^* computed using equation (2 shown for rounds 1-6).

Table 2: Payoffs for Random Dictator Allocations

Round	w	x	z	y	β^*
1	–	26	16	24	0.40
2	–	26	16	20	1.20
3	–	30	10	24	0.60
4	–	30	10	20	1.00
5	–	34	4	24	0.67
6	–	34	4	20	0.93
7	28	25	16	24	0.19
8	34	28	10	24	0.38
9	36	33	4	24	0.59
10	38	32	4	24	0.52

In principle, we can also infer individual i's value of α_i from their choices between fair and asymmetric majority allocations when their majority allocation payoff is x, as it is in the *Random Dictator* mechanism, and provided that we fix the value of β_i inferred from their choices between fair and symmetric allocations. However, we do not have sufficient variation in our parameter values to be able to identify α_i with much accuracy or precision. We therefore make the following simplifications in our analysis. First, following FS, we assume that $\alpha_i \geq \beta_i$ for all subjects. Subject i will choose the fair option over the asymmetric majority option if

$$y \geq x - \alpha_i \left(\frac{w - x}{4} \right) - \beta_i \left(\frac{x - z}{2} \right) . \tag{3}$$

If a subject chooses the fair allocation when the estimated value of β_i would otherwise predict an unfair outcome, then we can infer that i is more responsive to envy (disadvantageous inequality) than to guilt (advantageous inequality), such that

$$\alpha_i \geq \frac{4x - 4y - 2\beta_i(x - z)}{w - x} . \tag{4}$$

Otherwise, we assume that $\alpha_i = \beta_i$. Substituting into equation (3), observing the fair outcome implies

$$\beta_i \geq \frac{4x - 4y}{w + x - 2z} , \tag{5}$$

and the thresholds β^* in Table 2 for rounds 7-10 are computed using the expression on the right-hand side of (5).

4.2 Communication and Pairwise Voting

The *Pairwise Voting* rounds involve a simultaneous voting game, and because such games have multiple equilibria in which players are not pivotal, individual choices for both fair as well as majority outcomes can be rationalized given the right configuration of others' actions. It is standard practice to rule out weakly dominated voting strategies and to focus on predicting voting behavior in equilibria where group members vote as if they are pivotal. Thus, with two alternatives, the choice situation faced by an individual in a *Pairwise Voting* round is nearly identical to the choice situation in a *Random Dictator* round. In the absence of communication, we therefore expect subjects' votes to reflect the same underlying preferences for fairness in the *No Chat Pairwise Voting* mechanism as in the *No Chat Random Dictator* mechanism.[10]

From a strategic perspective, introducing discussion should have no effect on the fairness of voting behavior or majority decisions. This is because *Pairwise Voting* is strategically uncomplicated. Compared to *Coalition Voting*, there is no coordination problem with *Pairwise*

[10] Recall that subjects receive no feedback in either task in the *No Chat* condition, so while it is possible that voting involves expressive motivations, we think it is unlikely. The only potential for strategic differences between the two situations lies in the pivot probabilities. In *Random Dictator*, the probability a player is pivotal (conditional on the round counting for payment) is fixed exogenously at $\frac{1}{5}$, whereas in *Pairwise Voting* it is uncontrolled and endogenous to the group and their behavior. Nevertheless, if subjects vote as if they were pivotal in both parts, differences in beliefs about pivotality should not produce any differences in behavior.

Voting that pre-play communication solves, nor is there any kind of social dilemma or co-operation problem. Even if there is incomplete information about others' social preferences, such information is not relevant to whether or not one's own vote is a weakly undominated action. Instead, to the extent that discussion has any kind of effect, we contend it must be a psychological one.

We speculate that there may be two kinds of psychological effects. One is that discussion may elicit or clarify social norms (Bicchieri, 2002, 2006). By social norms, we do not mean specific behaviors enforced by instrumental punishment strategies, as in repeated social dilemma games, but a more general notion of shared beliefs about what rules of behavior are appropriate in a given situation.[11] If individuals perceive there to be ambiguity about the appropriate norm in our voting context, discussion may serve to clarify what is appropriate and therefore resolve this ambiguity. This prediction is in line with Bicchieri and Lev-On (2007), who show that communication about a social dilemma can focus agents on pro-social norms (particularly the norm of promise keeping); when it does so, communication generates a normative environment that is conducive to cooperation.

Another psychological mechanism may be by enhancing social preferences such as inequity aversion or guilt aversion, as in Charness and Dufwenberg (2006). Here, our argument is based on limited cognition or a disconnect between cognition and emotion, roughly sketched as follows. When thinking about payoffs on their own, individuals underestimate their own social preferences because such thinking is a matter of individual, rather than social, cognition. But when interacting with others in a group context, the process of communication and discussion unconsciously activates the full social aspects of the interaction, thereby increasing the salience of their latent social preferences. In terms of the FS model, we can think of discussion as effectively increasing the magnitudes of the inequity aversion parameters.

In either case, whether the underlying mechanism is the activation of a social norm or the activation of social preferences, the starkness of our experimental design and the lack of strategic concerns in the pairwise voting treatment makes the choice between majority tyranny and fairness especially salient. This leads us to formulate the following hypothesis:

Hypothesis 1. *In rounds with two alternatives* (Pairwise Voting)*, if public discussion increases the salience of social norms or other-regarding preferences, then we will observe (a) an increase in the likelihood that individuals vote for the fair outcome and (b) an increase in the likelihood that the fair alternative is chosen by the group.*

4.3 Communication and Coalitional Stability

As with *Pairwise Voting*, the *Coalition Voting* mechanism involves up to two periods of a simultaneous voting game. With multiple alternatives, however, we cannot rely on the elimination of weakly dominated strategies to make behavioral predictions based on a subject's underlying preference for or against fair outcomes. To fix ideas, consider first the one-shot version of the voting game, and let the alternatives be as given in the top of Table 1, where

[11] In a larger social context, such norms could be internalized as the result of long-term, repeated social interactions. Alternatively, individuals may have preferences for conformity and then comply with a norm because they perceive it as the "thing to do."

the majority options are symmetric (with the fair option F). Suppose that Green and Blue vote for Option A, Yellow votes for C, and Grey votes for D. Even if Red is highly inequity averse (high β_i), she would vote for Option A because it is better to obtain the majority payoff than failing to obtain a majority (and getting a payoff of 0). Indeed, Red would vote for an option that gives her the minority payoff if doing so avoids a failed majority vote. Thus, any vote can be rationalized in the *Coalition Voting* game depending on the votes of other group members, and so strategic considerations clearly come into play.

We next consider symmetric equilibria of the one-shot game to guide our expectations for when the game is played in the absence of communication, further narrowing our attention to equilibria with two properties that we believe reflect natural behavior in our experimental setting. The first is that the equilibrium strategy profile should generate a positive probability of producing a majority decision. This rules out equilibria in which each group member votes for a different majority allocation with certainty. The second property is that strategies should reflect subjects' inability to coordinate using the labels, positions of alternatives, or any other payoff-irrelevant public signals. Thus, although it is clearly an equilibrium for all subjects to vote for Option A, the absence of a coordination device makes such a pure strategy equilibrium unlikely.

We believe two equilibria with these properties are most likely to be used. One is the pure strategy equilibrium in which every member votes for the fair alternative. In this case, the fair alternative is focal and this equilibrium ensures that a majority decision is reached with certainty.[12] The other is the mixed strategy equilibrium in which every member votes for the options that give them the majority payoff with equal probability. The latter equilibrium reflects the notion that group members seek the majority payoff, but randomize their choice across the majority alternatives because they are unable to coordinate. Note that this mixed strategy equilibrium is highly unlikely to produce a successful majority vote: the probability that any particular option receives a majority is $\left(\frac{1}{3}\right)^3 = \frac{1}{27}$, so with five such options the probability of a majority is only $\frac{5}{27} \approx 18.5\%$. Given our parameters, risk-neutral subjects will ex ante prefer the fair equilibrium in a one-shot game.[13]

But because the *Coalition Voting* mechanism allows for two ballots, group members can attempt to coordinate on a majority outcome on the first ballot without suffering the cost of a failed majority. Provided that subjects are sufficiently self-interested, they may go about trying to form a coalition by randomizing their votes over their majority options on the first ballot, just as in the mixed strategy equilibrium of the one-shot game. If they do so, then even if a majority does not form on the first ballot, group members can still use the realized votes on the first ballot to coordinate. For example, if no option receives a majority but Option A receives two votes on the first ballot (e.g., Red and Green), then Blue will weakly prefer to switch to voting for Option A in order to reach a majority. In this way, the results from the first ballot provide a potential coordination device. The probability that a coalition

[12] However, the equilibrium is only efficient (maximizes social welfare) if $y = 24$. When $y = 20$, the fair equilibrium is inefficient.

[13] Because each member receives the majority payoff x for 3 options and the minority payoff z for two, the expected payoff from this mixed strategy equilibrium is $\frac{5}{27}\left(\frac{3}{5}x + \frac{2}{5}z\right)$. For every round in the experiment we hold constant $3x + 2z = 110$, so the expected payoff is $\frac{110}{27} \approx 4$ while the lowest value of y in the experiment is 20.

will form in this way in the second round is approximately 80%.[14] The asymmetric majority payoffs complicate this strategic calculus somewhat: to the extent that a member seeks the high payoff w, the asymmetry should make coordination more difficult.

We expect communication to have different effects in *Coalition Voting* than in the *Pairwise Voting* mechanism. First, and most obviously, we expect much of the discussion to revolve around coordination, thus leading to greater majority tyranny outcomes. While we still expect discussion to raise the salience of social preferences as in *Pairwise Voting* (e.g., when the fair alternative is suggested or mentioned by other-regarding members), we anticipate that the coordination effect should dominate. This is because, unlike in *Pairwise Voting*, each group member has three options for which they are members of a majority coalition, and since no group member is exogenously assigned only to the minority payoff, there is no longer a self-interested motivation to argue for the fair outcome. Moreover, to the extent that there is heterogeneity in inequity aversion that complicates coordination, free-form discussion allows more selfish group members to identify themselves and to form a coalition with each other, thereby excluding the other-regarding members of their group. This argument generates the following hypothesis:

Hypothesis 2. *When groups face multiple alternatives* (Coalition Voting)*, if public discussion facilitates coordination (more than it enhances the salience of social preferences), then we will observe (a) an increase in the likelihood of majority tyranny outcomes and (b) decrease in the number of ballots groups need to reach a decision.*

When there is discussion, we also expect there to be greater competition when majority allocations are asymmetric than when they are symmetric. Indeed, we intentionally vary the symmetry of allocations and configured the alternatives in such a way as to vary the instability of majority rule. The argument relies on the concept of the core from cooperative game theory (or equivalently, social choice theory), where the core is the set of undominated alternatives. Option A dominates Option B if there exists a coalition $\mathcal{C}$ that can implement A over B (in this case, a majority) and members of $\mathcal{C}$ unanimously (strictly) prefer A to B. Assuming self-interested players, notice that the fair alternative is dominated by *every* unfair majority allocation, regardless of whether it is symmetric or asymmetric. In other words, the fair alternative is a Condorcet loser.

When majority allocations are symmetric, then every such allocation is undominated and hence the core has multiple alternatives. Once a coalition forms and settles on a symmetric majority allocation, there is no reason why any member of the majority coalition will want to deviate to a different coalition. Hence, majority rule is stable, although only weakly so because each alternative in the core is weakly preferred to every other by some majority. We

[14] The analytical calculation of the probability that a coalition will form is complicated by the way we configured the table of payoffs (i.e., only 5 out of 20 possible three-person majority coalitions are feasible and each individual is a member of 3 such coalitions), so we used simulations to compute the probability of coalition formation in a two-round game. These complications are compounded by the possibility that some individuals prefer the fair outcome. If the probability an agent is a "fair type" is $p = 0.4$, then the chance of forming a majority coalition in the first round increases to 35% in our simulations because there is a 32% probability a majority of the group prefers the fair outcome (while the probability of majority coalition formation in the first round declines to 3%). In this case, the overall probability of a majority tyranny outcome drops to 46% (3% in the first period, 43% in the second period).

therefore refer to *Coalition Voting* rounds with symmetric majority allocations as the "weak stability" condition.

In contrast, when majority allocations are asymmetric, then *none* of the alternatives are undominated. Consider the configuration of alternatives in the bottom part of Table 1. Every option is dominated by some other option. For example, the coalition Red, Green, and Blue prefer G to J, so G dominates J. But then Blue, Yellow, and Grey prefer I to G, so I dominates G. Indeed, there is a majority rule cycle: G is preferred to J, J is preferred to H, H is preferred to K, K is preferred to I, I is preferred to G. Since majority rule is stable, we refer to *Coalition Voting* with asymmetric majorities as the "strong instability" condition.

In the strong instability condition, we expect group members to engage in greater competition in discussion than in the weak instability case. If a majority coalition comes to a (tentative) agreement in the strong instability condition, the losing minority can always pick off one of the members of the majority by offering them the higher majority payoff. For example, if Red, Green, and Blue agree to G, then Yellow and Grey can try to obtain I by agreeing to the payoff 28 for themselves and offering Blue the higher payoff 34. If competition continues in this fashion, then groups may "settle" on the fair alternative rather than risking a failed vote. This leads to another hypothesis:

Hypothesis 3. *When there is public discussion, groups are less likely to implement unfair majority outcomes due to greater competition in the strong instability condition (asymmetric majority allocations) than in the weak stability conditions (symmetric allocations).*

5 Results

5.1 Dictator Choices and Fairness Preferences

We begin by examining subjects' *Random Dictator* choices. Our subjects exhibit a considerable degree of inequality aversion: across all subjects and rounds in Part 1, subjects chose the fair option 38.6% of the time. Not surprisingly, we also find heterogeneity in subjects' revealed preferences for fairness (see Figure 1). At the extremes, 24% *never* chose a fair outcome (the modal subject), while 10% of subjects *always* chose the fair outcome. Most of our subjects appear to be primarily self-interested, as the median subject chose 3 fair options out of 10 decisions. Nevertheless, a sizeable portion cared at least a little about fairness, and many cared a lot. Modeling preferences as being purely self-interested is therefore clearly not appropriate for our distributional choice setting.

Figure 2 shows the proportion of fair choices disaggregated by round as a function of the inequality between the fair and majority options, where the inequality between the options is measured as the threshold level of inequality aversion required to prefer the fair option in the FS model (the values of β^* given in Table 2). A majority of subjects chose the fair outcome when the FS only requires mild inequality aversion to do so (63% of subjects choose the fair outcome when $\beta^* = 0.19$), whereas far fewer subjects chose the fair option when the FS model requires a strong degree of inequality aversion (20% chose the fair option when $\beta^* = 1.2$). The negative relationship shown in Figure 2 between β^* (horizontal axis) and fair choices (vertical axis) suggests that the FS model is a reasonable, albeit imperfect, way of

Table 3: Distribution of Estimated Inequity Aversion Parameters

	$\underline{\beta_i}$	$\overline{\beta_i}$	β_i Sym.	β_i All
< 0.4	38%	58%	59%	71%
$[0.4, 0.6]$	9%	16%	14%	7%
$[0.6, 0.93]$	11%	9%	2%	0%
$[0.93, 1.2]$	23%	6%	8%	2%
> 1.2	20%	11%	18%	19%
# Subjects	80	80	51	42

modeling social preferences.[15]

We next turn to computing individual-specific measures of inequity aversion. Relying on the principle of revealed preference, we employ the following procedure. For each round k, let β^*_k denote the corresponding threshold defined by equation (2), as shown in Table 2. Every fair choice made by subject i implies an inequality aversion parameter greater than the threshold, $\beta_i > \beta^*_k$. Thus, define the maximum value of β^*_k for all of i's fair choices to be $\underline{\beta_i}$. This is the lower bound for β_i because i's choices implied $\beta_i \geq \underline{\beta_i}$. Similarly, the upper bound $\overline{\beta_i}$ is computed as the minimum value of β^*_k for the rounds k in which i chooses the majority option, since their choices revealed $\beta_i \leq \overline{\beta_i}$. Subject i's behavior is completely consistent with the FS model if $\underline{\beta_i} < \overline{\beta_i}$.

Table 3 shows the distribution of estimated inequality parameters. We estimate $\underline{\beta_i}$ and $\overline{\beta_i}$ using only the choices in rounds 1-6, when the majority option is symmetric and disadvantageous inequality aversion, α_i, is irrelevant. We cannot make perfect comparisons to previous estimates of inequality aversion since our β^* thresholds are different from those in previous work, which also vary widely: Fehr and Schmidt (1999) estimate that 30% of individuals have $\beta_i = 0$, 30% have $\beta_i = 0.25$, and 40% have $\beta_i = 0.6$, while Blanco, Engelmann and Normann (2011) find 56% of their subjects fall in the upper range ($\beta_i \geq 0.5$) and Yang, Onderstal and Schram (2016) find 60% of their subjects fall in the lower range ($\beta < 0.125$). Using our lower-bound measure, the distribution of inequality aversion in our subjects appears to be consistent with Blanco, Engelmann and Normann (2011), as we can classify 62% of our subjects as having $\underline{\beta_i} > 0.4$. However, the distribution of our upper-bound estimates appears to be more consistent with the original FS estimates, as 42% of subjects are classified in the upper range ($\overline{\beta_i} > 0.4$).

Interestingly, 51 (64%) of our subjects make choices that are entirely consistent with FS (such that we estimate $\underline{\beta_i} < \overline{\beta_i}$). The distribution of inequality parameters for these subjects (third column) closely resembles our upper-bound estimate, which suggests that

[15] It is also apparent from the uptick in the middle of Figure 2 that the FS model does not perfectly fit the data. There may be several reasons for this. One is simply that subjects make random errors, so incorporating the FS framework into a random utility model might fit the data better. Another may be due to the loss of fit from our simplification of the FS model from a two-parameter model (α, β) to a one-parameter model ($\alpha = \beta$). It may also be that an alternative model of social preferences such as the ERC model of Bolton and Ockenfels (2000) or a model that also incorporates a concern for efficiency would be more appropriate. Nevertheless, the FS model is consistent enough to be useful for the analysis.

Figure 1: Subject-Level Distribution of Fair Choices

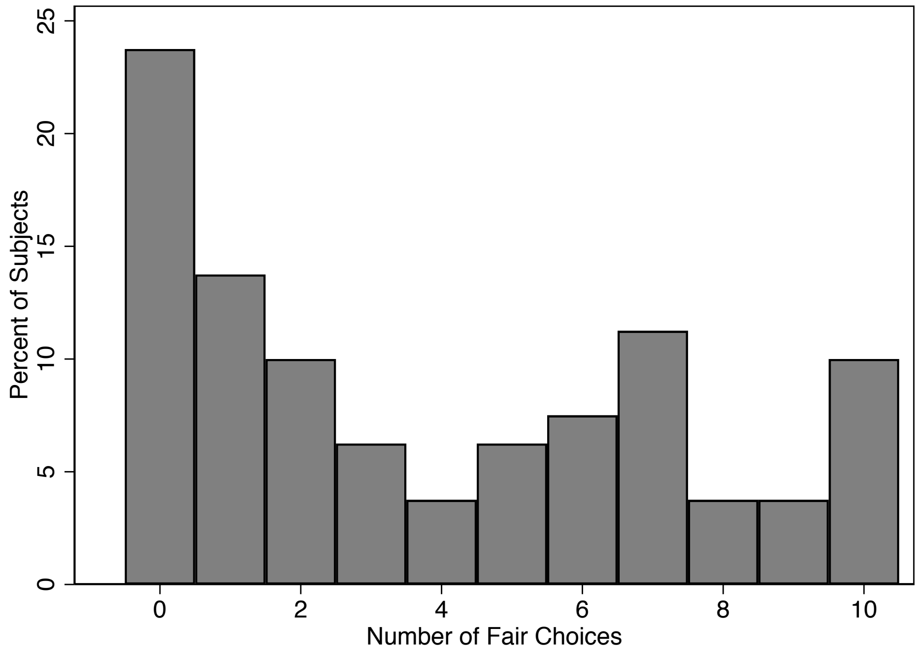
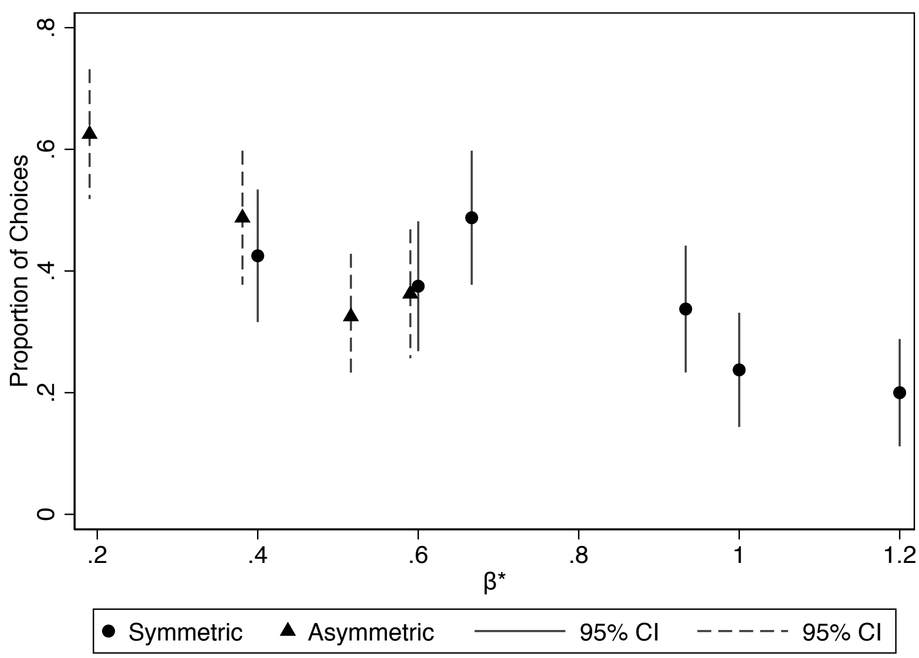


Figure 2: Fair Options Chosen in Random Dictator Rounds



the upper-bound measure may be a better estimate of inequality aversion than the lower-bound estimate. For comparison, the last column in Table 3 shows the distribution for subjects whose behavior is consistent across all rounds in Part 1 under the assumption that $\alpha_i = \beta_i$. While there is some loss of consistency (suggesting that $\alpha_i \neq \beta_i$ for 9 subjects), that 42 out of 51 subjects' choices remain consistent with FS under this assumption suggests that it is a reasonable approximation for our purposes.

Now that we have a way of accounting for individual fairness preferences, which suggests that a non-trivial fraction of subjects will vote for the fair option in the absence of communication, we turn to our main results regarding the effect of discussion on the fairness of majority rule decisions.

5.2 Effects of Discussion on Votes and Outcomes

The main effects of discussion on the fairness of voting and majority decisions are shown in Table 4, which compares the overall proportions of fair choices for individuals and groups by treatment (*No Chat* versus *Chat*) and decision mechanism (*Pairwise Voting* versus *Coalition Voting*). We find that discussion can both increase as well as decrease the fairness of majority voting. The direction of the effect depends on the context. When there are only two alternatives, discussion increases the proportion of individual votes for fair outcomes without affecting the fairness of group decisions, providing partial support for Hypothesis 1. The effect on *Pairwise Voting* is consistent with our argument that discussion enhances the social or normative dimensions of group decisions. In contrast, when there are multiple alternatives, discussion decreases the proportion of groups that choose the fair outcome without affecting individual voting behavior. The effect on *Coalition Voting* is fully consistent with Hypothesis 2 and our expectation that subjects would use communication to solve strategic coordination problems. However, we find no evidence that the symmetry of majority allocations affects majority tyranny, so there is no support for Hypothesis 3 and the role of majority rule instability.

As a baseline reference for the underlying level of fairness preferences in our sample, the first row of Table 4 shows that the percentage of fair options chosen by subjects in the *Random Dictator* part of the experiment is around 38-40%. This figure does not vary by treatment. In *Pairwise Voting* rounds, the proportion of subjects choosing the fair outcome is noticeably higher, ranging from 66% to 79%. However, a direct comparison between these overall rates in Part 1 and Part 2 may be misleading for a couple of reasons. One is that the payoff values for several rounds in Parts 1 and 2 are not the same, with inequality between options generally lower in Part 2 than Part 1.[16] That is, the average value of β^* for the options in Part 2 is lower than Part 1, which will lead more subjects to vote for fair options in Part 2. The other is that two members of each group are assigned to the lowest minority payoff z in each round of Part 2, and both self-interest and inequality aversion will lead these subjects to vote for the fair option. When we disaggregate votes in Part 2 according to whether group members are assigned to the majority or minority payoff, we find that members assigned to the minority vote for the fair option almost all of the time (98-99%).

The behavior of interest in *Pairwise Voting* rounds is the voting behavior of group mem-

[16] For the full list of payoffs and corresponding rounds, see Table A1.

Table 4: Fairness in Voting Behavior and Majority Decisions

	Individual Votes				Group Decisions			
	No Chat	Chat	$p < .05$	N	No Chat	Chat	$p < .05$	N
Dictator (Part 1)	39.5%	37.8%		800				
Pairwise (Part 2)	66.3%	79.0%	*	800	80.0%	86.3%		160
Majority	44.6%	66.7%	*	480				
Minority	98.8%	97.5%		320				
Coalition (Part 3)	73.6%	71.7%		1,445	99.2%	71.9%	*	256
Symmetric	71.8%	70.2%		725	98.4%	71.9%	*	128
Asymmetric	75.4%	73.2%		720	100.0%	71.9%	*	128
First ballot	70.0%	71.4%		1,280	100%	71.4%	*	223
Second ballot	88.4%	90.0%		146	96.8%	100.0%		33

bers that are (exogenously) assigned to the majority payoff. When communication is not allowed, these majority members vote for the fair outcome only slightly more often (45% of the time) than subjects who chose the fair option in *Random Dictator* rounds. By contrast, free-form discussion prior to voting causes a marked and statistically significant increase in voting for fair options by more than 20 percentage points (to 67%).

When we look at the corresponding majority decisions reached by groups in Part 2 (the right half of Table 4), the increase in fair voting translates only into a small increase in the probability that a group will choose a fair outcome. However, this increase (about 6 percentage points) is not statistically significant. Discussion has a small effect on outcomes in the *Pairwise Voting* mechanism because groups are already choosing fair outcomes at high rates. Given that the two minority members will almost certainly vote for the fair outcome, it only takes one majority member to vote for the fair outcome to generate a fair majority decision, and the percentage of fair outcomes (80-86%) is in line with what we would expect if majority members voted for fair outcomes with the same probability that they chose fair outcomes in the *Random Dictator* rounds. Indeed, the only tangible effect of the increase in fair voting behavior is to increase the size of the majority voting in favor of the fair outcome from an average of 3.5 in the *No Chat* treatment to 4.1 in the *Chat* treatment (a statistically significant increase in 0.6 votes for the fair outcome).

With multiple alternatives in Part 3 (*Coalition Voting*), individual subjects chose fair outcomes at much higher rates (72-74%) than they did in either Part 1 (as random dictators) or in Part 2 (when assigned the majority payoff). Although we again caution that the payoff values we used for some rounds in Part 3 are not perfectly comparable to some of rounds in Part 1 and Part 2, we were surprised by the extent to which subjects exhibited fairness-oriented behavior in *Coalition Voting* rounds. We expected subjects to vote for majority outcomes at roughly the same rate as they chose them in Part 1 because with two ballots to reach a decision it is *costless* for a group to fail to reach a decision on the first ballot.

As we argued in our theoretical discussion, if individuals randomize their votes across the options that give them the majority payoff, there is a high probability that at least one option receives two votes on the first ballot, which would then allow a majority to coordinate on the second ballot. This does not appear to be what subjects did. On the first ballot, 70-71% of votes cast were for the fair option, and comparing individual behavior across treatments within *Coalition Voting* rounds, we find that discussion has no effect on the overall level of fair voting. Conditional on a failed first vote, individuals are much more likely to vote for the fair option (88-90%) with the prospect of a failed decision looming on the second ballot. Of course, reducing behavior to whether or not a member voted for the fair option obscures *which* majority option a member voted for.

When we look at group outcomes, there are several noteworthy findings. First, in the *No Chat* treatment, nearly every group chose the fair option. The only group that did not choose the fair option failed to reach a majority on the second ballot. Interestingly, 76% of decisions were made on the first ballot and 23% on the second ballot. This suggests that a non-trivial fraction of group members attempted to form coalitions in a way consistent with our theoretical expectations (by voting their underlying preference for majority options in the first round). But every group that then reached a decision chose the fair option on the second ballot, with the one exception. This was in contrast to our expectations because at least one option received two votes on the first ballot in 90% of groups. This suggests that at least some groups could have then coordinated on a majority outcome.

Second, we find that discussion has a substantial effect on outcomes consistent with our theoretical expectations. Discussion significantly increases the likelihood that majority coalitions will coordinate (from 0% to 28%). It also significantly reduces the time it takes for groups to reach a decision: 98% of all groups reach a decision on the first ballot in the *Chat* treatment. Thus, while discussion does not affect the overall probability that any particular individual will vote for a majority option, it does affect relatively selfish voters' ability to coordinate and thereby impose majority tyranny, exploiting the minority. The aggregate evidence therefore provides strong support for our coordination hypothesis.

Third, we find no effect of majority rule instability. Within each communication treatment, groups choose fair decisions at the same rate regardless of whether majority allocations are symmetric or asymmetric (98-99% in *No Chat* and 72% in *Chat*).

5.3 Regression Analysis

We present more complete statistical analyses in Tables 5 and 6 in the form of linear probability regression models, which control for differences in payoff values (across rounds and parts), heterogeneity in individual fairness preferences, and experience. The models also account for the non-independence of observations in the form of subject-level random effects and session-clustered standard errors. The analysis combines observations from both *Pairwise Voting* and *Coalition Voting* rounds, and the results in Table 5 support the conclusions we drew from the aggregate analysis. More specifically, discussion has a positive, statistically significant effect on the likelihood of voting for the fair option, with numerical estimates ranging from a 9.3% to 13.7% increase. We also find that while the probability of voting for the fair option is slightly lower in *Coalition Voting* than in *Pairwise Voting*, the difference is not statistically significant. Thus, we conclude that discussion has a positive effect on individual fairness behavior, but this effect is limited to the *Pairwise Voting* environment.

In terms of the other correlates of fair voting, the effect of payoff differences are consistent

Table 5: Fairness of Individual Voting Behavior

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Chat in Part 2	0.127**	0.137***	0.124***	0.105*	0.093*	0.132**	0.119**
	(0.042)	(0.040)	(0.036)	(0.046)	(0.044)	(0.041)	(0.037)
Chat in Part 3	0.014	0.024	0.011	-0.008	-0.020	0.018	0.006
	(0.139)	(0.133)	(0.132)	(0.136)	(0.137)	(0.131)	(0.130)
Part 3	-0.074	-0.074	-0.073	-0.074	-0.073	-0.074	-0.073
	(0.109)	(0.109)	(0.109)	(0.109)	(0.109)	(0.109)	(0.109)
Majority in Part 2	-0.419***	-0.419***	-0.418***	-0.419***	-0.418***	-0.419***	-0.418***
	(0.068)	(0.068)	(0.068)	(0.068)	(0.068)	(0.068)	(0.068)
$w - x$	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$x - y$	-0.024***	-0.024***	-0.024***	-0.024***	-0.024***	-0.024***	-0.024***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
$y - z$	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Experience	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Ineq. Aver. ($\underline{\beta}$)		0.166***	0.151***				
		(0.044)	(0.042)				
Ineq. Aver. ($\overline{\beta}$)				0.210**	0.208**		
				(0.071)	(0.074)		
Pct. Fair Dictator						0.239***	0.226***
						(0.058)	(0.060)
Male			-0.014		-0.012		-0.012
			(0.036)		(0.046)		(0.038)
Trust			-0.042**		-0.044*		-0.043*
			(0.016)		(0.019)		(0.019)
Risk			0.026*		0.033**		0.028*
			(0.012)		(0.012)		(0.011)
Constant	0.922***	0.823***	0.901***	0.803***	0.855***	0.827***	0.900***
	(0.045)	(0.028)	(0.051)	(0.035)	(0.051)	(0.035)	(0.068)
R^2 overall	0.126	0.158	0.185	0.150	0.181	0.160	0.188
R^2 between	0.0359	0.151	0.247	0.121	0.235	0.156	0.259
R^2 within	0.161	0.161	0.161	0.161	0.161	0.161	0.161
Observations	2,080	2,080	2,080	2,080	2,080	2,080	2,080

GLS regression with subject-level random effects, standard errors clustered by session
* $p < .05$ ** $p < .01$ *** $p < .001$

Table 6: Fairness of Group Decisions

	Combined		Part 2 only		Part 3 only	
	(1)	(2)	(3)	(4)	(5)	(6)
Part 2 Chat	0.095	0.026	0.102	0.039		
	(0.073)	(0.081)	(0.076)	(0.069)		
Part 3 Chat	-0.261*	-0.297*			-0.267**	-0.306*
	(0.067)	(0.087)			(0.064)	(0.101)
Part 3	0.379**	0.460**				
	(0.079)	(0.069)				
$w - x$	-0.005	-0.006	0.004	0.002	-0.014	-0.015
	(0.006)	(0.006)	(0.009)	(0.008)	(0.012)	(0.012)
$x - y$	-0.019*	-0.020*	-0.029**	-0.029**	-0.019	-0.019*
	(0.006)	(0.006)	(0.007)	(0.006)	(0.007)	(0.007)
$y - z$	0.010**	0.010**	0.014	0.014	0.011	0.011
	(0.002)	(0.002)	(0.006)	(0.006)	(0.005)	(0.005)
Experience	-0.002	-0.001	0.004	0.006	0.001	0.001
	(0.003)	(0.003)	(0.015)	(0.015)	(0.003)	(0.003)
Median Ineq. Aver $(\underline{\beta})$	0.091		0.147		0.063	
	(0.054)		(0.123)		(0.078)	
Median Ineq. Aver $(\overline{\beta})$		0.164		0.043		0.228
		(0.090)		(0.174)		(0.154)
Min. Maj. Ineq. Aver. $(\underline{\beta})$	0.175*		0.151*			
	(0.045)		(0.051)			
Min. Maj. Ineq. Aver. $(\overline{\beta})$		0.308**		0.420		
		(0.048)		(0.173)		
Number of Males	-0.005	-0.012	0.003	-0.011	-0.010	-0.016
	(0.012)	(0.017)	(0.025)	(0.035)	(0.015)	(0.020)
Constant	0.651**	0.558**	0.540	0.500	1.022***	0.971***
	(0.097)	(0.092)	(0.250)	(0.241)	(0.048)	(0.053)
R^2	0.163	0.149	0.128	0.084	0.204	0.210
Observations	416	416	160	160	256	256

OLS regressions with standard errors clustered at session level

* $p < .05$ ** $p < .01$ *** $p < .001$

with what we would expect from a mix of selfish and inequity averse preferences. For example, the larger the difference between the majority payoff x and the fair payoff y, the less likely an individual is to choose the fair option. Similarly, individuals are also less likely to vote for the fair option as the difference between the high payoff w and the median majority payoff x increases. Purely selfish voters would not pay attention to the difference between the fair payoff y and the low payoff z, yet as this difference increases (equivalently, the worse the minority payoff becomes), the more likely it is that a subject will vote for the fair outcome. In addition, the results suggest that behavior does not change over time as a result of subjects gaining more experience.

The alternative specifications in the columns of Table 5 vary the covariates used to account for individual preferences. Model (1) is a basic model that excludes individual controls. Models (2) and (3) control for inequity aversion using the lower bound measure $\underline{\beta_i}$, while models (4) and (5) use the upper bound measure $\overline{\beta_i}$. Models (6) and (7) use a simpler measure of an individual's concern for fairness: the percentage of fair dictator choices in Part 1 (which does not depend on the FS model). Models (3), (5), and (7) include additional covariates from the questionnaire administered at the conclusion of the experiment. We include gender (male), a survey measure of generalized trust, and survey measure of risk attitudes.[17] Regardless of which measure of inequity aversion we use in our analysis, we find that inequity aversion revealed in the dictator task has a consistently positive, statistically significant, relationship with voting for the fair option. Trust and risk attitudes are also consistently associated with voting behavior, but gender is not.

The analysis of group decisions presented in Table 6 also supports the conclusions we drew from the aggregate analysis. Models (1) and (2) combine observations from both Parts 2 and 3, while models (3) and (4) restrict the analysis to *Pairwise Voting* rounds and models (5) and (6) restrict attention to *Coalition Voting* rounds. When we control for differences in payoff values across rounds as well as heterogeneity in the composition of fairness preferences in each group, the regression estimates show that discussion significantly depresses the probability of the fair outcome, but this effect holds only for *Coalition Voting* rounds. We also find a significant difference in fair outcomes across the different voting mechanisms: Groups are significantly more likely to choose fair outcomes with *Coalition Voting* than with *Pairwise Voting*. This within-subjects difference suggests that the introduction of the coordination problem causes groups to choose the focal outcome.

The particular composition of each group in terms of the distribution of inequity aversion only matters for outcome in the *Pairwise Voting* mechanism. We included two kinds of group-level covariates in the models. We included the median level of inequity aversion in each group (the median value of the lower bound $\underline{\beta_i}$ or upper bound $\overline{\beta_i}$) as well as the minimum value of the group members assigned to the majority payoff (for rounds in Part 2). The coefficient for the median level of inequity aversion in a group is consistently positive, but the magnitude varies and the estimate is not statistically significant. However, the minimum majority coefficient is positive and statistically significant in models (1) and (3) when we

[17]The trust question is worded: "On a scale from 1 to 7, generally speaking, would you say that most people can be trusted (1) or that you can't be too careful in dealing with people (7)." The risk question is worded: "On a scale from 1 to 7, how do you normally see yourself: Are you generally a person who is fully prepared to take risks (1) or do you try to avoid taking risks (7)?"

use the lower bound measure; the corresponding coefficient for the upper bound measure is positive in both (2) and (4) but only statistically significant in (2).

5.4 Behavioral Effects of Voting

The preceding analysis suggests the possibility that differences in the decision mechanism may have caused changes in individual voting behavior. Holding payoff values of w, x, y, and z fixed, individuals face a nearly identical decision between a fair and majority option in the *Random Dictator* and *Pairwise Voting* rounds, and an extremely similar decision in *Coalition Voting*. If subjects simply voted their underlying preference for fair or majority outcomes, then we would expect to see the same behavior across all three parts of the experiment. This is because, as we argued, the only difference between *Random Dictator* and *Pairwise Voting* is in the source of the pivot probability (exogenous or endogenous), and weakly undominated strategies predict the same behavior in both parts. A slightly different argument applies to *Coalition Voting* but generates the same prediction: because the first ballot is costless, individuals who prefer the majority allocation would randomize their votes across their majority options rather than voting for the fair option. Thus, we would expect subjects who chose the majority option in the *Random Dictator* part of the experiment to also vote for a majority option on the first ballot in the *Coalition Voting* part. Although *Coalition Voting* involves a difficult coordination problem, we had no reason to expect there would be any differences in behavior, and any differences would be considered "behavioral."

In this section, we explore whether decisions made by majority voting have such behavioral consequences. Because we did not fully anticipate this possibility, we did not use identical payoff values in each part of the experiment in our design, but we can match payoff values for some rounds across parts in our statistical analysis: 5 pairs of rounds between parts 1 and 2, 9 pairs of rounds between parts 1 and 3, and 4 pairs of rounds between all three parts.[18] We also caution that because this is primarily within-subjects analysis, we treat any causal inferences we draw as tentative.

Table 7 presents linear probability model estimates with a fair vote as the dependent variable and *Random Dictator* choices as the baseline omitted category. Model (1) uses data from the 5 rounds in Parts 1 and 2 with the same payoff values and controls for the threshold value β^* for each round. The coefficient for Pairwise Voting is not statistically significant, which suggests that behavior in *Pairwise Voting* rounds indeed reflects underlying preferences for fairness. The only difference in behavior, consistent with what we found in the previous section, is due to the availability of communication.

Model (2) uses the data from the 9 rounds with matched payoff values in Parts 1 and 3. In this case, we do find that subjects are significantly more likely to vote for fair outcomes in *Coalition Voting* rounds than we would expect from their *Random Dictator* choices. The magnitude of this effect is surprisingly large. To the extent that the underlying behavioral mechanism is subjects' recognition of the coordination problem, this strikes us as an *overreaction* rather than a rational response, though admittedly our interpretation is entirely subjective.

[18] See Table A1 for details.

Table 7: Analysis of Chat, Dictator, and Voting Mechanisms

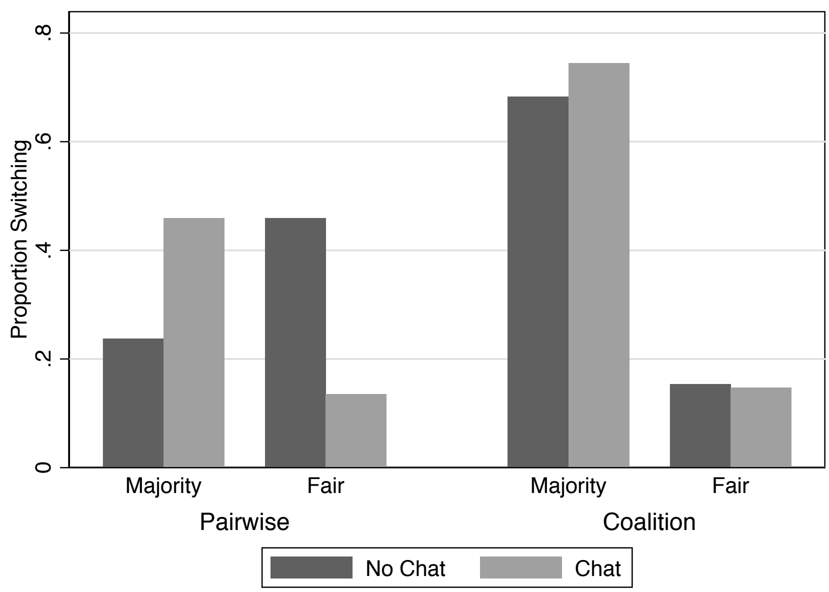
	(1)	(2)	(3)
Pairwise Voting	-0.088		-0.069
	(0.067)		(0.069)
Pairwise × Chat	0.267**		0.260**
	(0.089)		(0.093)
Coalition		0.382***	0.313***
		(0.057)	(0.059)
Coalition × Chat		0.042	0.138*
		(0.065)	(0.061)
β^*	-0.339**	-0.203***	-0.176
	(0.099)	(0.034)	(0.108)
Constant	0.632***	0.502***	0.534***
	(0.056)	(0.050)	(0.068)
R^2	0.0418	0.178	0.155
Observations	640	1440	832

OLS regression with standard errors clustered by subject

* $p < .05$ ** $p < .01$ *** $p < .001$

Another way in which we can explore the behavioral consequences of the voting procedure is to examine switching behavior. We say that a voter *switches* if their vote differs from their *Random Dictator* choice. Figure 3 displays switching behavior by voting mechanism and communication treatment. Interestingly, we find switching behavior in both *Pairwise Voting* and *Coalition Voting*. In *Pairwise Voting*, the direction of switching behavior is conditional on whether or not there is communication. Without communication, *Pairwise Voting* leads to a decrease in observed fairness: subjects are more likely to switch from choosing the fair option in the *Random Dictator* to the majority option in *Pairwise Voting* than the other way around. This effect is reversed when there is communication: subjects are more likely to switch from the majority to the fair option.

Figure 3: Switching Behavior between Dictator and Voting Rounds



Switching behavior between *Random Dictator* and *Coalition Voting* is more prevalent. There is a much higher proportion of switching from majority dictator decisions to fair coalition votes (about 65-75%) than from fair dictator decisions to majority coalition votes (about 18%). In addition, there is little variation in switching behavior due to the availability of communication. This is consistent with our interpretation that subjects overreact to the introduction of a coordination problem.

5.5 Chat Analysis

How did subjects use their opportunity to communicate? In this section, we present preliminary analysis of chat messages. Our main finding is that group members primarily used communication instrumentally to state their preferred outcome or intended behavior. Few subjects used the chat technology to persuade or argue, and when they did, it was rarely effective.

Group members did not talk or say much when they used the chat technology. Figure 4 shows the average volume of chats over time within each period. There is a burst of activity early on that dies down and levels out after 20 seconds, with some intermittent activity in the remaining 55 seconds available to communicate. Members communicate more in the *Coalition Voting* than *Pairwise Voting*, likely due to the coordination problem introduced in the former. Figure 5 shows the distributions of the length of messages in terms of the number of characters (upper panel) as well as the number of words (bottom panel). While some subjects write lengthy messages (up to 100 characters or 16 words), no subject writes anything as long as a tweet. Strikingly, the modal message—nearly 40% of all messages—consists of a single character. These single characters refer to the allocations (e.g., A, B, C, etc) in the group's choice set.

If we look more closely at the chat transcripts, we can get a sense of the dynamics of the discussion and see why the messages are so brief. We will look at two rather typical examples from *Coalition Voting* rounds. The first example is taken (verbatim) from Session 3, Round 21, Group 1:

Green (1)	I
Red (6)	I?
Grey (9)	I
Blue (7)	I
Red (6)	thats the only one where everyone gets the same thing
Yellow (4)	yep
Green (1)	Exactly
Grey (9)	I think we should just keep like that the whole part

The first four messages contain the label of the fair option (I). Note that one member (Red) includes a question mark, which seems to suggest that the message is meant as a question to the group (as in "should we do I?"), although it could also indicate the tentativeness of Red's own intentions. Once a majority of group members have signaled this intention, Red then points out the obvious, that Option I gives equal payouts, which Yellow and Green then confirm. This group appears to use communication to quickly come to an agreement, but what's interesting is that only one of these group members (Green, who spoke first) chose the fair option in the corresponding *Random Dictator* round. The other four members chose the majority option as dictators, yet this brief discussion was enough to move them towards voting for and adopting the fair option.

The next example is from Session 1, Decision 36, Group 1, and it is a group that ultimately chose majority tyranny:

Figure 4: Time and Volume of Messages in Chat Treatment

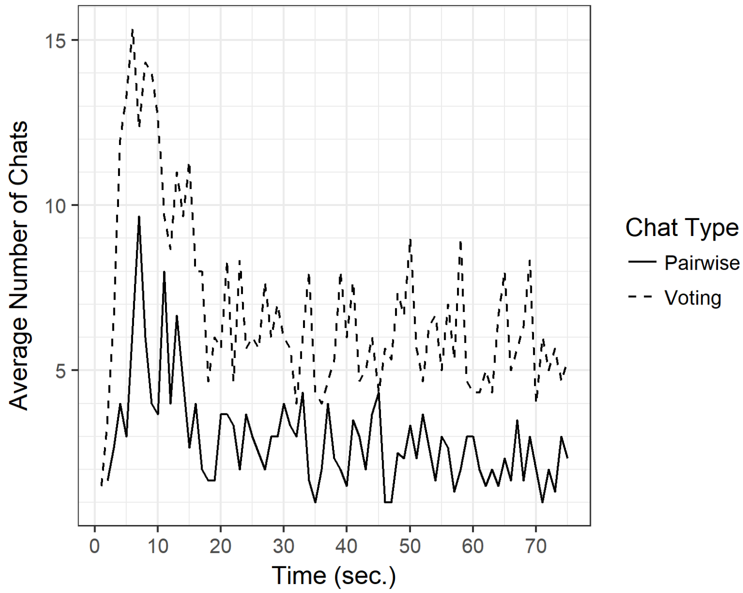
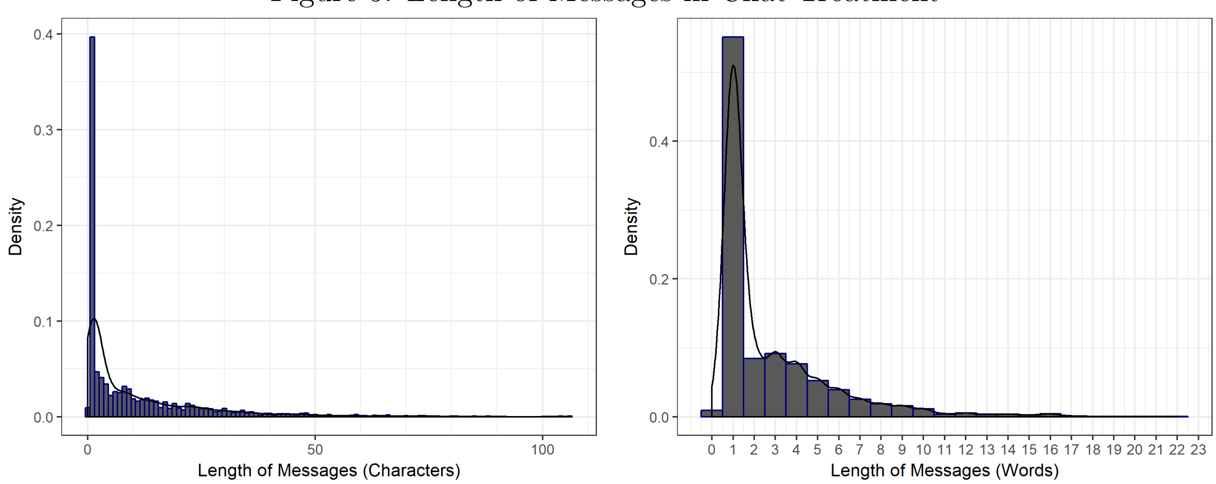


Figure 5: Length of Messages in Chat Treatment



Blue (4)	B
Green (14)	B
Grey (11)	N
Yellow (15)	grey and red n
Red (2)	N
Green (14)	knew that was coming
Blue (4)	stop no one watns 4
Grey (11)	SORREY
Red (2)	h2p
Green (14)	B have a soul. how would you explain to your grandma your decision making

As with the previous group, only one player (Blue) chose the fair option in the corresponding dictator round and was the first to speak, suggesting the fair option (B). Green, who chose the majority option in the dictator round, next agrees to the fair option, but then this group quickly takes a divergent path. Grey suggests an unfair option (N), followed by Yellow. Note that Yellow addresses Grey and the remaining player, Red, who signals intent with a single character. Green then expresses disappointment, but at first does nothing to try to persuade the majority. Interestingly, Grey (who first suggested the unfair option) apologizes. Finally, Green attempts to guilt the majority into choosing the fair option, to no avail: the group chooses Option N.

Examining the specific transcripts of a few groups is suggestive (and often entertaining), but we have not yet worked out a systematic method of characterizing or modeling the dynamics of these discussions. Indeed, comparing these two examples suggests that such analysis is likely to be difficult: the first half of each conversation consists of barely more than one-character messages that state an alternative. For now, we take a simple approach.

To the extent that we can systematically describe the content of messages, Table 8 summarizes our results for all chat messages (before *Pairwise Voting* as well as *Coalition Voting*. The majority of messages (60%) refer to at least one of the voting options. Messages that are directed at other group members (as in Yellow's message to Grey and Red above) are a distant second (7%). Only a tiny fraction of messages refer to any kind of principle or decision criterion, whether related to fairness, maximization, or forming majorities (less than 2% of messages each).[19]

6 Simultaneous Message Experiment

Although we found that discussion increased majority tyranny by facilitating coordination, group decisions were predominantly fair and chat messages largely devoid of substantive content. To investigate whether we could increase majority tyranny further, as well as generate more meaningful messages and greater competition in the discussion process, we

[19]We conduct our content analysis by first searching for keywords, then human coding additional messages (e.g., to deal with typos and misspellings). We look for the following words to indicate fairness: fair, common, equal, even. The keywords for maximization are: max, more, most. For payoff differences: only, difference, disparity, gap.

Table 8: Content of Messages in Chat Treatment

Characteristic	Pct.
Option (Letter)	60.8%
Player ID (Color)	6.5%
Fairness	3.3%
Differences	1.7%
Maximization	1.0%
Majority	0.3%
Total Messages	2,160

conducted a variation of our experiment. The new version modified several key features, so while it preserves much of the basic structure, we cannot consider it to be a "treatment" in the proper sense because we cannot draw causal inferences from direct comparisons between our original design and the modified version.

As before, the experiment was divided into three parts, and in each part the group's task was to choose between fair and majority outcomes. Part 1 involved 15 rounds of the *Random Dictator* task. In Part 2, we replaced *Pairwise Voting* with 10 rounds of *Coalition Voting*, but instead of *Chat*, we introduced a different communication technology we refer to as *Simultaneous Messages*. Part 3 involves 20 rounds of *Coalition Voting* with *Chat*. In addition to modifying Part 2, we also modified the set of payoff values so that the fair alternative is sometimes less efficient than it was in our original version.[20] We conducted two sessions of this version of the experiment (30 subjects total).

In the *Simultaneous Message* technology, which borrows from Burchardi and Penczynski (2014), each individual constructs a single message before voting, and the messages are then viewed simultaneously by all group members. Unlike with free-form chat, there are no further opportunities to communicate once messages are exchanged (unless the first vote fails). Each message has two components. One part is a "suggestion" for what the group should do, and our instructions explicitly mention several possible ways they could use their suggestion: they could suggest a single option, one of several options, and they could (optionally) address specific members of their group (by their colors). The second part of a message is an "explanation," which we encourage subjects to use "to convince other members of your group to follow your suggestion." We also exhort them to "Construct your message wisely, and try to be as clear and persuasive as possible." In contrast to experiments with the standard chat technology for which the corresponding instructions only tell subjects that the technology is available, the message instructions are intentionally heavy-handed so as to encourage greater cognitive effort in constructing meaningful messages.

The first column of Table 9 suggests that we succeeded in generating messages with more meaningful content. A third of message explanations refer to fairness, and a third of explanations refer to payoff maximization, compared to the tiny fractions of chat messages

[20]It is still true that the payoff values satisfy the inequality $w > x > y > z$ and that $3x+2z = w+2x+2z = 110$. In the original version, $y \in \{20, 24\}$; in the modified version, $y \in \{10, 16, 20, 24\}$. For the full set of payoff values in the Messages Experiment, see Table A2.

Table 9: Content of Messages in Simultaneous Messages Experiment

Characteristic	Messages Pct.	Chats Pct.
Letter (Option)	–	67.3%
Exactly one	84.9%	65.2%
Two or more	15.1%	2.1%
Color (Player)	34.3%	14.6%
Exactly one	1.1%	9.8%
Two or more	33.1%	4.8%
Fairness	32.1%	1.7%
Differences	8.6%	1.3%
Maximization	32.6%	1.9%
Efficiency	2.0%	–
Total Messages	350	2,160

in the original experiment mentioning either principle. Here are a few specific examples of messages:

- Suggestion: "RED AND GREY PICK M"; Explanation: "Im picking m regardless and if both of you follow well get our money $$$$"
- Suggestion: "D, S, Q"; Explanation: "There is really no good way to convince you guys that this is fair, because it isn't, but hopefully the other 2 people who would benefit from these options also want to make money and then we will be the majority"
- Suggestion: "option Z"; Explanation: " lets just all make 24."
- Suggestion: "Option Q"; Explanation: "Maybe we should just all stick together?? Good karma??"

The first two examples suggest that group members attempted to form coalitions in the *Simultaneous Message* stage, and indeed a third of messages referred two or more other group members' colors.

Interestingly, we find that when groups communicate instead using the standard chat technology in Part 3, the character of their discussions largely revert to patterns similar to what we observed in the original experiment. For example, references to fairness or maximization drop to less than 2%, as before. However, there are more references to other players' colors in the *Chat* following *Simultaneous Messages* than when *Coalition Voting* followed *Pairwise Voting*. These results suggest that our heavy-handed treatment may have increased competition and attempts at coalition formation even though meaningful content did not persist.

Additional evidence of increased competition is presented in Table 10. This analysis models the average length of messages (column 1) and average number of messages (column 2) for each group-round chat from all parts and sessions of the experiment, including both *Pairwise*

Table 10: Chat Messages, Voting Mechanisms, and Treatments

	(1) Length b/se	(2) Number b/se
Coalition Voting	0.717	4.460***
	(0.792)	(1.011)
Message Treatment	1.126	13.131***
	(0.704)	(0.899)
Constant	9.546***	7.525***
	(0.623)	(0.796)
Observations	331	331
R^2	0.017	0.518

OLS regression, observation is group-round
* $p < .05$ ** $p < .01$ *** $p < .001$

Voting and *Coalition Voting* from the original version and the Part 3 *Chat* in the modified version. We find that there are no statistically significant differences in the average length of messages across any of the conditions that use chat, regardless of the voting mechanism and whether subjects first used simultaneous messages. Consistent with our argument about the competitive aspects of discussion, we find that more messages were sent in *Coalition Voting* than in *Pairwise Voting* and in *Coalition Voting* when it followed *Simultaneous Messages* than *Pairwise Voting*. This suggests that our heavy-handed encouragement to use messages persuasively appeared to have a persistent effect on the competitiveness of discussion.

In terms of individual behavior and majority decisions, Table 11 shows that votes were far less other-regarding and group decisions much more unfair than in the original version of our experiment. Whereas we previously found over 70% of both votes and outcomes favoring fair allocations, we find only 40% favoring fairness with the *Simultaneous Message* technology. In the last part, with the *Chat* technology, there is even less fairness-oriented behavior (33% of individual votes and 23% of decisions). However, the relative lack of fairness in the *Simultaneous Message* experiment may because the sample of subjects was less other-regarding than subjects who participated in the original experiment (as only 22% of *Random Dictator* choices were fair), but this could also be because the fair outcomes were much less socially efficient. Intriguingly, we also observe three instances of decision failure (i.e., no majority reached on the second ballot) compared to one such instance in the original experiment. Of course, these are both very small numbers compared to all of the other 432 *Coalition Voting* rounds in which a majority reached a decision, and so this comparison is merely suggestive. Overall, although we cannot identify the exact causal mechanism, we do find that the various modifications we made in the *Simultaneous Messages* experiment were highly effective at reducing the fairness of majority rule decisions.

Table 11: Fairness of Votes and Decisions in Simultaneous Messages Experiment

	Individual Votes		Group Decisions	
	Pct. Fair	N	Pct. Fair	N
Dictator (Part 1)	22.4%			
Coalition - Messages (Part 2)	39.1%	350	40%	70
Symmetric	48.6%	300	53.3%	35
Asymmetric	29.7%	175	26.7%	35
First ballot	40.3%	175	46%	60
Second ballot	32.0%	50	10%	10
Coalition - Chat (Part 3)	33%	605	23.3%	121
Symmetric	33%	300	21.7%	60
Asymmetric	33.1%	305	25%	61
First ballot	33.3%	600	23.5%	120
Second ballot	0.0%	5	0%	1

7 Conclusion

In our experimental analysis, we find that groups generally use majority rule to choose fair allocations. This is despite the fact that pure self-interest predicts that a majority would easily exploit a minority. In the absence of communication, the votes and decisions we observe are consistent with the importance of social preferences, as commonly found in a wide range of the behavioral and experimental literature.

As for the key manipulation of interest, our results suggest that whether discussion increases or decreases the fairness of voting outcomes depends on the context. Individuals are more likely to vote for fair outcomes after a period of discussion when coordination poses no strategic problem, consistent with a psychological effect of increasing the salience of social preferences. But communication also has a dark side, as it allows majorities to coordinate their actions and form coalitions that exploit minorities, producing unequal outcomes.

Discussion in our setting is predominantly instrumental. It is almost never principled, although there are a few instances where subjects make simple appeals to fairness or equality. When reason-giving and persuasion are explicitly encouraged, appeals to fairness increase, but so do entreaties to consider payoff maximization and naked self interest. This kind of discussion is a far cry from the normative ideal of deliberative democrats, who conceive of discussion as concerned with substantive issues and principles, and involving a process of giving and asking for reasons. Of course, our environment is also a far cry from real-world issue politics. Nevertheless, when many of the complexities of the real world are stripped away, many issues at their core are distributive, and it is important that we have taken steps toward developing a basic understanding of how groups use discussion in these settings.

Appendix

Table A1: Payoff Values in Main Experiment

Payoffs				Rounds		
w	x	z	y	Part 1 (Dictator)	Part 2 (Messages)	Part 3 (Chat)
	26	16	24	1	16	25
	26	16	20	2		28
	30	10	28		20	
	30	10	24	3	13	21
	30	10	20	4		24
	30	10	16			23
	34	4	32		14	
	34	4	28		17	
	34	4	24	5	12	22
	34	4	20	6		27
	34	4	16			26
28	25	16	24	7	19	
28	25	16	20			29
34	28	10	24	8	11	35
32	29	10	24		18	34
32	29	10	20			33
42	30	4	24		15	32
36	33	4	24	9		30
38	32	4	24	10		36

Table A2: Payoff Values in Messages Experiment

Payoffs				Rounds		
w	x	z	y	Part 1 (Dictator)	Part 2 (Messages)	Part 3 (Chat)
	26	16	24	1	19	34
	26	16	20	2		29
	26	16	16	3		28
	30	10	24	4	20	33
	30	10	20	5	17	31
	30	10	16	6		30
	34	4	24	7		26
	34	4	20	8	18	27
	34	4	16	9		35
	34	4	10	10	16	32
32	23	16	20	12	22	42
28	25	16	20	11	25	41
36	27	10	20	14	21	37
36	27	10	16			44
34	28	10	20			38
34	28	10	16			40
32	29	10	24	13	23	36
32	29	10	20			45
38	32	4	20	15	24	43
38	32	4	16			39

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Appendix: Instructions for Chat Treatment

General Information

This is an experiment on group decision-making. You will be paid in cash for your participation at the end of the experiment. The exact payment you receive will depend partly on your decisions, the decisions of others, and on chance. You will be paid privately, meaning that no other participant will find out how much you earn.

Pay attention and follow the instructions closely, as we will explain how you will earn money and how your earnings will depend on the choices that you make. Each participant has a printed copy of these instructions, and you may refer to them at any time.

If you have any questions during the experiment, please raise your hand and wait for an experimenter to come to you. Please do not talk, exclaim, or try to communicate with other participants during the experiment except when asked to do so via the computer interface. Please also silence your phones and put them away along with other personal belongings.

Parts, Rounds, and Groups

This experiment consists of three **parts**, and we will explain the instructions for each part before beginning that part. In each part, there is a series of **rounds**. Each round is a separate decision task.

For each round, you will be randomly assigned to a **group** of 5 participants. Because groups are randomly reassigned for each round, some members of your group for one round may or may not be the same as the members of your group for another round.

Each group member will then be assigned to a unique color to identify you (red, green, blue, yellow, or grey). These colors will also be assigned anew before each round so that a participant's color for one round may or may not be the same as for another round.

Note that you will not know the identity of any of the other participants you are matched with in any round, and your earnings for each round will depend only on the choices of the members of your group. Your group's decision in any round is entirely separate from any other other group's decision.

Payoffs

We will **randomly select one round to count** for payment from the entire session, with each round being equally likely to be selected. Only the points you receive from the round that counts will be used to calculate your payment, so you should think of each round as separate from any other.

Payoffs during the experiment will be denominated in **points**. Points will be converted to cash at the rate of **75 cents per point**, and then we will add $7 to your earnings for completing the experiment (this includes the $5 for showing up on time). At the end of the experiment, you will see the points you earned in the round that counts and your total earnings for the experiment.

Part 1

For each round in this part, you will make a choice between two options. Each option specifies how many points to give to yourself and to each of the other group members. For example, Option A in the table below gives you and every other group member 25 points, while Option B gives you 30 points, 30 points each to Green and Yellow, and 10 points each to Blue and Grey. The number of your points will always be displayed in the left-most column.

	Red (You)	Blue	Green	Yellow	Grey
Option A	25	25	25	25	25
Option B	30	10	30	30	10

If this round is selected to count for payment, we will randomly select one member's decision to be implemented within each group. In other words, if your decision is selected, then the number of points that each member in your group receives depends only on your decision. If another group member's decision is selected, then the number of points you receive will depend only on that selected member's decision and not your own.

Your options will differ in each round, and other group members may not necessarily have the same options that you do.

You will not receive any feedback about the options that were selected in the round by any of your group members in Part 1. You will only find out the number of points you earned at the end of the experiment for the round that counts.

Before beginning Part 1, we will ask you a few questions to make sure that you have fully understood these instructions.

Part 2

For each round in this part, each group's task is to select one of two options by a majority vote. As in Part 1, each option specifies how many points to give to each group member. Your points will always be displayed in the left-most column. Every member in your group will see the same two options, but the order of the rows and columns for each player may be different.

The voting procedure is as follows:

- You will cast your votes at the same time.
- Each group member has one vote, and abstentions are not allowed.
- **An option is selected by your group only if it receives three or more votes**.

Before you vote in each round, you will have 75 seconds to communicate electronically with members of your group through a chat window on your screen. Each message you send will be seen by all members of your group. Please refrain from using obscene or offensive language, and do not enter any message that identifies or describes you in any way (such as your age, gender, race, appearance, etc).

After you vote, you will not receive any feedback about the number of votes cast for each option, nor will you find out which option was selected by your group in any round in Part 2. You will only find out the number of points you earned at the end of the experiment for the round that counts.

Before beginning Part 2, there will also be a few questions on your computer to make sure that you have fully understood these instructions.

Part 3

For each round in this part, each group will select one of six options by majority vote. As in Part 2, each group member casts one vote, and an option is selected by the group only if it receives three or more votes.

An example of what the six options might look like is given in the table below. You will see a table like this in each round, and your points from each option will always be shown in the left-most column. Every group member will see the same six options, but the order that the rows and columns appear in the table will be different for each group member.

	Red (You)	Blue	Green	Yellow	Grey
Option A	10	30	30	10	30
Option B	30	10	30	30	10
Option C	10	30	30	10	30
Option D	30	10	10	30	30
Option E	25	25	25	25	25
Option F	30	30	10	30	10

The voting procedure in Part 3 is as follows:

- You will cast your votes at the same time.
- Each group member has one vote, and abstentions are not allowed.
- **An option is selected by your group only if it receives three or more votes**.
- After you vote, you will be informed of the number of votes cast for each option, but you will not know how individual group members voted.
- If an option does not receive at least three votes, your group will vote again. The number of votes required to select an option on the second ballot is the same as for the first ballot: an option is selected only if it receives three or more votes.
- If no option receives at least three votes on the second ballot, then each player will receive 0 points for the round.

Before each ballot, you will have 75 seconds to communicate electronically with members of your group through a chat window on your screen. Just as in Part 2, each message you send will be seen by all members of your group, please refrain from using obscene or offensive language, and do not enter any message that identifies or describes you in any way.

Before beginning Part 3, there will also be a few questions on your computer to make sure that you have fully understood these instructions.

Appendix: Instructions for Simultaneous Messages Experiment

General Information

This is an experiment on group decision-making. You will be paid in cash for your participation at the end of the experiment. The exact payment you receive will depend partly on your decisions, the decisions of others, and on chance. You will be paid privately, meaning that no other participant will find out how much you earn.

Pay attention and follow the instructions closely, as we will explain how you will earn money and how your earnings will depend on the choices that you make. Each participant has a printed copy of these instructions, and you may refer to them at any time.

If you have any questions during the experiment, please raise your hand and wait for an experimenter to come to you. Please do not talk, exclaim, or try to communicate with other participants during the experiment except when asked to do so via the computer interface. Please also silence your phones and put them away along with other personal belongings.

Parts, Rounds, and Groups

This experiment consists of three **parts**, and we will explain the instructions for each part before beginning that part. In each part, there is a series of **rounds**. Each round is a separate decision task.

For each round, you will be randomly assigned to a **group** of 5 participants. Because groups are randomly reassigned for each round, some members of your group for one round may or may not be the same as the members of your group for another round.

Each group member will then be assigned to a unique color to identify you (red, green, blue, yellow, or grey). These colors will also be assigned anew before each round so that a participant's color for one round may or may not be the same as for another round.

Note that you will not know the identity of any of the other participants you are matched with in any round, and your earnings for each round will depend only on the choices of the members of your group. Your group's decision in any round is entirely separate from any other other group's decision.

Payoffs

We will **randomly select one round to count** for payment from the entire session, with each round being equally likely to be selected. Only the points you receive from the round that counts will be used to calculate your payment, so you should think of each round as separate from any other.

Payoffs during the experiment will be denominated in **points**. Points will be converted to cash at the rate of **75 cents per point**, and then we will add $7 to your earnings for completing the experiment (this includes the $5 for showing up on time). At the end of the experiment, you will see the points you earned in the round that counts and your total earnings for the experiment.

Part 1

For each round in this part, you will make a choice between two options. Each option specifies how many points to give to yourself and to each of the other group members. For example, Option A in the table below gives you and every other group member 25 points, while Option B gives you 30 points, 30 points each to Green and Yellow, and 10 points each to Blue and Grey. The number of your points will always be displayed in the left-most column.

	Red (You)	Blue	Green	Yellow	Grey
Option A	25	25	25	25	25
Option B	30	10	30	30	10

If this round is selected to count for payment, we will randomly select one member's decision to be implemented within each group. In other words, if your decision is selected, then the number of points that each member in your group receives depends only on your decision. If another group member's decision is selected, then the number of points you receive will depend only on that selected member's decision and not your own.

Your options will differ in each round, and other group members may not necessarily have the same options that you do.

You will not receive any feedback about the options that were selected in the round by any of your group members in Part 1. You will only find out the number of points you earned at the end of the experiment for the round that counts.

There are 15 rounds in Part 1.

Before beginning Part 1, we will ask you a few questions to make sure that you have fully understood these instructions.

Part 2

For each round in this part, each group will select one of six options by majority vote. Each group member casts one vote, and an option is selected by the group only if it receives three or more votes.

An example of what the six options might look like is given in the table below. As in Part 1, each option specifies how many points to give to each group member. You will see a table like this in each round, and your points from each option will always be shown in the left-most column. Every group member will see the same six options, but the order that the rows and columns appear in the table will be different for each group member.

	Red (You)	Blue	Green	Yellow	Grey
Option A	10	30	30	10	30
Option B	30	10	30	30	10
Option C	10	30	30	10	30
Option D	30	10	10	30	30
Option E	25	25	25	25	25
Option F	30	30	10	30	10

Voting

The voting procedure in Part 2 is as follows:

- You will cast your votes at the same time.
- Each group member has one vote, and abstentions are not allowed.
- **An option is selected by your group only if it receives three or more votes**.
- After you vote, you will be informed of the number of votes cast for each option, but you will not know how individual group members voted.
- If an option does not receive at least three votes on the first ballot, your group will vote again. The number of votes required to select an option on the second ballot is the same as for the first ballot: an option is selected only if it receives three or more votes.
- If no option receives at least three votes on the second ballot, then each player will receive 0 points for the round.

Communication

Before each ballot you will have an opportunity to send a message to the other members of your group. Your message should include a suggestion and an explanation. Specifically, you should:

1. **Suggest an option or options your group should vote for.** You might suggest one option (e.g., "let's vote for X") or several possible options (e.g., "vote for X, Y, or Z"). It is also permissible to direct your message to specific members of your group (e.g., "Red and Green, let's vote for Z.")

2. **Provide a detailed explanation for your suggestion.** This is your chance to convince other members of your group to follow your suggestion. Construct your message wisely, and try to be as clear and persuasive as possible.

Please refrain from using obscene or offensive language, and do not enter any message that identifies or describes you personally in any way (such as your age, gender, race, appearance, etc).

Once everyone in your group has entered a message, you will see all of your group's messages at the same time. You will then vote after you see the messages.

There are 10 rounds in Part 2.

Before beginning Part 2, there will also be a few questions on your computer to make sure that you have fully understood these instructions.

Part 3

The decision task in Part 3 is the same as in Part 2: your group will select one of six options by majority vote, each group member casts one vote, and an option is selected by the group only if it receives three or more votes.

Voting

The voting procedure in Part 3 is the same as in Part 2.

- You will cast your votes at the same time.
- **An option is selected by your group only if it receives three or more votes**.
- You will be informed about the number of votes cast for each option, but you will not know how specific individuals voted.
- You will have up to two ballots to reach a majority decision. If an option does not receive at least three votes on the first ballot, your group will vote again. If no option receives at least three votes on the second ballot, then each player will receive 0 points for the round.

Communication

The way you communicate is different in Part 3. Before each ballot, instead of writing a single message to your group, you will have 75 seconds to communicate with members of your group through a chat window on your screen. Your messages will be seen as soon as you send them, and you may send as many messages as you like before the 75 seconds are up. Just as in Part 2, please refrain from using obscene or offensive language, and do not enter any message that identifies or describes you in any way.

There are 20 rounds in Part 3.