Promoting Competition or Helping the Less Endowed? Distributional Preferences and Collective Institutional Choices under Intra-Group Inequality

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Abstract:

Unequally distributed resources are ubiquitous. The decision of whether to promote competition or equality is often debated in societies and organizations. With heterogeneous endowments, we let subjects collectively choose between a public good that most benefits the less endowed, and a lottery contest in which only one individual in a group receives a prize. Unlike standard theoretical predictions, the majority of subjects, including a substantial number of subjects who believe that their expected payoffs are better in the contest, vote for the public good. Our data suggests that people's collective institutional choices may be driven by inequality-averse concerns. It also suggests that the collective decision to select the option for the public good depends on voting rules.

Keywords: heterogeneity, experiment, cooperation, competition, public goods, inequality

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Introduction

The prevalence of heterogeneous resources is one of the most fundamental features of our organizations and societies today (e.g., Stiglitz 2012, Piketty 2014). For example, there are wide income gaps within societies. The Gini coefficient of household disposable incomes is on average 0.31 even in OECD countries.[1] Moreover, inequality across regions in many countries is increasing over time (see, for example, Baldwin and Wyplosz (2012) for regional disparity in the United Kingdom). It is also often the case that the distribution of resources is skewed to the right. While the heterogeneity of resources has some positive aspects such as the potential to increase material gains for some people, it nonetheless has negative aspects. For instance, inequality in society or regions often leads to serious intra-group conflicts. We therefore face a difficult collective decision: as a society or a country, should we promote competition by which ex-post inequality may be enhanced? Or should we enhance equality by offering some mechanism that assists the less endowed?

People's collective choices on policies have important consequences for resulting norms, people's behaviors, and the degree of intra-group conflicts in a society. For example, inequality can be enhanced by policies and as a result may increase anti-social behavior, such as violent crime in metropolitan counties in the United States (e.g., Kelly 2000). The government could enrich education programs for the poor or introduce social welfare programs, such as unemployment benefits, in order to alleviate poverty, while reducing programs that promote competition, such as subsidies to firms. This kind of policy change could help reduce the income gap and may create a fairer society. However, it may displease more well-off individuals who would not benefit from such a scheme. The negative consequences of inequality are also serious

[1] OECD Factbook 2013 (DOI: 10.1787/18147364).

in less developed countries. For instance, if existing regional inequalities were magnified by official policies, it may result in political conflicts in Sub-Saharan Africa (e.g., Østby *et al.* 2009). Also, some firms offer incentive schemes such as tournaments, which may contribute to increasing the productivity of workers. Such competition-oriented policies may, however, lead to more uncooperative behaviors among workers (e.g., Akerlof and Yellen 1998, Trevor *et al.* 2012).

In modern democratic societies, people have the right to choose their preferred policies either directly or indirectly through votes. Given the fact that very wealthy people account for a small percentage of the population, one might expect that most countries or organizations would employ strong redistributive or cooperative policies. In reality, however, a large degree of redistribution is rarely observed. For instance, there has been an overall trend to reduce tax rates for high-income groups over the last several decades in countries such as the United States and the United Kingdom (e.g., Atkinson et al. 2012, Alvaredo et al. 2013).[2] Field observations such as this may not reflect the population's collective distributional preferences. For example, the literature on political economy explains that moderate redistributive policies could result from political processes such as low voter turnout rates among low-income people, party loyalty and electoral competition in representative democracy (Harms and Zink (2003) for a survey). It is also possible that the less endowed may in fact prefer light redistributive policies for various reasons. For instance, they may tolerate inequality if they have a prospect of upward mobility (Harms and Zink, 2003, pp. 657-665). In recent decades, scholars have actively studied people's collective institutional choices using laboratory experiments. However, little attention has yet been paid to people's collective preferences for implementing either competitive or cooperative

[2] Atkinson *et al.* (2011) report that the Gini coefficient increased by 8.4 percentage points in the United States from 1976 to 2006.

institutions within a heterogeneously endowed group, and this question remains to be empirically answered.

Exploring the behavioral principles behind people's collective choices on this topic is not straightforward, however. First, previous extensive experiments have found that some individuals have other-regarding preferences such as inequality aversion (see Fehr and Schmidt (2006) for a survey). For example, some people may enjoy higher non-material gains if the payoffs are similar to each other. Therefore, we cannot infer people's institutional choices only from material incentives. Second, recent experiments have shown that egalitarian subjects – those who prefer fair distribution of payoffs – are more likely to avoid competitive environments when self-selecting environments in real-effort experiments (e.g., Bartling *et al.* 2007, Balafoutas *et al.* 2012).[3] The more egalitarian preferences they have, the less likely they may be to support competitive institutions in the context of this study. The voting decisions of egalitarian individuals may nonetheless depend on the degree of material incentives offered under a competitive regime. Even a person strongly averse to inequality might support a competitive institution if the potential benefits from competition were sufficiently high. In addition, people's voting decisions may depend on the size of their endowments because material and non-material incentives differ according to endowment size. Third, other-regarding preferences in risky situations constitute a new research area which remains to be explored. The selection of a competitive institution involves a risk whereby people receive lower returns if they lose the competition. People's decisions might be based on ex-ante payoffs (i.e., opportunities), ex-post payoffs, or a mix of the two (e.g., Brock *et al.* 2013). Fourth, a wealth of literature shows that in situations where subjects' resources are unbalanced, the amounts of resources and subjects'

[3] The subjects made choices between a tournament and a piece rate scheme in these two papers.

levels of cooperativeness are negatively correlated (e.g., Chan *et al.* 1996, Maurice *et al.* 2013). This tension between highly endowed and less endowed members may be sufficiently severe to inspire the collective preference for a more competitive environment.

We conducted an experiment in order to study people's collective institutional choices between a competitive scheme versus a public good scheme that helps the less endowed more when endowments are unequally distributed. A novel feature of our design is to let subjects collectively select one of two fundamentally different institutions within each of which the same endowments are used. Subjects are randomly assigned endowments, with the distribution being unbalanced within their groups. Each group then has to collectively choose a regime designed to serve the public good or a lottery contest regime by voting. If a group implements the public good, each member decides how much to contribute for their group. The total contributions are doubled and are then redistributed so that subjects with smaller endowments receive more from the public account. By contrast, if a group selects the contest option, then the members compete for a prize. Under this regime, each member decides how many points they want to allocate to their lottery account. The more points a subject assigns to the account, the more likely he/she is to win the competition and receive the prize. Only one member wins the competition. Thus, subjects would experience greater ex-post inequality if this regime is selected. The policy implementation and subjects' interaction under collectively selected regimes are one-shot.[4]

Our data shows that the majority of subjects prefer to serve the public good, contrary to the standard theoretical prediction. This study also reveals that a substantial number of subjects who believe that the material incentives under the contest are higher actually vote for the public good. A comparison of the distributions of payoffs suggests that subjects' votes may be driven

[4] This setup was adopted to obtain data without reputation effects.

by inequality-averse motives. The average Gini coefficients of realized payoffs within groups are significantly smaller with the public good than with the contest scenario. Moreover, subjects on average believe that payoffs are more equally distributed among members if a public good is created. Two clear results were found regarding groups' collective vote outcomes. First, the majority of groups selected the public good even when there was a higher level of efficiency under the contest regime than under the public good regime. Second, however, the likelihood of the public good being adopted largely depends on which voting rule is used. This study found that the public good is less likely to be selected if highly endowed subjects have higher voting power.

Experimental Design

The experiment consisted of two phases. In the first phase, endowments were randomly given to subjects. The second phase is a voting stage, followed by an allocation stage. Subjects made one-time policy implementation decisions and allocation decisions. Our study consists of three main treatments, which will be referred to as "choice treatments" in the paper. We also conducted one control treatment whereby a public good was exogenously imposed in Phase 2 in order to check whether the democratic decision-making process influences subjects' behaviors in the allocation stage (Table 1).

At the onset of Phase 1, subjects in all treatments were randomly assigned to a group of five individuals. In each group, one subject received 50 points, two subjects each received 20 points, and the remaining two were given 10 points each. The assignment of endowments was random: the probabilities with which they received 50, 20 and 10 points were 1/5, 2/5 and 2/5, respectively. We refer to the set of subjects who were given 50, 20 and 10 points as Sets H, M

and *L*, respectively. Note that the endowments of Set *M* and Set *L* subjects were less than the average in their groups, which was 22 (= 50 + 20 × 2 + 10 × 2)/5).

In the three choice treatments, the Low, High and Very High treatments – dubbed L, H and VH – Phase 2 began with subjects deciding whether to create a public good or to implement a lottery contest. Subjects subsequently stated their beliefs regarding the other four members' votes. In order to avoid a hedging problem, the belief elicitation task was not incentivized. Either the public good or the contest was then collectively implemented in accordance with the result of the voting; and each subject also made an allocation decision under the selected regime. (In the control treatment, which is called the "Exogenous Public Good treatment," subjects did not vote on the two regimes; they only decided how much to contribute to their group's public goods.) Once all of the subjects had decided on the allocation amounts, they submitted beliefs regarding the other four members' allocation amounts before being informed of the outcomes of the allocation stage. As in the first belief elicitation task, this elicitation task was not incentivized. However, at the end of the experiment, just before they were informed of the outcome of the allocation stage, subjects were asked to answer incentivized questions concerning risk attitudes.[5] Figure 1 provides a schematic diagram of the experiment.

Two Possible Regimes

The public good corresponds to goods and services that redistribute people's wealth and also increase efficiency (total gains). Examples include government support for education for the poor and voluntary mentoring programs for employees in corporations. Redistributive programs, such as social welfare provisions in countries and poverty alleviation programs in international

[5] They were not informed about the presence of this task at the onset of the experiment to avoid making this task salient. They were instead told that additional questions unrelated to the main experiment may be asked.

organizations, may also have this property if the poor utilize received sources to improve their education and/or health and accordingly productivity among the poor rises. If a public good is created, each group member simultaneously decides how much to allocate to their private account and to the public account. The contribution amounts must be integers between 0 and their assigned endowments (50, 20 or 10). A subject receives one point for each point that she allocates to her private account. The allocation to the public account, by contrast, is doubled and redistributed among group members: 25% of the amounts are given to each of the two Set *L* subjects, 20% of them are given to each of the two Set *M* subjects and 10% of them are given to the Set *H* subject (note that 25% × 2 + 20% × 2 + 10% = 100%). In other words, the less endowment a member has, the more the member receives from the public account. This kind of redistribution rule is found, for example, in education programs and public welfare assistance to help the poor. In firms, voluntary "buddies" programs tend to help less-skilled workers more than highly skilled workers.[6]

Suppose that the public good is created and a member having an endowment E_i contributes C_i to the public good. Then, that member's payoff, π_i, is expressed as follows:

$$\pi_i = (E_i - c_i) + \alpha_i \cdot 2 \sum_{j=1}^{5} c_j, \qquad (1)$$

where $\alpha_i = .1$ if subject *i* is a Set *H* subject; $\alpha_i = .2$ if *i* is a Set *M* subject; and $\alpha_i = .25$ if *i* is a Set *L* subject.

[6] As an anonymous referee pointed out, however, I acknowledge that some real-world examples do not perfectly fit the public good regime due to the methods of collecting resources to operate the redistribution mechanism. For example, tax and/or transfer mechanisms are usually used to implement redistribution policies in societies; but the adoption of taxation and/or subsidization creates a deadweight loss. For the sake of simplicity, our experimental design did not explicitly incorporate a possibility of such a deadweight loss. Similar simplifications without explicitly incorporating a deadweight loss in experiments have been adopted in some past studies (e.g., Tyran and Sausgruber (2006)).

By contrast, when the lottery contest is implemented in a group, subjects compete with the other four members for a prize. Each group member simultaneously decides on an allocation amount to the lottery account. The prizes are 50, 110, and 220 points and the competition is low, high, and very high in the L, H, and VH treatments, respectively. Only one member in the group receives the prize. Each subject can increase their winning probability by raising the allocation amounts to the lottery account. Suppose that subject *i* makes an investment of x_i and that the other four members allocate X_{-i} in total to their lottery accounts. Then, subject *i*'s winning probability is $\frac{x_i}{x_i+X_{-i}}$. x_i must be an integer ($x_i \in \{0, 1, 2, \ldots, E_i\}$). When all five members allocate nothing (i.e., $x_i = 0$ for all *i*), the prize is given to one member randomly (i.e., with a probability of 20%). Subject *i* receives the remaining points, $E_i - x_i$, as a part of his/her payoff. The competition in this kind of contest is also prevalent in some real-world situations. For example, there are often winners who gain a large surplus and losers who gain less in a market economy.[7] A further example is the case where workers exerting more efforts are more likely to get promoted to higher positions in their organization. Their chances of promotion, however, negatively depend on the contributions of other workers as higher-ranked positions are limited. A person may be promoted even with zero or small efforts if other employees do not strive for promotion.

Once all subjects had made allocation decisions under their collectively selected regimes, they were asked to submit beliefs on how much other group members had allocated.[8] These elicited beliefs were used in analysis to calculate the (expected) payoff that each subject believed they would obtain under the selected regime.

[7] For the sake of simplicity, we adopted a single-prize lottery contest design, rather than a multi-prize contest set-up.
[8] For example, each Set *M* subject was asked about his beliefs on (a) the allocation amount of his Set *H* subject, (b) the allocation amount of the other Set *M* subject and (c) the average allocation amount of the two Set *L* subjects in his group.

Voting Rules

This study let subjects vote under two voting rules and assessed the effects of voting power on subjects' collective institutional choices. This analysis was conducted as collective institutional choices may depend on voting rules. For instance, Markussen *et al.* (2014) found that an inter-group competition scheme is more likely to be selected in a set of three groups when a majority rule based on votes of all subjects in the three groups is used, relative to when a group veto rule (a rule that imposes a policy if the majority in each group supports it) is used. Vote outcomes may differ by voting rule in our study as well because subjects' voting decisions may be affected by the heterogeneous endowments, considering that incentives under each regime may depend on endowment size.

Specifically, in the choice treatments, at the onset of Phase 2, subjects voted on whether to have the public good or the lottery contest for each of the two scenarios: (1) the equal voting rule is used; and (2) the weighted voting rule is used.[9] After all of the subjects had voted, they were asked about their beliefs concerning how others had voted before being informed of the collective outcomes.[10] The two voting decisions were incentive compatible. Once all of the subjects had submitted their votes and answered the questions on beliefs, the computer assigned either of the two rules to each group with a probability of 50% each. Subjects' votes under the selected voting rule were used to calculate the collective vote outcome of their groups.[11] When the weighted voting rule was assigned, the voting power of subject *i* was $E_i/110$, where 110 = 50 + 20 + 20 + 10 + 10 (the sum of endowments in his group). Consequently, the distribution of

[9] Weighted voting rules are often used in organizations, such as IMF (e.g., Rapkin and Strand 2006) and shareholder meetings of corporations.
[10] For example, each Set *M* subject was asked about his belief on the voting decisions of the Set *H* subject, the other Set *M* subject, and the two Set *L* subjects for each of the two voting rules.
[11] This kind of strategy method is commonly used when there is a need to obtain a sufficient number of incentive-compatible decisions under each of many possible conditions (e.g., Fehr *et al.* 2013, Dal Bó *et al.* 2011, Kamei forthcoming).

voting power among his group members was unequal. The voting power of Set *H* subjects was the largest. However, it was not possible for them to decide the policy selection independently, as their voting power equaled 50/110 (= .45 < .5). Therefore, the votes cast by subjects belonging to Sets *M* and *L* also influenced each group's collective decision. When the equal voting rule was assigned to a group, the voting power was one-fifth for each subject. In other words, the standard majority rule determined the group's regime.

Elicitation of Risk Preferences

Once subjects had submitted beliefs on others' allocation amounts, they were asked questions concerning risk attitudes. The questionnaire on risk attitudes consists of the ten questions used by Holt and Laury (2002). We included this task in order to assess whether subjects' institutional choices were affected by risk attitudes.

Theoretical Predictions

A group has a collective action dilemma if the public good is selected in that group because the MPCR (marginal per capita return) is $2 \cdot \alpha_i$, which is less than 1 for each subject, as shown in Eq. (1). Therefore, according to the standard theory, contributing nothing to the public account is a strictly dominant strategy for each group member. Subjects in Sets *H*, *M* and *L* obtain 50, 20 and 10 points, respectively, as payoffs under Nash Equilibrium (NE).

By contrast, if the lottery contest is implemented in a group, the members can have some expected gains, regardless of their risk preferences. Suppose that each member in a group is risk-neutral. Then, the utility function of a subject is proportional to his/her expected payoff. The expected payoff of subject i, $E[\pi_i]$, is calculated by:

$$E[\pi_i] = (E_i - x_i) + \frac{x_i}{x_i + X_{-i}} z. \tag{2}$$

Here, z = 50, 110, and 220 in the L, H and VH treatments, respectively. x_i is subject *i*'s investment amount. For simplicity, let us also assume that two Set *M* subjects in a group allocate the same amounts to the lottery account, and that two Set *L* subjects in a group also make the same allocation decisions in equilibrium. Under this assumption, all members choose to allocate eight points to the lottery accounts in order to maximize their expected payoffs in the L treatment (Appendix A.1). They can each raise their expected payoffs by two points in equilibrium in the L treatment. Optimal allocation amounts differ in terms of endowment size in the H treatment: subjects from Sets *H*, *M* and *L* allocate 21, 20 and 10 points, respectively, to the lottery accounts in equilibrium. This means that the winning probability is the highest for Set *H* subjects and the lowest for Set *L* subjects in the H treatment. Nevertheless, as shown in Table 1, the expected payoff of each category of subjects is higher in equilibrium in the H treatment than in the L treatment. Lastly, in the VH treatment, subjects of each type would allocate all of their endowments to the lottery accounts in equilibrium. Expected payoffs then reach 100, 40 and 20 points for Set *H*, *M* and *L* subjects, respectively. The standard theory therefore predicts that subjects prefer to have the contest in all of the choice treatments under the assumption of the risk-neutral preference.

The advantage of the contest over the public good does not change even if we assume that subjects are risk-averse. This is because they can allocate amounts as small as possible to the lottery accounts while securing a chance of receiving a prize in case the other four members allocate smaller points to the lottery accounts.

PREDICTION 1: *Standard Theoretical Predictions.*

All subjects allocate nothing to the public accounts and thus receive their own endowments as their payoffs when the public good regime is selected. By contrast, they have positive expected gains when the lottery contest regime is selected. They therefore vote for the contest.

However, recent experiments have found that people have other-regarding preferences, such as inequality aversion (e.g., Fehr and Schmidt 1999, Bolton and Ockenfels 2000) and reciprocity (e.g., Rabin 1993, Dufwenberg and Kirchsteiger 2004, Falk and Fischbacher 2006). These preference models predict that some subjects contribute positive amounts to their public accounts and thus some of them receive payoffs higher than their own endowment amounts under the public good regime. As a result, those subjects' preferences between the two regimes may differ from Prediction 1. Let us suppose that subjects have inequality-averse preferences. For simplicity, we will assume that subject *i* has the following utility function:

$$u_i(\pi_i|\pi_{-i}) = \pi_i - \mu_i \cdot \frac{1}{N-1}\sum_{j=1}^{N}(\pi_j - \pi_i)^2. \tag{3}$$

Here, μ_i is the utility weight of subject *i* on inequality and *N* is group size ($N = 5$).[12] Subjects are assumed to be heterogeneous: μ_i differs by subject. As illustrated in Appendix A.2, the mutual full free-riding equilibrium (i.e., $c_i = 0$ for all *i*) no longer occurs for a broad range of μ. Moreover, the inequality-aversion model predicts that a higher percentage of Set *H* subjects, compared with Set *L* subjects, allocate positive amounts to the public accounts regardless of the allocation amounts of Set *L* or *M* subjects, as they have much higher endowments. The inequality-aversion model also predicts the conditional cooperative behavior of Set *L* and *M* subjects because they do not like to see inequality with their group members.

PREDICTION *2: Contributions to the Public Good based on Inequality Aversion.*

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[12] The use of a quadratic form, instead of the functional form proposed by Fehr and Schmidt (1999), is due to its tractability.

(a) Some subjects contribute positive amounts to the public accounts. (b) A higher percentage of Set H subjects, relative to Set L subjects, contribute positive amounts to the public accounts, regardless of the contribution amounts of Set M and Set L subjects. (c) The contribution amount of a Set L or M subject is positively correlated with his/her beliefs on the contribution amounts of the other members.

Note that regarding Prediction 2(b), a Set *H* subject's optimal contribution amount may depend on his/her belief. He/she may decide how much inequality to reduce according to μ. For instance, suppose that a Set *H* subject believes that each of two Set *M* subjects in her group would contribute 7 points and each of two Set *L* subjects in her group would contribute 1 point to the public account. In that case, if the Set *H* subject contributes 28 points, the five subjects obtain almost the same payoffs and hence the Gini coefficient would be minimized (which would be .00312).[13] However, the Set *H* subject would most likely contribute less than 28 points as her material payoff would have some utility weight.

We also note that despite Prediction 2(b), Set *H* subjects would not contribute very large amounts. In the previous example, if the Set *H* subject contributes more than 28 points, the payoff distribution is reversed and the payoff of the Set *H* subject becomes the lowest in her group. Even if Set *M* and Set *L* subjects contribute all of their endowments, when the Set *H* subject contributes her full 50 points, the Set *H* subject would receive a much smaller payoff than the other subjects.[14]

In the lottery contest regime, only one individual in the group wins a prize. Predictions based on social preferences in such a risky environment need an additional assumption. There

[13] In this example, the Set *H*, *M*, and *L* subjects obtain payoffs of 30.8, 30.6 and 31.0 points, respectively.
[14] The Set *H*, *M*, and *L* subjects obtain payoffs of 22.0, 44.0 and 55.0 points, respectively, in this case.

are two ways to model social preferences, as studied by Brock *et al.* (2013). One is to assume that a subject *i* cares about the ex-post distribution of income in her group. Under this assumption, as shown in Eq. (3), the inequality-averse agent incurs a large utility loss due to a high inequality in the contest, regardless of whether the agent wins or loses.[15] Therefore, those who are more concerned about ex-post inequality would be more likely to vote for the public good. Combined with Prediction 2(a), we have the following prediction:

PREDICTION 3: *Voting based on Ex-post Inequality Aversion.*

If subjects care about ex-post inequality within their groups and Prediction 2(a) holds, then they vote for the public good in all treatments.

Another way to model social preferences in the risky environment is based on subjects' likelihood of winning (see Brock *et al.* also). If subject *i* cares about ex-ante opportunities to receive high payoffs, we can assume that his/her utility depends on his/her expected payoffs and those of his/her four peers: $\{E[\pi_i]\}_{i\in\{1,2,3,4,5\}}$. The degree of inequality is measured using the Gini coefficient. The Gini coefficient of the equilibrium expected payoffs with the standard theoretical assumption is .327 under the public good regime (five members' payoffs are 50, 20, 20, 10, 10); .300 under the contest regime with a prize of 50 (five members' payoffs are 52, 22, 22, 12, 12); and .292 under the contest regime with a prize of 110 (five members' payoffs are 57.5, 27.2, 27.2, 13.6, 13.6); and .327 under the contest regime with a prize of 220 (five members' payoffs are 100, 40, 40, 20, 20). Therefore, in a situation in which all subjects behave selfishly, the public good regime has more unequal ex-ante expected payoff distribution than the

[15] $E[u_i(\pi_i|\pi_{-i})|G_i] = E[\pi_i|G_i] - \mu_i \cdot \frac{1}{N-1}\sum_{j=1}^{N} E\left[(\pi_j - \pi_i)^2|G_i\right]$, where G_i is the probability distribution of each member's winning in the group of subject *i* based on (a) subject *i*'s own allocation decision and (b) subject *i*'s belief about the allocation amounts made by the other four members. $\sum_{j=1}^{N} E\left[(\pi_j - \pi_i)^2|G_i\right]$ is much larger with the contest than with the public good.

contest regime in the L and H treatments. This implies that if ex-ante equality is more important to subjects than ex-post equality, they will not vote for the public good in these two treatments unless Prediction 2(a) holds. By contrast, in the VH treatment, the ex-ante inequality is equal in the public good and contest regimes.

PREDICTION 4: *Voting based on Ex-ante Inequality Aversion.*

If neither material incentives nor risk attitudes drive subjects' institutional choices, then (a) subjects vote for the contest regime in the L and H treatments unlike Prediction 3; and (b) a higher proportion of subjects in the L and H treatments, compared with the VH treatment, vote for the contest.

It should be noted that in Prediction 4, subjects' allocation behaviors under the public good and contest regimes are assumed to follow the predictions of the standard theory (Table 1). Subjects' voting decisions can be different from this benchmark; for example, if Prediction 2 holds.

There is also a possibility that subjects' risk preferences drive their institutional choices. The distribution of a subject's ex-post payoffs substantially differs between the two regimes. The range of a subject's possible payoffs is larger in the lottery contest regime: while a higher payoff is possible, he/she obtains nothing from the contest if he/she loses. In particular, the contest regime in the H or VH treatment generates a higher expected return, but subjects may perceive it as being more risky, as they believe that larger amounts must be invested to win the competition. Hence, more risk-averse subjects may vote for the public good.

PREDICTION 5: *Risk Preferences and Voting.*

While more risk-averse subjects vote for the public good, more risk-loving subjects vote for the lottery contest.

We can test Prediction 5 by using the elicitation task used by Holt and Laury (2002). This task consists of ten questions, each of which asks subjects to choose an option between a risky lottery and a safe lottery. We use the number of risky options chosen by a subject (which we denote as $\eta \in \{0, 1, 2, \ldots, 10\}$) as a proxy of his/her risk preference. If Prediction 5 holds, then the average η of supporters of the public good should be significantly smaller than that of supporters of the contest.

Results

14 sessions, four for each choice treatment and two for the control treatment, were conducted at the University of Michigan in April and May 2014 and in January 2016. The experiment was programmed using ztree (Fischbacher 2007). Almost all of the subjects were undergraduate students there. They were recruited via solicitation emails using a recruiting website, ORSEE (Online Recruitment System for Economic Experiments). No subjects participated in more than one session. No communication was allowed during the sessions. Experimental sessions lasted on average from one to one-and-a-half hours, and subjects earned on average $22.75 (including a participation fee of $5). Neutral framing was used in all instructions and experiments.[16]

Subjects' Voting Results

Panel (1) of Table 2 reports subjects' votes. A strikingly large portion of subjects, around 70% in total, voted for the public good under each of the two voting rules, contrary to Prediction

[16] Loaded words such as "contribute" and "public good" were avoided.

1 (see the “Total” row in Table 2). A closer look at individual votes by endowment reveals that high percentages of support for the public good from Set *M* and Set *L* subjects do not depend on the size of prize under the lottery contest regime; their votes for the public good are more than 70% in all of the three choice treatments. The percentage of Set *H* subjects who support the public good is lower than that of Set *M* and Set *L* subjects, but it is at a high level, a little above 50%, in the L and H treatments; it is also 33% in the VH treatment where Set *H* subjects have a large advantage under the alternative contest regime (Table 1). These observations contradict Prediction 4. This may mean that (i) subjects’ material incentives or risk preferences drive them to vote for the public good; (ii) the Gini coefficients of subjects’ ex-ante expected payoffs are different from those predicted by the standard theory; and/or (iii) ex-post inequality aversion affects subjects’ voting decisions. As explained later, our detailed analyses show that while subjects’ votes may be influenced by material benefits under the public good when the size of the prize in the contest is low, possibilities (ii) and (iii) play important roles, especially in the H and VH treatments.

Regarding the effects of endowment size on subjects’ votes, it was found in this study that the smaller the endowments assigned to subjects, the more likely the subjects were to vote for the public good (Appendix Table B.2). It was also found that subjects’ voting decisions were affected only slightly by voting rules.[17]

Panel (2) of Table 2 reports collective vote outcomes. It shows a significant difference between the equal and weighted voting rules due to the large difference in individual preferences according to endowment size. It was found that the public good was significantly more likely to

[17] The number of votes for the public good under the equal voting rule (152 of 215 votes) is not significantly different from that under the weighted voting rule (151 of 215 votes) according to a two-sample z-test of proportion (*p*-value = .916, two-sided).

be selected with the equal voting rule than with the weighted voting rule.[18] Especially in the VH treatment, around 67% of Set *H* subjects voted for the contest whereas more than 70% of Set *M* and Set *L* subjects voted for the public good. Set *M* and Set *L* subjects outweighed Set *H* subjects' opposing votes under the equal voting rule, but not always under the weighted voting rule.

RESULT 1: *(a) Prediction 1 does not hold: around 70% of subjects voted for the public good. (b) The smaller the endowments assigned to subjects, the more likely the subjects were to vote for the public good. (c) The public good is more likely to be selected under the equal voting rule than under the weighted voting rule.*

Subjects' Action Choices

Subjects on average contributed positive amounts under the collectively selected public good regime (Figure 2), which is consistent with Prediction 2(a). Part of the subjects' action choices can be explained by inequality-averse motives. Strong conditional cooperative behavior was observed under the public good regime with Set *M* and Set *L* subjects, as in Prediction 2(c). That is, their contribution amounts were positively correlated with their beliefs on the (average) allocation amounts of Set *M* and Set *L* subjects in their groups (Appendix Table B.5). This resonates with the idea that subjects are inequality-averse and prefer a smaller inequality in payoffs.

[18] The public good was significantly more likely to be implemented under the equal voting than under the weighted voting rule according to a two-sample z-test of proportion (*p*-value = .0372, two-sided). We also calculated the hypothetical likelihood of two regimes being implemented if the assigned voting rule was different (i.e., if the vote was conducted with the weighted voting rule in groups where the equal voting rule was assigned; and if the equal voting rule was used in groups where the weighted voting rule was assigned). See Appendix Table B.1.

RESULT 2: *The contribution amounts of Set M and Set L subjects in the public good regime were positively correlated with their beliefs on the contribution amounts of the other subjects from Sets M and L.*

However, some subjects' behavior under the public good regime cannot be explained by the inequality-aversion model. It was found that a significantly *smaller* proportion of Set *H* subjects, compared with Set *M* or *L* subjects, contributed positive amounts to the public good (Appendix Table B.3).[19] This contradicts Prediction 2(b). Also, this cannot be explained by the differences in beliefs between Set *H* subjects and Set *M* or *L* subjects on the contribution amounts of other group members − the differences were not statistically significant for most comparisons in all of the choice treatments (Appendix Table B.4).[20] Moreover, Set *H* subjects contributed significantly smaller percentages of endowments than subjects in the other categories (Figure 2 and Panel (2) of Appendix Table B.3). Set *M* and Set *L* subjects correctly anticipated this behavior of Set *H* subjects (Appendix Table B.4). Although these results cannot be explained by inequality aversion, they are consistent with the well-known experimental evidence that subjects' contribution amounts are dependent on their MPCRs (e.g., Fisher *et al.* 1995, Zelmer 2003). MPCR is the highest for Set *H* subjects and the lowest for Set *L* subjects, as shown in Eq. (1).[21] In addition, it is consistent with the findings of past studies showing that subjects' endowment size and level of cooperation are negatively correlated in public goods games when endowments are heterogeneous.

[19] The levels of contributions were similar across the three categories of subjects in the L treatment because of one Set *H* subject who contributed his/her full endowment.

[20] It also implies that the less frequent positive contributions of Set *H* subjects cannot be explained by reciprocity models.

[21] As discussed in the Prediction Section, the difference in MPCR means that Set *H* subjects received lower payoffs than subjects in the other categories if they contributed very large amounts. This can also partially explain the Set *H* subjects' small contributions if they are inequality-averse agents.

RESULT 3: *A significantly smaller proportion of Set H subjects, compared with that of Set M and Set L subjects, contributed positive amounts to the public accounts.*

Despite their correct beliefs that Set *H* subjects would contribute a lower percentage of endowment than they did, Set *M* and Set *L* subjects still believed that they would obtain significantly higher payoffs than those predicted by standard theory under the public good regime (Appendix Table B.8). A subject's ex-ante expected payoff was calculated using his/her own allocation amount and his/her beliefs regarding the other four members' allocation amounts.[22]

In the lottery contest regime, the average allocations to the lottery accounts by subjects of each category were smaller than the standard theoretical predictions under risk neutrality (Appendix Table B.6 and Table 1). This implies that they were on average risk-averse.

An exploration of subjects' beliefs reveals that both Set *M* and Set *L* subjects in the L treatment believed that Set *H* subjects had allocated significantly more than 8 points (the allocation amount predicted by standard theory with risk neutrality) to the lottery accounts, and that their own winning probability would be less than the standard theoretical predictions (Appendix Table B.7). Moreover, in all choice treatments both Set *M* and Set *L* subjects believed that Set *H* subjects had allocated the largest amounts in their groups. Pessimism due to the expectation about Set *H* subjects' high allocations may prevent subjects with medium-sized and low endowments from voting for the contest.

RESULT 4: *Subjects in all categories allocated smaller amounts to the lottery accounts than the standard theoretical predictions. Set M and Set L subjects believed that Set H subjects had*

[22] Eq. (1) or (2) was used. For instance, a Set *M* subject's believed payoff in the public good regime was calculated by: $20 - C_M + .2 \cdot 2 \cdot (C_H^b + C_M + C_M^b + 2C_L^b)$. Here, C_M is the contribution of the Set *M* subject, and C_i^b is the Set *M* subject's belief concerning the contribution amount of the Set $i \in \{H, M, L\}$ member.

allocated larger amounts to the lottery accounts than themselves and therefore assumed higher probabilities for Set H subjects to win than for themselves in each choice treatment.

Ex-ante and Ex-post Material Incentives

An inter-regime comparison of subjects' ex-ante expected payoffs reveals that relative material payoffs between the two regimes depend on endowment size and prize size in the lottery contest (Figure 3 and Appendix Table B.9). In the L treatment, Set *M* and Set *L* subjects on average believed that they would receive significantly higher expected payoffs under the public good regime, but Set *H* subjects believed that the payoffs would be almost identical between the two regimes. In the H treatment, although Set *L* subjects again believed that they would obtain higher expected payoffs with the public good, both Set *H* and Set *M* subjects believed that their payoffs would be higher under the contest regime. Thus, Set *H* and Set *M* subjects faced conflicts with Set *L* subjects in terms of ex-ante material interests in the H treatment. In the VH treatment, subjects in all three categories believed that they would obtain higher expected payoffs, although the difference was insignificant for Set *L* subjects, under the contest regime. Therefore, there are no conflicts in the VH treatment if subjects are only concerned about their own material payoffs.

RESULT 5: *Set L subjects believed that they would obtain significantly higher payoffs with the public good in the L and H treatments, but not in the VH treatment. Set H and M subjects believed that they would obtain significantly higher expected payoffs with the contest in the H and VH treatments.*

Appendix Figure B.1 and Table B.10 report average ex-post payoffs by treatment. These show that the total payoffs (average payoffs) were in fact higher in the contest regime than in the public good regime in the H and VH treatments, although the majority of groups did not select the contest in these two treatments.[23] The higher efficiency under the contest regime may imply that subjects face a trade-off between efficiency and inequality in the H and VH treatments. The degree of inequality under each of the two regimes is explored in the next subsection.

RESULT 6: *The total ex-post payoffs (efficiency) were higher in the contest regime than in the public good regime in the H and VH treatments; they were lower in the contest regime than in the public good regime in the L treatment.*

Gini Coefficients in the Two Regimes

As mentioned, Set *M* and Set *L* subjects' strong support for the public good was surprisingly similar across the three choice treatments, despite the changes in the material incentives across the treatments. Recall that Set *M* subjects especially had much higher material expected payoffs with the contest than with the public good in the H and VH treatments.[24] Second, despite Set *H* subjects believing that they would have very high material payoffs in the contest, a significant fraction of Set *H* subjects voted for the public good in the H and VH treatments. These results suggest that subjects' voting decisions, especially Set *M* subjects' and some Set *H* subjects', were driven not only by the level of their *own* ex-ante expected payoffs. What can explain the seemingly irrational voting behavior of the subjects? Detailed analyses suggest that their votes are affected by inequality-averse concerns.

[23] The regime under which a subject would receive a higher payoff depends on whether he/she wins the competition in the contest. In the L and H treatments, Set *H* subjects on average received higher payoffs with the contest than with the public good, whereas Set *M* and Set *L* subjects received higher payoffs with the public good than with the contest. In the VH treatment, conversely, Set *H* subjects on average received higher payoffs with the public good, whereas Set *M* and Set *L* subjects received higher payoffs with the contest.

[24] We acknowledge that Set *L* subjects' strong support for the public good in the L and H treatments can be explained by income maximization as their material payoffs (both ex-ante and ex-post) were higher with the public good. However, as for the VH treatment, Set *L* subjects' material payoffs with the contest were indeed higher than with the public good. Despite the higher material incentives in the contest, Set *L* subjects' strong support for the public good was almost the same in the VH treatment as that in the L and H treatments.

First, regardless of endowment size, subjects believed that the Gini coefficients of expected payoffs would be much smaller with the public good than the contest (Figure 4(a) and Appendix Table B.11). The differences in the Gini coefficients between the two regimes were especially large for Set *M* and Set *L* subjects. Each subject's believed Gini coefficient in his/her group was calculated using Eq. (1) or (2). For this calculation, the ex-ante expected payoffs of the five group members were computed based on the subject's own allocation amount and his/her belief regarding the allocation amounts of the other four members. The smaller believed Gini coefficients with the public good suggest that the votes of some Set *H* and Set *L* subjects as well as Set *M* subjects may be affected by the difference in the ex-ante inequality between the two regimes.

In order to formally test the impact of ex-ante inequality-averse concerns on subjects' voting, two regression analyses were conducted separately for (1) groups that selected the public good (PG groups, hereafter); and (2) groups that selected the lottery contest (conflict groups, hereafter). The dependent variable is a dummy which equals 1 if a subject votes for the public good; it equals 0 otherwise, for both the PG and conflict groups. Independent variables include subjects' ex-ante Gini coefficients with the public good and with the contest for the PG and conflict groups, respectively.[25] Notice that PG groups include not only subjects who voted for the public good, but also those who voted for the contest. The same holds true for conflict groups. If ex-ante inequality aversion plays an important role in subjects' voting decisions, the size of subjects' perceived Gini coefficients with the public good would be *negatively* correlated with their support for the public good in PG groups; subjects' perceived Gini coefficients in the contest would be *positively* correlated with their support for the public good in conflict groups.

[25] The idea to explore the correlation between subjects' votes and perceived Gini coefficients was provided by an anonymous referee.

This turned out to be true (Table 3).[26] These regression results suggest that people with more ex-ante inequality-averse concerns are more likely to vote for the public good.

RESULT 7: *Regardless of endowment size, subjects' ex-ante expected payoffs based on beliefs are more equally distributed with the public good than the contest. In the groups where the public good was selected, those who voted for the public good expected a smaller degree of inequality than those who voted against it.*

Second, a similar observation can be made with ex-post inequality between the two regimes. Figure 4(b) reports the average Gini coefficients of subjects' realized payoffs within a group. The Gini coefficients in the lottery contest regime were on average 65%, 135%, and 134% higher than those in the public good regime in the L, H and VH treatments, respectively.[27] The significant differences in the degree of ex-post inequality between the two regimes suggest that subjects' ex-post inequality-averse motives may also drive their support for the public good. Figure 4(b) further indicates that the average ex-post Gini coefficients under the contest are much higher in the H and VH treatments than in the L treatment. Recall that the Gini coefficients of ex-ante expected payoffs in the contest regime are similar across the three choice treatments (Figure 4(a)) but material incentives with the contest are higher in the H and VH treatments than in the L treatment. These observations imply that subjects' ex-post inequality-averse concerns can discourage them from voting for the contest, at least in the H and VH treatments. These findings resonate with the results of Brock *et al.* that the ex-ante expected payoff comparison alone cannot explain people's decisions in a risky environment. This interpretation, along with

[26] Significantly positive correlations between subjects' votes and perceived Gini coefficients are robust even with the inclusion of control variables for PG groups – see columns (1) and (2). This is not the case for conflict groups. This is possibly due to the small sample size in the contest (the majority of groups selected the public good as discussed previously).

[27] Mann-Whitney tests show that the differences in the average Gini coefficient between the two regimes are significant in all treatments (Panel (b) of Appendix Table B.11).

the voting data by Set *M* subjects and some Set *H* subjects, is also consistent with the finding of Bartling *et al.* that people have strong aheadness aversion.

RESULT 8: *The Gini coefficients of ex-post payoffs are much smaller for the public good than for the contest.*

Risk Preferences and Subjects' Votes

Another factor that could be responsible for subjects' institutional choices is risk attitudes. However, our data does not support Prediction 5. The average risk attitudes (η) were not significantly different between supporters of the public good and those of the contest for most of the subjects from Sets *H*, *M* and *L*, regardless of the prize size in the contest (Appendix Table B.12; also see Table 3). This suggests that risk attitudes are not the most important factor in subjects' voting decisions.

RESULT 9: *Prediction 5 does not hold. Risk attitudes were not significantly different between those who voted for the public good and those who voted for the contest.*

The Democratic Process and Subjects' Votes

Lastly, we note that there is a possibility that subjects' voting decisions may be affected by the endogenous process, such as the effects of signals sent through voting and the democracy premium – impact that the democracy directly has on people's beliefs and/or preferences (e.g., Tyran and Feld 2006, Dal Bó *et al.* 2010, Kamei forthcoming). We could expect that the presence of the endogenous process may make subjects vote for the public good, assuming that some subjects have non-standard preferences. These endogenous effects alone do not explain subjects' collective institutional choices, however. The average contribution amounts to the public good were, in fact, slightly lower in the three choice treatments than in the Exogenous

Public Good treatment (Figure 2). This suggests that the democratic process is not the most important factor that drives subjects' institutional choices in this environment. This result, along with Results 1 and 5–9, suggests that it is more reasonable for us to interpret the voting decisions made by some subjects – especially Set *M* subjects and some Set *H* subjects – as their dislike for an unequal distribution of payoffs among members.

Conclusions

This paper provides the first experimental evidence concerning people's collective choices between a policy that helps the less endowed to a greater degree − a public good regime − and a policy that promotes competition − a lottery contest regime − in a situation where the resources of individuals are unequally distributed. In the experiment, around 70% of the subjects voted for the public good. Subjects with medium-sized and high endowments believed that their expected payoffs would be higher if they selected the contest in which the size of the prize was large. Nevertheless, a substantial number of subjects in the two categories supported the public good. As a result, the public good was selected in most groups, even when the prize size in the contest was high and accordingly the efficiency was in fact higher with the contest than that with the public good.

A closer look at our data reveals that the voting behavior of some of the subjects − especially those with medium-sized or high endowments − can be explained by inequality-averse concerns. The distributions of payoffs within groups − not only for ex-post payoffs but also for ex-ante expected payoffs based on subjects' beliefs − were more equal with the public good than with the contest. It was also found that subjects' believed Gini coefficients in the public good regime were negative predictors regarding their support for the public good.

Our paper has two implications regarding people's collective institutional choices. First, the results suggest that people's inequality-averse motives may be strong enough to drive their collective institutional choices away from competitive rules. This implies that a competition scheme may not be collectively implemented in a society or an organization even though it may generate a materially better outcome than an alternative with a public good aspect. Second, recent papers, including Ertan *et al.* (2009), Putterman *et al.* (2011) and Kamei *et al.* (2015), has shown that institutions which may materially benefit all members equally in social dilemmas while not sacrificing equality are more likely to be collectively selected when an equal voting rule is used because the majority of assenting votes outperform the minority of dissenting votes by anti-social individuals who favor the right to free ride. Our results suggest that competitive policies, even those that offer material benefits to people, may be *less likely* to be selected with an equal voting rule (compared with a weighted voting rule) when there is an alternative offering a public good aspect if the population's inequality-averse preferences are sufficiently strong and the competitive policies generate a greater inequality among people.

The second implication extends to the context of conflict resolution and post-conflict peace building. In a post-conflict country, if the leaders attempt to rebuild the country without addressing inequality among people, it may generate grievances resulting from people's strong preferences for equality as evidenced in the present study, which could lead to another conflict. Moreover, it is known that policies with public good aspects can mitigate conflicts in different situations. For instance, social welfare policies that reduce inequalities may contribute significantly to conflict resolution, including terrorism (e.g., Burgoon 2006).[28] Our findings imply that strengthening democratic norms in the decision-making process could help resolve

[28] I acknowledge the ongoing debate about whether inequality and poverty can trigger terrorism. Some authors argue that a link between the two may not exist or may be weak (e.g., Krueger and Maleckova 2004).

international and domestic conflicts as policies with public good aspects are more likely to be collectively selected with a more democratic voting rule.[29]

We acknowledge that our result appears to contradict light or moderate redistributive policies currently observed in some societies or organizations. The reason for this discrepancy could be because the moderate redistributive policies seen in reality are the consequences of some political processes. Our experiment indeed shows that when the prize in a contest is high, the contest regime will be more easily selected when the rich group has more voting power. We could therefore conjecture that as the majority of people prefer cooperative policies over competitive policies when resources are heterogeneously distributed, policies may be pulled in a more redistributive direction in the long term if there is a trend of employing more democratic decision-making systems. Further experimental or empirical investigations, examining not only people's collective preferences but also the effects of political processes in relation to policy choices, are desirable.

[29] Li (2006) show that democratic participation, defined as voter turnout, is a negative predictor for a number of transnational terrorist incidents. He also shows the proportional representation system, compared with the majoritarian or mixed representative system, helps reduce such incidents. Part of the reason why democracy may reduce terrorist incidents may be that policies aimed at mitigating conflicts are more likely to be implemented with more democratic norms present as in our paper.

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Figure 1. *Experimental Design*

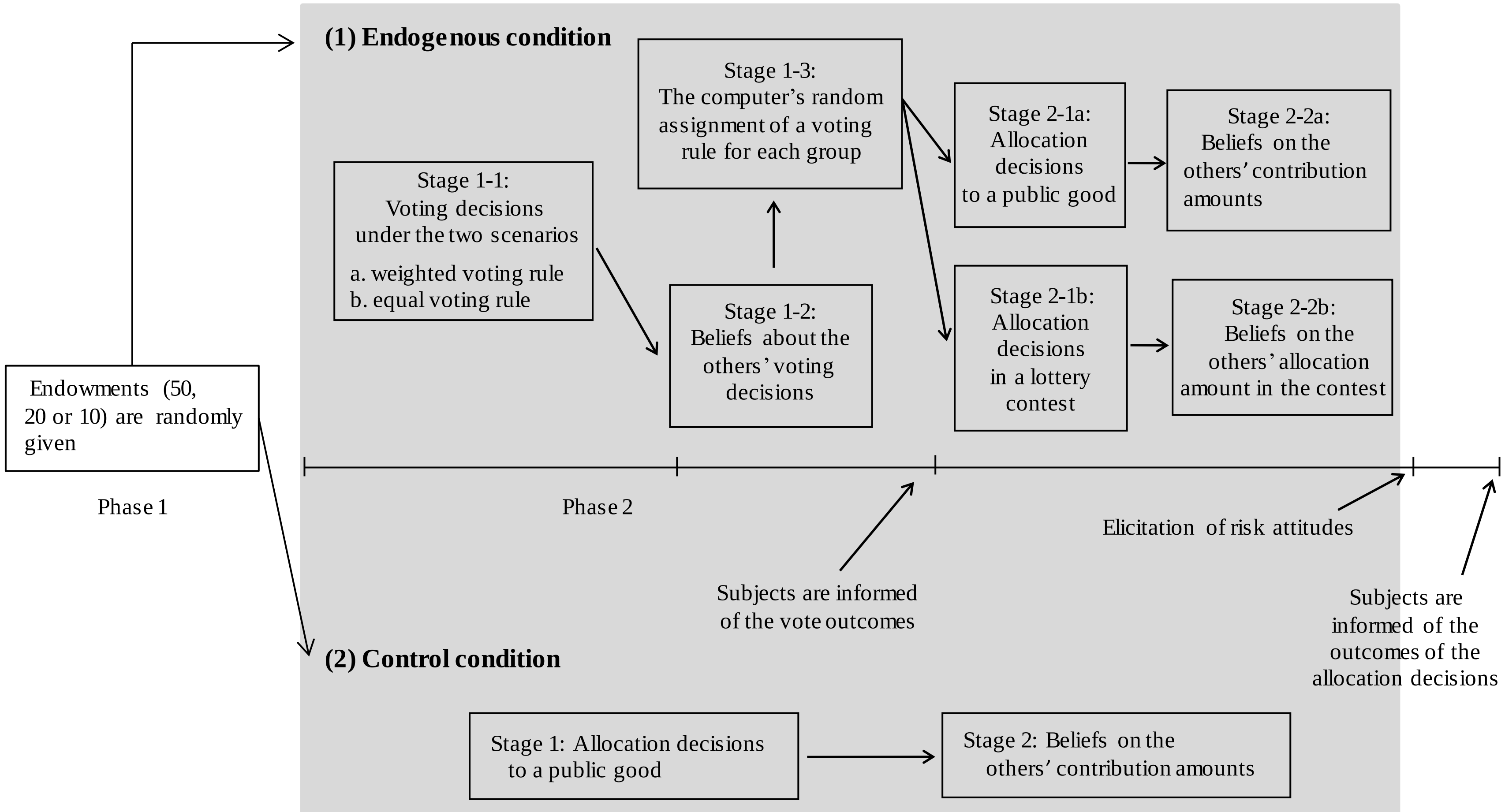


Table 1. *Summary of Treatments*

Treatment	Prize size in a lottery contest	Number of sessions	Number of groups (subjects)	Standard theoretical predictions under the risk-neutral preference				
				(a) Allocation amounts		(b) Payoff		(c) Voting
				Public good	Lottery contest	Public good	Lottery contest	
[Choice Treatments]								
L (Low)	50 points	4	15 (75)	$c_i = 0$ for all i	$x_i = 8$ for all i	$\pi_H = 50$ $\pi_M = 20$ $\pi_L = 10$	$\pi_H = 52$ $\pi_M = 22$ $\pi_L = 12$	All members vote for contest
H (High)	110 points	4	13 (65)	$c_i = 0$ for all i	$x_H \approx 21$ $x_M = 20$ $x_L = 10$	$\pi_H = 50$ $\pi_M = 20$ $\pi_L = 10$	$\pi_H = 57.5$ $\pi_M = 27.2$ $\pi_L = 13.6$	All members vote for contest
VH (Very High)	220 points	4	15 (75)	$c_i = 0$ for all i	$x_H = 50$ $x_M = 20$ $x_L = 10$	$\pi_H = 50$ $\pi_M = 20$ $\pi_L = 10$	$\pi_H = 110.0$ $\pi_M = 40.0$ $\pi_L = 20.0$	All members vote for contest
[Control Treatment]								
Exogenous Public Good	----	2	6 (30)	$c_i = 0$ for all i	----	$\pi_H = 50$ $\pi_M = 20$ $\pi_L = 10$	----	----

Note: c_i (x_i) is the allocation of subject i to his/her public (lottery) account. π_H, π_M, and π_L are (expected) payoffs of Set H, Set M and Set L subjects, respectively.

Table 2. *Voting Decisions and Outcomes*

(1) Individual Conditional Voting Decisions

Treatment	Subject category		Number of votes under EV[1]	Number of votes under WV[1]	Percentage under EV	Percentage under WV
L	Set *H*	Public good	8	8	53%	53%
		Contest	7	7	47%	47%
	Set M	Public good	23	21	77%	70%
		Contest	7	9	23%	30%
	Set *L*	Public good	21	23	70%	77%
		Contest	9	7	30%	23%
	Subtotal	Public good	52	52	69%	69%
		Contest	23	23	31%	31%
H	Set *H*	Public good	8	6	62%	46%
		Contest	5	7	38%	54%
	Set *M*	Public good	21	20	81%	77%
		Contest	5	6	19%	23%
	Set *L*	Public good	21	20	81%	77%
		Contest	5	6	19%	23%
	Subtotal	Public good	50	46	77%	71%
		Contest	15	19	23%	29%
VH	Set *H*	Public good	5	5	33%	33%
		Contest	10	10	67%	67%
	Set *M*	Public good	22	23	73%	77%
		Contest	8	7	27%	23%
	Set *L*	Public good	23	25	77%	83%
		Contest	7	5	23%	17%
	Subtotal	Public good	50	53	67%	71%
		Contest	25	22	33%	29%
Total		Public good	152	151	71%	70%
		Contest	63	64	29%	30%

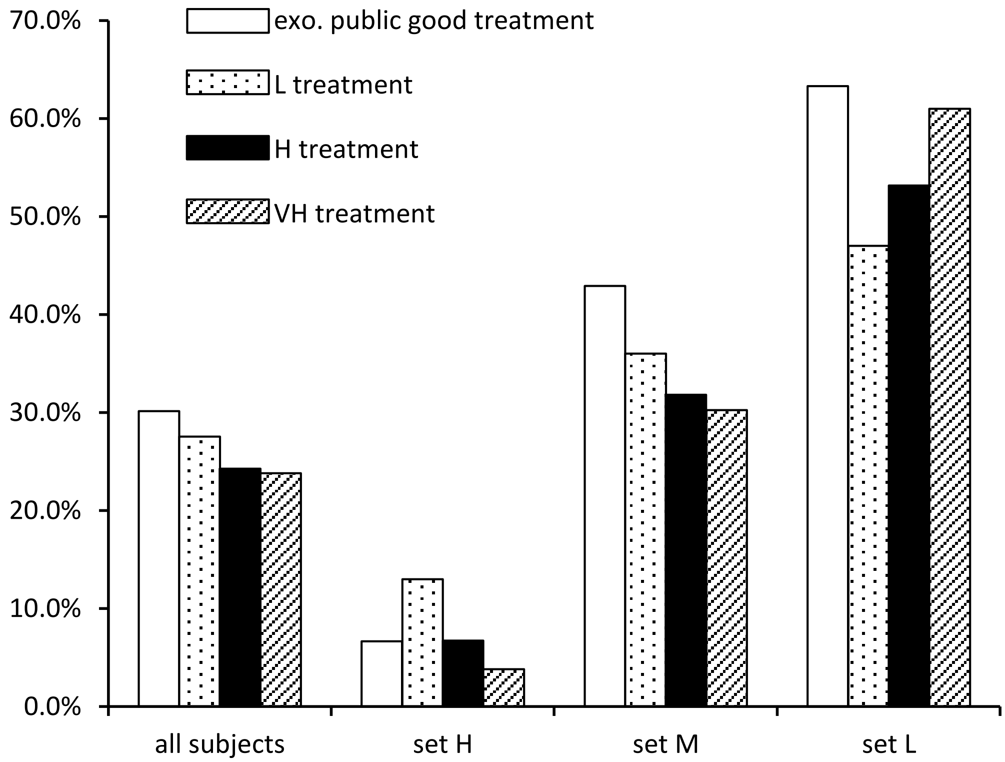
(2) Realized Collective Vote Outcomes

Treatment		EV	WV
L	Public good	80%	60%
	Contest	20%	40%
H	Public good	100%	78%
	Contest	0%	22%
VH	Public good	89%	33%
	Contest	11%	67%
Total	Public good	89%	60%
	Contest	11%	40%

Notes: [1] The numbers in the EV and WV columns in Panel (1) indicate the numbers of individual votes under the equal and weighted voting rule, respectively.

[2] The numbers in Panel (2) indicate the realized collective vote outcomes under each voting rule as percentages of cases. Appendix Table B.1 includes the counts of groups. Table B.1 also includes the hypothetical results for cases where each voting rule was used to all groups based on individual votes in Panel (1).

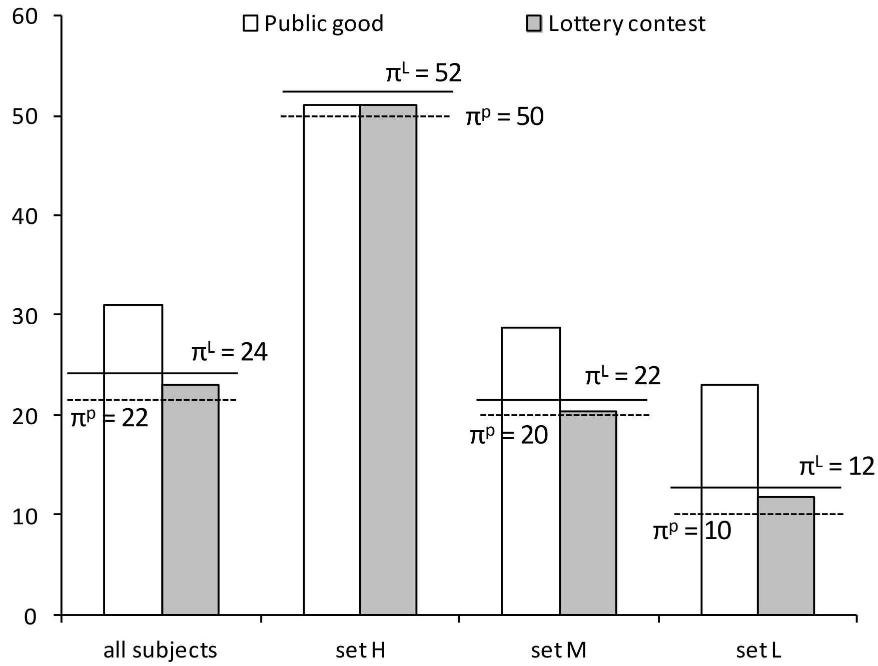
Figure 2. *Average Contribution in the Public Good Regime*



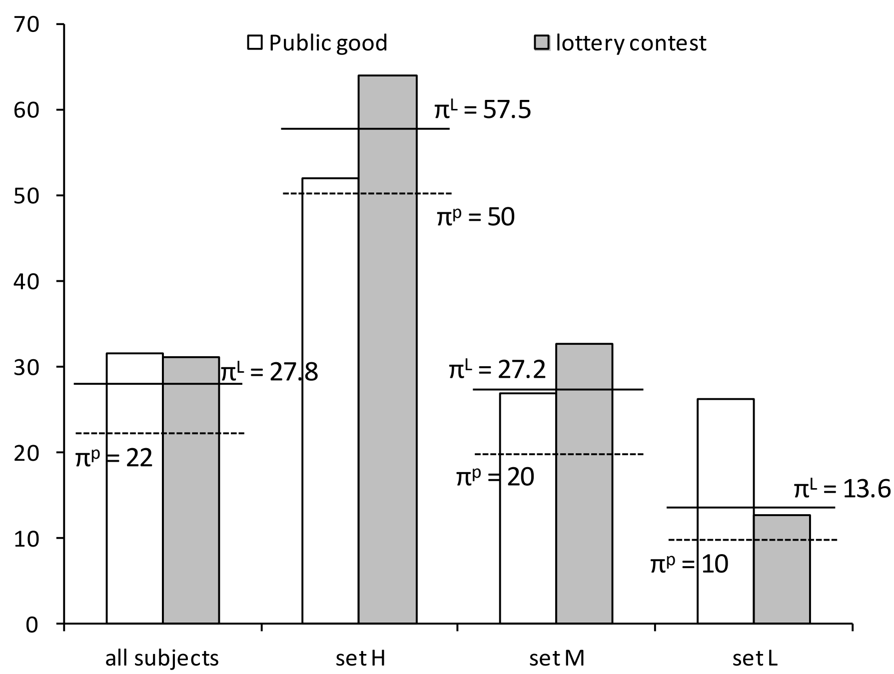
Notes: Each bar was calculated by: 100·(the average contribution in the category)/(their endowments). Each of the "all subjects" bars was calculated by: 100·(the average contribution of all subjects in the corresponding treatment)/22. Here, 22 is the average endowment amount (= 110/5).

Figure 3. *Average Ex-ante Expected Payoffs based on Beliefs*

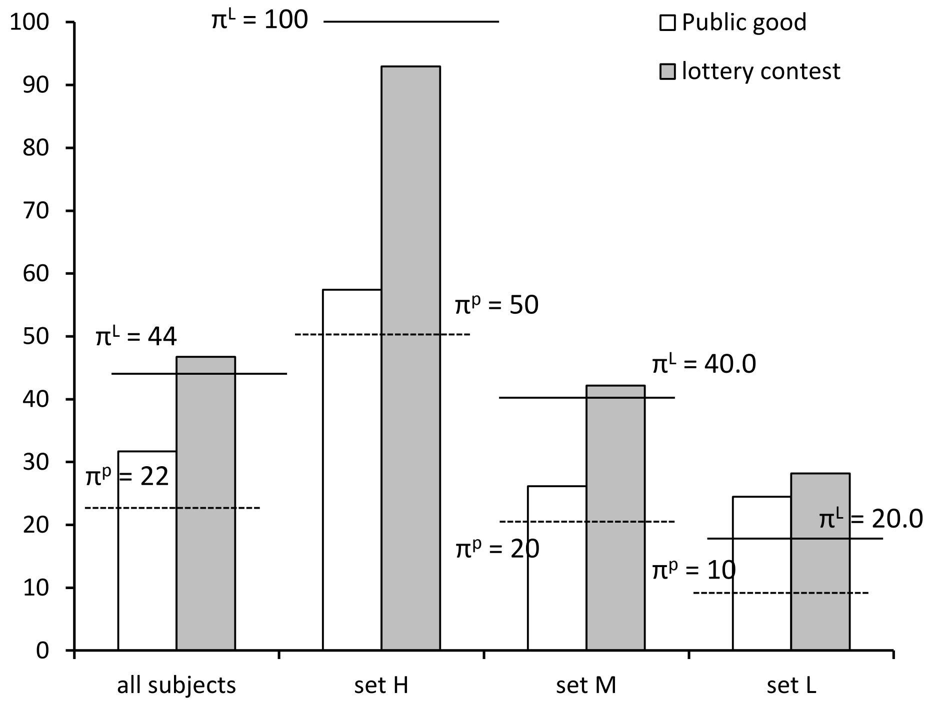
(a) L treatment



(b) H treatment



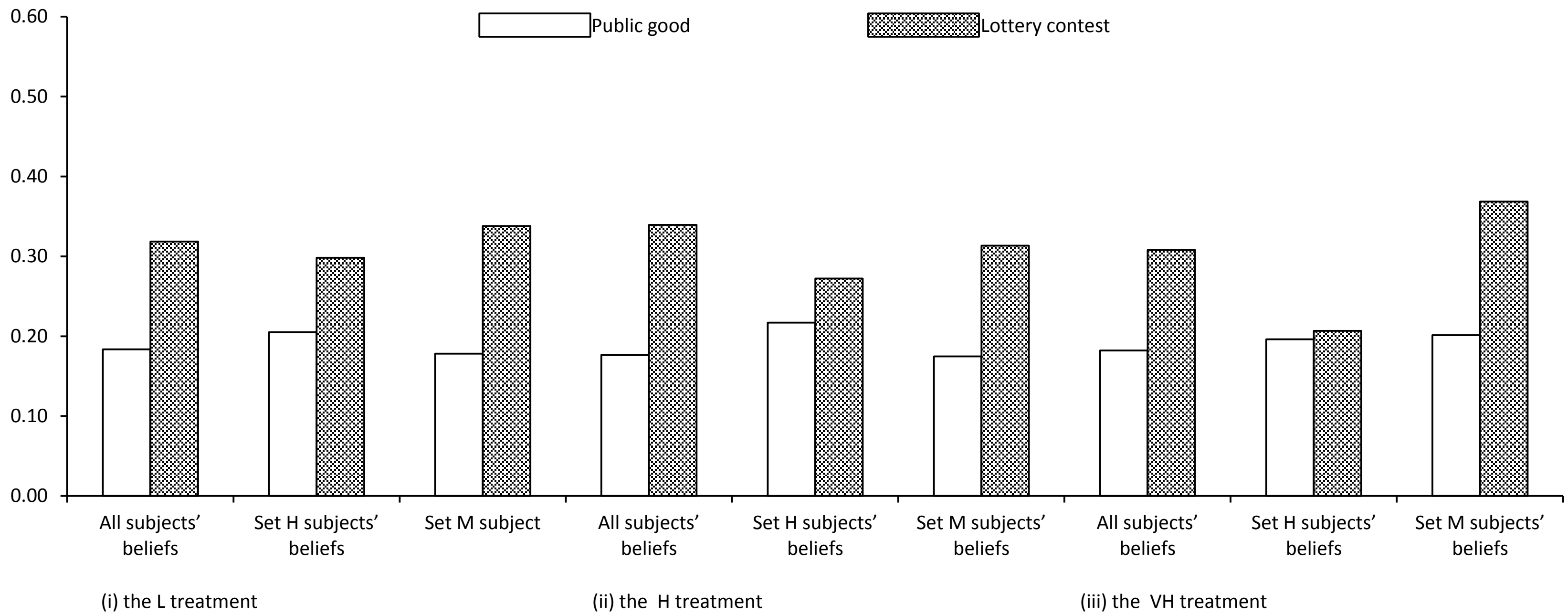
(c) VH treatment



Notes: π^p (π^L) indicates expected payoffs under the public good (the lottery contest) based on the standard theoretical predictions with the risk-neutral preference. A subject's believed ex-ante expected payoff was calculated based on his/her own allocation decision and beliefs on allocation amounts of the other four members. Figures of average realized payoffs are found in Appendix Figure B.1.

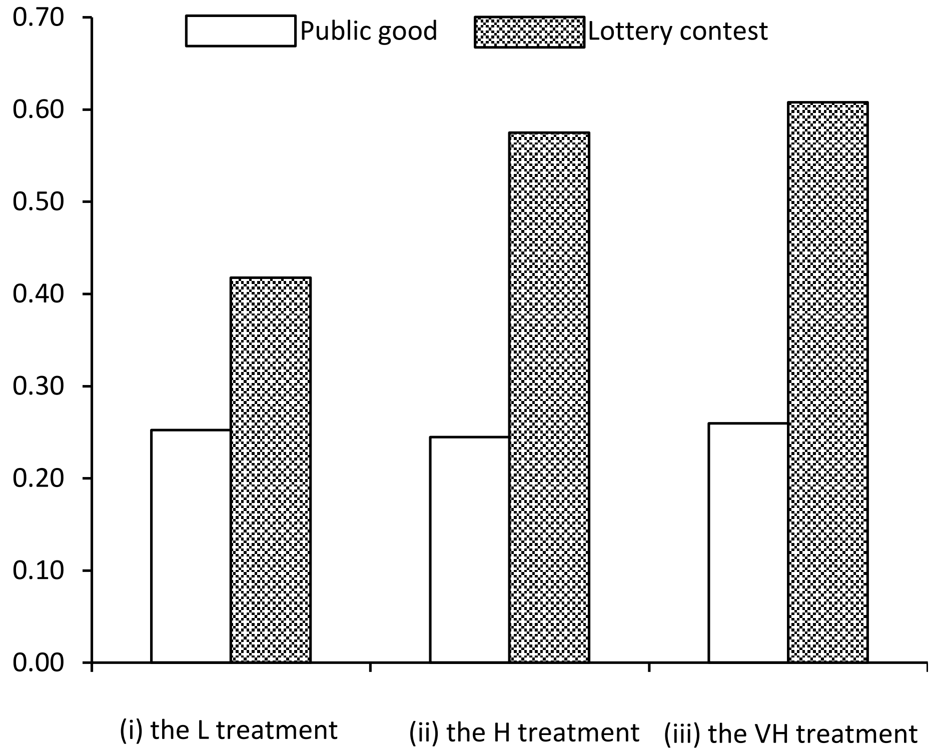
Figure 4. *Average Gini Coefficients of Subjects' Payoffs by Regime*

(a) Ex-ante Expected Payoffs



Notes: Each bar indicates the average believed Gini coefficient across all subjects or across Set *H* subjects or Set *M* subjects. We first calculated each subject's (i) own ex-ante expected payoff and (i) believed other four members' ex-ante expected payoffs based on his/her allocation amount and beliefs, using Eq. (1) or (2). We then calculated each subject's Gini coefficient. The data for Set *L* subjects is found in Appendix Table B.11.

(b) Ex-post Payoffs



Note: Each bar in figure (b) indicates the average realized Gini coefficient in groups by regime.

Table 3. *Subjects' Voting and Believed Gini Coefficients under Collectively Selected Regimes*

Dependent variable: a dummy which equals 1 if subject *i* voted for the public good regime; and 0 otherwise.

	PG Groups		Conflict Groups	
	(1)	(2)	(3)	(4)
Subject *i*'s believed Gini coefficient based on her beliefs with public good in columns (1) and (2); with lottery contest in columns (3) and (4)	-.94** (.40)	-.82** (.41)	2.07** (.80)	1.33 (.89)
Endowment {= 10, 20, 50}	----	-.0043** (.0021)	----	-.011** (.0044)
Risk attitudes (η) {= 0, 1, 2, …, 10}	----	-.026 (.017)	----	-.0083 (.043)
Price size {= 50, 110, 220}	----	----	----	.00028 (.0008)
Constant	.98*** (.079)	1.16*** (.12)	-.19 (.26)	.29 (.47)
# of observations	155	155	60	60
F	5.45	3.81	6.66	3.49
Prob > F	.0209	.0114	.0124	.0131
Adjusted R-squared	.0281	.0520	.0875	.1443

Notes: Linear regressions.

*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Not for Publication

Supplementary Online Appendix for

"Promoting Competition or Helping the Less Endowed? Distributional Preferences and Collective Institutional Choices under Intra-Group Inequality"

Table of Contents

Appendix A: Theoretical Predictions

A.1. Standard Theoretical Predictions in the Lottery Contest Regime: Optimal Allocations under the Assumption of the Risk-Neutral Preference

For simplicity, we assume that two Set *M* subjects in a group each allocate the same amounts to their lottery accounts, and that two Set *L* subjects in a group also each make the same allocation decisions in equilibrium.

Proposition A1: Suppose that each subject has the risk-neutral preference. Then, the following is the unique equilibrium under the lottery contest regime in each treatment: $(x_H^*, x_M^*, x_L^*) = (8, 8, 8)$ *in the L treatment;* $(x_H^*, x_M^*, x_L^*) = (21, 20, 10)$ *in the H treatment; and* $(x_H^*, x_M^*, x_L^*) = (50, 20, 10)$ *in the VH treatment.*

<u>Proof</u>:

a. The L treatment:

Each subject in a group maximizes his or her expected payoff expressed in Eq. (2) in the paper. Suppose that the solutions are interior. Then, the first-order condition (FOC) for subject *i* reduces to:

$$\frac{\partial E[\pi_i]}{\partial x_i} = -1 + \frac{50X_{-i}}{(x_i + X_{-i})^2} = 0. \tag{A.1}$$

Thus, each group member's best response is given by:

$$-1 + \frac{50(2x_M^* + 2x_L^*)}{(x_H + 2x_M^* + 2x_L^*)^2} = 0 \text{ for a Set } H \text{ subject.} \tag{A.2}$$

$$-1 + \frac{50(x_H^* + x_M^* + 2x_L^*)}{(x_M + x_H^* + x_M^* + 2x_L^*)^2} = 0 \text{ for a Set } M \text{ subject.} \tag{A.3}$$

$$-1 + \frac{50(x_H^* + 2x_M^* + x_L^*)}{(x_L + x_H^* + 2x_M^* + x_L^*)^2} = 0 \text{ for a Set } L \text{ subject.} \tag{A.4}$$

Here, x_H, x_M, and x_L are allocations to the lottery accounts by the Set *H*, Set *M* and Set *L* subjects, respectively. Conditions (A.2) to (A.4) imply that $x_H^* = x_M^* = x_L^* = 8$. Under this equilibrium, the expected payoffs of the Set *H*, Set *M* and Set *L* subjects are 52, 22 and 12, respectively.

There are no corner solutions. For example, suppose that $x_L^* = 10$, $x_M^* < 20$ and $x_H^* < 50$. Then, Conditions (A.2) and (A.3) imply that $x_H^* = x_M^*$. As $\frac{\partial E[\pi_L]}{\partial x_L} \geq 0$ at $x_L = 10$, along with Condition (A.2) we obtain: $x_H^* > 10$. However, the left hand side of Condition (A.2) is negative for any x_H^* such that $x_H^* > 10$, contradicting that x_H^* is the solution to (A.2). We likewise obtain a contradiction if we assume any other corner solution; the details are omitted to conserve space.

b. The H treatment:

We first show that there are no incentives for each member to change their strategy from (x_H^*, x_M^*, x_L^*) = (21, 20, 10) in order to prove that this is an equilibrium.

First, regarding a Set *H* subject, all we need to do is to compare π_H between two strategies: $x_H = 21$ and $x_H = 22$, as $\frac{\partial E[\pi_H]}{\partial x_H} = -1 + \frac{110(2x_M^*+2x_L^*)}{(x_H+2x_M^*+2x_L^*)^2} = -1 + \frac{110\cdot 60}{(x_H+60)^2}$ is decreasing in x_H and $\frac{\partial E[\pi_H]}{\partial x_H}$ is positive at $x_H = 21$ but negative at $x_H = 22$. $x_H = 21$ is the best strategy for the Set *H* subject since $E[\pi_H]|_{x_H=21, x_M=20, x_L=10} - E[\pi_H]|_{x_H=22, x_M=20, x_L=10}$ > 0.

Second, $x_M = 20$ is the best response for a Set *M* subject given that $x_H^* = 21$, $x_M^* = 20$ (the allocation amount of the other Set *M* subject) and $x_L^* = 10$. This is because $\frac{\partial E[\pi_M]}{\partial x_M} = -1 + \frac{110(21+20+2\cdot 10)}{(x_M+21+20+2\cdot 10)^2}$ is decreasing in x_M, and $\frac{\partial E[\pi_M]}{\partial x_M}$ is positive at $x_M = 20$.

Lastly, $x_L = 10$ is the best response for a Set *L* subject as well. Note that $\frac{\partial E[\pi_L]}{\partial x_L} = -1 + \frac{110(21+2\cdot 20+10)}{(x_L+21+2\cdot 20+10)^2}$ is decreasing in x_L, and $\frac{\partial E[\pi_L]}{\partial x_L}$ is positive at $x_L = 10$.

Any other corner solution or interior solution cannot be an equilibrium. We have a contradiction if we assume any other corner solution. The details are omitted to conserve space. As for the possibility of interior solutions, suppose that $x_H^* < 50$, $x_M^* < 20$ and $x_L^* < 10$. Then, each group member's best response is given by:

$$-1 + \frac{110(2x_M^*+2x_L^*)}{(x_H+2x_M^*+2x_L^*)^2} = 0 \text{ for a Set } H \text{ subject.} \quad \text{(A.5)}$$

$$-1 + \frac{110(x_H^*+x_M^*+2x_L^*)}{(x_M+x_H^*+x_M^*+2x_L^*)^2} = 0 \text{ for a Set } M \text{ subject.} \quad \text{(A.6)}$$

$$-1 + \frac{110(x_H^* + 2x_M^* + x_L^*)}{(x_L + x_H^* + 2x_M^* + x_L^*)^2} = 0 \text{ for a Set } L \text{ subject.} \qquad \text{(A.7)}$$

Conditions (A.5) to (A.7) imply that $x_H^* = x_M^* = x_L^* = \frac{88}{5}$. The best strategy for each subject is either 17 or 18 as x_H^*, x_M^* and x_L^* are integers. This contradicts the constraint that $x_L^* < 10$.

At (x_H^*, x_M^*, x_L^*) = (21, 20, 10), the expected payoffs of the Set *H*, Set *M* and Set *L* subjects are calculated as approximately 57.5, 27.2 and 13.6, respectively, using Eq. (2) in the paper.

c. The VH treatment:

We show that there are no incentives for each member to change their strategy from (x_H^*, x_M^*, x_L^*) = (50, 20, 10) in order to prove that this is an equilibrium.

As for a Set *H* subject, $\frac{\partial E[\pi_H]}{\partial x_H} = -1 + \frac{220(2x_M^* + 2x_L^*)}{(x_H + 2x_M^* + 2x_L^*)^2} = -1 + \frac{220 \cdot 60}{(x_H + 60)^2}$ when $x_M^* = 20$ and $x_L^* = 10$. $\frac{\partial E[\pi_H]}{\partial x_H}$ is decreasing x_H and $\frac{\partial E[\pi_H]}{\partial x_H}$ is positive at $x_H = 50$. This suggests that $x_H = 50$ is the best response for the Set *H* subject given that $x_M^* = 20$ and $x_L^* = 10$.

$x_M^* = 20$ is the best response for a Set *M* subject given that $x_H^* = 50$, $x_M^* = 20$ (the allocation amount of the other Set *M* subject) and $x_L^* = 10$. This is because $\frac{\partial E[\pi_M]}{\partial x_M} = -1 + \frac{220(x_H^* + x_M^* + 2x_L^*)}{(x_M + x_H^* + x_M^* + 2x_L^*)^2} = -1 + \frac{220 \cdot 90}{(x_M + 90)^2}$ is decreasing in x_M and is positive at $x_M^* = 20$.

$x_L^* = 10$ is the best response for a Set *L* subject given that $x_H^* = 50$ and $x_M^* = 20$ and $x_L^* = 10$ (the allocation amount of the other Set *L* subject). This is because $\frac{\partial E[\pi_L]}{\partial x_L} = -1 + \frac{220(x_H^* + 2x_M^* + x_L^*)}{(x_L + x_H^* + 2x_M^* + x_L^*)^2} = -1 + \frac{220 \cdot 100}{(x_L + 100)^2}$ is decreasing in x_L and is positive at $x_L^* = 10$.

Any other corner solution or interior solution cannot be an equilibrium. We have a contradiction if we assume any other corner solution. The details are omitted to conserve space. An interior solution also cannot be an equilibrium as is the same logic in the subsection b. above.

■

A.2. Predictions Based on the Inequality-Averse Preferences under the Public Good Regime

Suppose that the utility function of each subject is expressed as in Eq. (3) in the paper. This subsection of the Appendix illustrates a possibility that some subjects allocate positive amounts to their public accounts in equilibrium. For simplicity, we assume that two Set *M* subjects in a group each contribute the same amounts to the public account ($x_M = x_M^*$), and that two Set *L* subjects in a group also each make the same action choice ($x_L = x_L^*$) in equilibrium.

Proposition A2: Suppose that $\mu_H > \frac{1}{110}$*. Also suppose that the contribution amount of a Set M subject (Set L subject) is the same as that of the other Set M subject (Set L subject) in his or her group. Then, some subjects in the group allocate positive amounts to the public account in equilibrium.*

<u>Proof</u>: The utility functions of a Set *H* subject, a Set *M* subject and a Set *L* subject are expressed as:

$$u_H = \pi_H - \mu_H \cdot \frac{1}{4}\{2(\pi_M^* - \pi_H)^2 + 2(\pi_L^* - \pi_H)^2\}.$$

$$u_M = \pi_M - \mu_M \cdot \frac{1}{4}\{(\pi_H^* - \pi_M)^2 + (\pi_M^* - \pi_M)^2 + 2(\pi_L^* - \pi_M)^2\}.$$

$$u_L = \pi_L - \mu_L \cdot \frac{1}{4}\{(\pi_H^* - \pi_L)^2 + 2(\pi_M^* - \pi_L)^2 + (\pi_L^* - \pi_L)^2\}.$$

Here, π_H, π_M, and π_L are the material payoffs of the Set *H*, Set *M* and Set *L* subjects, respectively. These are expressed as in Eq. (1) in the paper. $\frac{\partial u_H}{\partial c_H}$, $\frac{\partial u_M}{\partial c_M}$, and $\frac{\partial u_L}{\partial c_L}$, given the other subjects' optimal strategies, are each calculated as:

$$\frac{\partial u_H}{\partial c_H} = -.8 + \mu_H \cdot \{88 - 3.13c_H - .06c_M^* + .04c_L^*\}. \tag{A.8}$$

$$\frac{\partial u_M}{\partial c_M} = -.6 - \mu_M \cdot \{1 - .37c_H^* + 2.03c_M - .47c_M^* - 1.04c_L^*\}. \tag{A.9}$$

$$\frac{\partial u_L}{\partial c_L} = -.5 - \mu_L \cdot \{23 - .545c_H^* - 1.29c_M^* + 1.555c_L - .695c_L^*\}. \tag{A.10}$$

Here, c_H, c_M, and c_L are the contributions made by the Set *H*, Set *M* and Set *L* subjects, respectively. Suppose that $c_H^* = c_M^* = c_L^* = 0$ in equilibrium. Then, $\frac{\partial u_H}{\partial c_H} = 88\mu_H - .8 > 0$ at $c_H = 0$, which contradicts the assumption that $c_H^* = 0$ is the best response strategy for the Set *H* subject. ■

Condition (A.8) indicates that a Set *H* subject allocates positive amounts to his public account even if μ_H is relatively small (i.e, his utility weight on inequality is relatively small). This is because the term of the curly bracket in Condition (A.8) is always a large positive number (i.e., greater than 80) for any values of c_M^* and c_L^* when $c_H^* = 0$. By contrast, Condition (A.10) implies that only if c_H^* and c_M^* are high enough that $23 - .545c_H^* - 1.29c_M^* < 0$, $\frac{\partial u_L}{\partial c_L} > 0$ at $c_L = c_L^* = 0$ for sufficiently high μ_L. The condition $23 - .545c_H^* - 1.29c_M^* < 0$ restricts the feasible set of c_H^* and c_M^*. For example, $c_H^* = 20$ and $c_M^* = 8$ (each of which is 40% of his or her endowment) do not satisfy this condition. This observation suggests that more Set *H* subjects contribute positive amounts to their public accounts than Set *L* subjects do, provided that the distributions of individual types are the same between Set *H* subjects and Set *L* subjects.

Proposition A3: A higher percentage of Set H subjects contribute positive amounts to the public accounts, compared with Set L subjects.

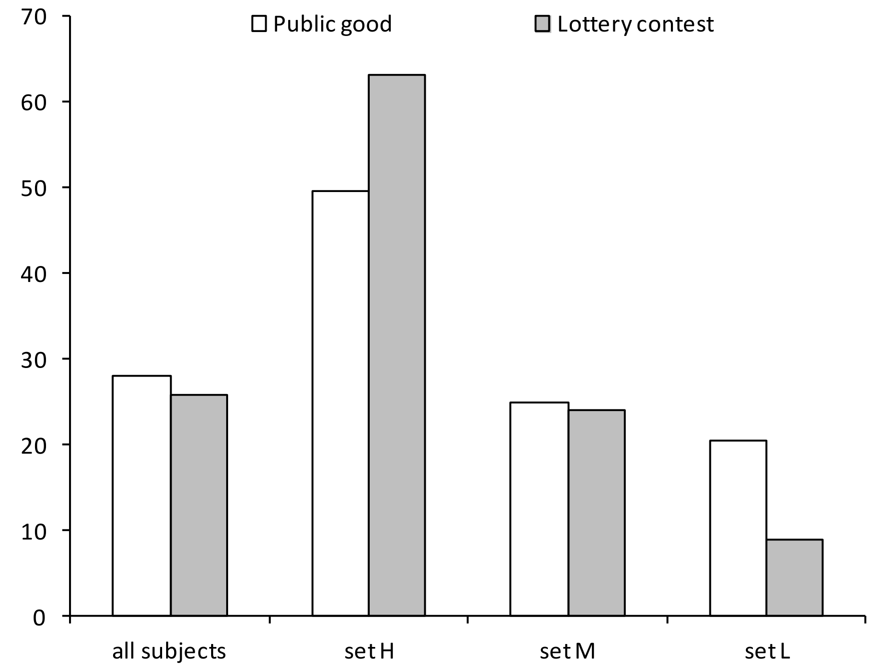
Conditions (A.8) to (A.10) give us predictions concerning subjects' conditional contribution behaviors in the public good regime. First, the higher c_H^*, c_M^* and c_L^* are, the more likely a Set *L* subjects are to contribute positive amounts to the public account. Notice that if the Set *H* subject, the two Set *M* subjects and the other Set *L* subject contribute large positive amounts, then the Set *L* subject receives a relatively large payoff, possibly one even higher than the subjects in the other two categories in case that c_H^* and c_M^* are sufficiently high. If this happens, in order to mitigate inequality among the members, more inequality-averse Set *L* subjects (i.e., Set *L* subjects with sufficiently high μ_L) contribute positive amounts themselves. Second, likewise, the higher c_H^*, c_M^* and c_L^* are, the higher percentage of Set *M* subjects contribute positive amounts to the public account. Third, such conditional cooperative behavior is negligible for Set *H* subjects. The coefficients of c_M^* and c_L^* are very small in Condition (A.8). This feature of the optimality condition results from the experimental setting that Set *H* subjects have much higher endowments, and they have greater income inequality in the groups unless they contribute positive amounts to their public accounts. We therefore obtain the following predictions based on the consideration above.

Proposition A4: The contribution amounts of Set L subjects (Set M subjects) are positively propositional to their beliefs on the contribution amounts of Set H subjects, the contribution amounts of the other Set L subjects (the other Set M subjects), and the average contribution amounts of two Set M subjects (Set L subjects). Unlike Set M or Set L subjects, the contribution amounts of Set H subjects are almost unrelated to the contribution amounts of subjects in the other two categories.

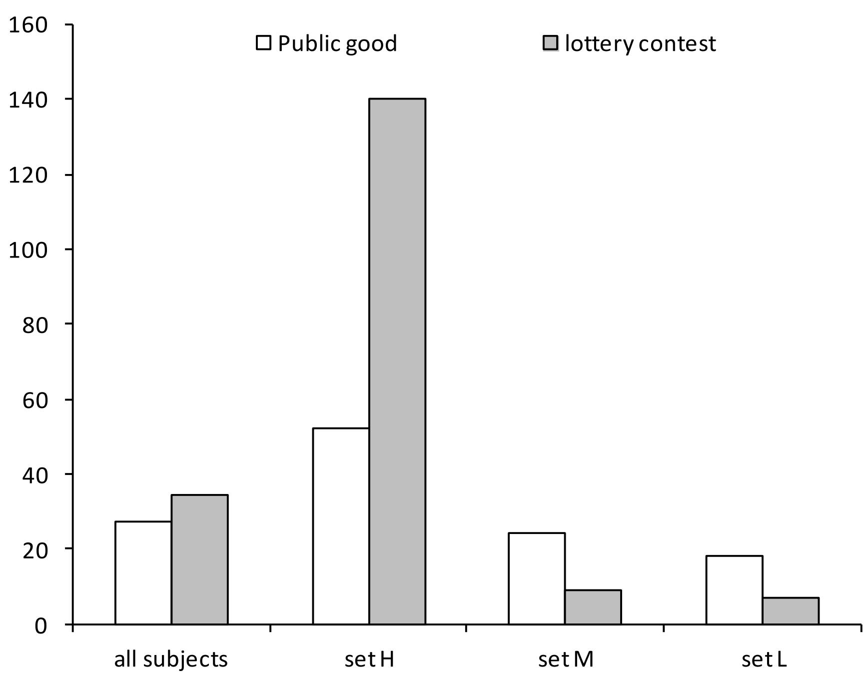
Appendix B: Additional Tables and Figures

Figure B.1. *Average Realized Payoffs by Endowment Size and Regime*

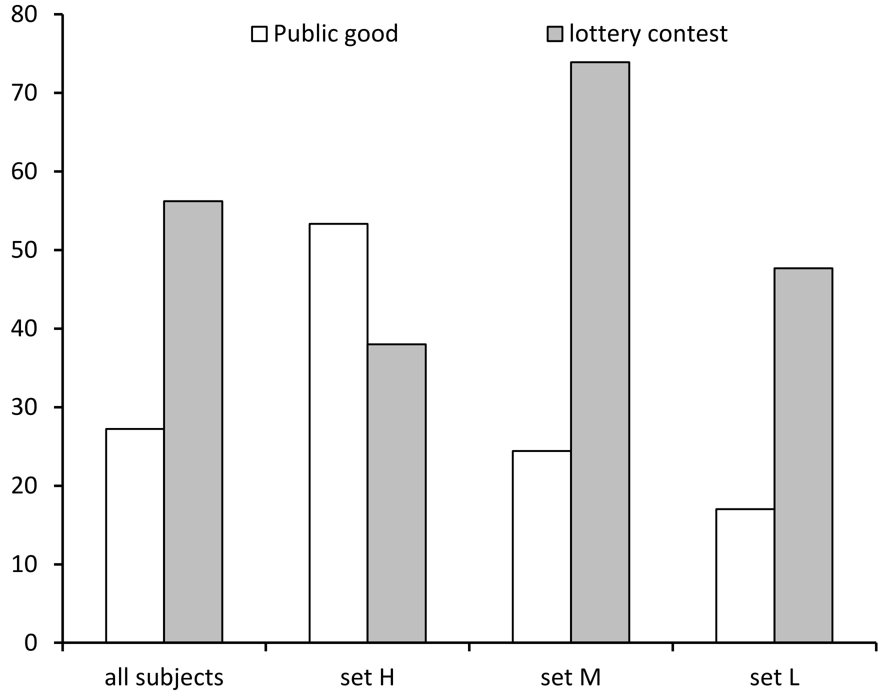
(a) The L treatment



(b) The H treatment[1]



(c) The VH treatment[2]



Notes: [1] Two groups collectively selected the lottery contest regime in the H treatment. In both groups, Set *H* subjects won the contest.

[2] Five groups collectively selected the lottery contest regime in the VH treatment. Set *M* subjects won the contest in three groups, and Set *L* subjects won the contest in the remaining two groups.

Table B.1. *Collective Vote Outcomes (supplementing Panel (2), Table 2 of the paper)*

Treatment		Number of groups				Percentage			
		EV		WV		EV		WV	
		actual[1]	hyp.[2]	actual[1]	hyp.[3]	actual[1]	hyp.[2]	actual[1]	hyp.[3]
L	Public good	4	12	6	10	80%	80%	60%	67%
	Contest	1	3	4	5	20%	20%	40%	33%
H	Public good	4	12	7	7	100%	92%	78%	54%
	Contest	0	1	2	6	0%	8%	22%	46%
VH	Public good	8	13	2	8	89%	93%	33%	53%
	Contest	1	2	4	7	11%	7%	67%	47%
Total	Public good	16	37[4]	15	25[4]	89%	88%	60%	58%
	Contest	2	6	10	18	11%	12%	40%	42%

Notes: The numbers in the EV (WV) columns indicate the numbers of collective outcomes under the equal (weighted) voting rule.

[1] The columns labeled "actual" indicate realized vote outcomes in groups where the equal or weighted voting rule was randomly assigned.

[2] The numbers in the "hyp." columns under EV are the sums of (a) the numbers of realized collective outcomes under the equal voting rule and (b) the numbers of unrealized collective outcomes calculated with the equal voting rule in groups where the weighted voting rule was assigned.

[3] The numbers in the "hyp." columns under WV are the sums of (a) the numbers of realized collective outcomes under the weighted voting rule and (b) the numbers of unrealized collective outcomes calculated with the weighted voting rule in groups where the equal voting rule was assigned.

[4] The public good is collectively preferred under the *equal* voting rule in 37 out of 43 cases, which is significantly different from the 25 out of 43 cases where it is collectively preferred under the *weighted* voting rule according to a two-sample z-test of proportion (p-value = .0039, two-sided).

Table B.2. *Determinants of Individual Votes in each Choice Treatment (Supplementing Table 2 of the paper)*

Dependent variable: A binary variable which equals 1 if a subject voted in favor of the public good under a randomly assigned voting rule; 0 otherwise.

Independent Variable	L treatment (1)	H treatment (2)	VH treatment (3)
Endowment $\in$ {50, 20, 10}	-.022**	-.021*	-.027**
	(.011)	(.012)	(.011)
Risk preference, η	-.10	-0.13	-.089
	(.10)	(.12)	(.10)
Female dummy {= 1 if female; 0 otherwise}	-.005	.89**	.55
	(.33)	(.39)	(.35)
General political orientation	-.22*	.024	.29**
	(.12)	(.16)	(.15)
Constant	2.54***	1.25	-.29
	(.86)	(.96)	(1.02)
# of Observations	75	65	75
Log likelihood	-40.65	-30.82	-40.24
LR Chi-squared	7.65	8.59	14.99
Prob > LR Chi-squared	.1052	.0722	.0047
Pseudo R-squared	.0860	.1223	.1570

Notes: Probit regressions. Subjects answered general political orientation at the end of the experiment. The general political orientation variable takes an integer between 1 and 7 (1 = very conservative to 7 = very liberal). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Table B.3. *The Difference in the Contribution Amounts across the Three Categories of Subjects in the Public Good Regime*

(1) The Percentages of Subjects that Contributed Positive Amounts to the Public Accounts

	L treatment	H treatment	VH treatment
The percentages of subjects that contributed positive amounts			
(i) Set *H* subjects	30.0%	45.5%	50.0%
(ii) Set *M* subjects	75.0%	90.9%	70.0%
(iii) Set *L* subjects	70.0%	77.3%	90.0%
p-value (two-sided)[1]			
(i) vs. (ii)	.0177**	.0041**	.2839
(i) vs. (iii)	.0371**	.0676*	.0146**
(ii) vs. (iii)	.7233	.2163	.1138

Notes: [1] Two-sample tests of proportions. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(2) Contribution Amounts as Percentages of Subjects' Endowments (supplementing Figure 2 of the paper)

We compared the contribution amounts as percentages of subjects' endowments between any two subsets of subjects (e.g., Set *H* versus Set *L*) by using Mann-Whitney tests.

(2a) The L treatment

	Set *H* subjects vs. Set *M* subjects	Set *H* subjects vs. Set *L* subjects	Set *M* subjects vs. Set *L* subjects
p-value (two-sided)	.0239**	.0285**	.500

Notes: Mann-Whitney tests. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(2b) The H treatment

	Set *H* subjects vs. Set *M* subjects	Set *H* subjects vs. Set *L* subjects	Set *M* subjects vs. Set *L* subjects
p-value (two-sided)	.0009***	.0022***	.0778*

Notes: Mann-Whitney tests. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(2c) The VH treatment

	Set *H* subjects vs. Set *M* subjects	Set *H* subjects vs. Set *L* subjects	Set *M* subjects vs. Set *L* subjects
p-value (two-sided)	.0253**	.0003***	.0149**

Notes: Mann-Whitney tests. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Results: Set H subjects on average contribute a significantly smaller fraction of their endowments to the public accounts, compared with Set M or Set L subjects, in each of the three choice treatments. Set M subjects on average contribute a significantly (weakly significantly) smaller fraction of their endowments than Set L subjects in the VH (H) treatment.

Table B.4. *Average Beliefs on the Contribution Amounts of the Other Four Group Members in the Public Good Regime*

(a) The L treatment

(a1) Average beliefs by the row subjects

	The contribution by Set *H* subject	The (avg.) contribution by Set *M* subject(s)	The (avg.) contribution by Set *L* subject(s)
(i) Set *H* subjects	---	9.30 (46.5%)	6.60 (66.0%)
(ii) Set *M* subjects	10.8 (21.6%)	7.95 (39.8%)	6.95 (69.5%)
(iii) Set *L* subjects	6.50 (13.0%)	9.45 (47.3%)	5.50 (55.0%)
Mann-Whitney Tests[1]			
(i) vs. (ii)	---	.2142	.4283
(i) vs. (iii)	---	.9083	.4149
(ii) vs. (iii)	.2372	.3458	.1474

Notes: The numbers in parenthesis indicate contribution amounts as percentages of the column players' endowments. For example, 66.0% in Panel (a1) is calculated by: 6.60/10 * 100 = 66.0%.
[1] The numbers are *p*-values (two-sided).
*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(a2) Contribution amounts as percentages of subjects' endowments

We tested whether Set *M* or Set *L* subjects believed that their peers in the Set *H* would contribute significantly smaller percentages of their endowments than subjects in the other two categories do in the L treatment.

	H_0: $\%_H^b = \%_M^b$	H_0: $\%_H^b = \%_L^b$
(ii) Set *M* subjects	.0013***	.0031***
(iii) Set *L* subjects	.0003***	.0005***

Notes: Wilcoxon signed ranks tests. The numbers are *p*-values (two-sided). $\%_H^b$ indicates the average belief by the row subjects on the contribution amounts of Set *H* subjects as percentages of the endowment size (which is 50). $\%_M^b$ and $\%_L^b$ are defined likewise. $\%_H^b$, $\%_M^b$ and $\%_L^b$ are shown in the parentheses in Panel (a1). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(b) The H treatment

(b1) Average beliefs by the row subjects

	The contribution by Set *H* subject	The (avg.) contribution by Set *M* subject(s)	The (avg.) contribution by Set *L* subject(s)
(i) Set *H* subjects	---	6.91 (34.6%)	4.82 (48.2%)
(ii) Set *M* subjects	8.91 (17.8%)	7.23 (36.2%)	5.14 (51.4%)
(iii) Set *L* subjects	12.1 (24.1%)	10.1 (50.5%)	5.09 (50.9%)
Mann-Whitney Tests[1]			
(i) vs. (ii)	---	.8574	. 5687
(i) vs. (iii)	---	.0561*	. 6820
(ii) vs. (iii)	.7891	.0264**	. 9521

Notes: The numbers in parenthesis indicate contribution amounts as percentages of the column players' endowments.
[1] The numbers are *p*-values (two-sided).
*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(b2) Contribution amounts as percentages of their endowments

We tested whether Set *M* or Set *L* subjects believed that their peers in the Set *H* would contribute significantly smaller percentages of their endowments than subjects in the other two categories do in the H treatment.

	H0: $\%_H^b = \%_M^b$	H0: $\%_H^b = \%_L^b$
(ii) Set *M* subjects	.0006***	.0006***
(iii) Set *L* subjects	.0001***	.0039***

Notes: Wilcoxon signed ranks. The numbers are *p*-values (two-sided). $\%_H^b$ indicates the average belief by the row subjects on the contribution amounts of Set *H* subjects as percentages of the endowment size (which is 50). $\%_M^b$ and $\%_L^b$ are defined likewise. $\%_H^b$, $\%_M^b$ and $\%_L^b$ are shown in the parentheses in Panel (b1). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(c) The VH treatment

(c1) Average beliefs by the row subjects

	The contribution by Set *H* subject	The (avg.) contribution by Set *M* subject(s)	The (avg.) contribution by Set *L* subject(s)
(i) Set *H* subjects	---	13.0 (65.0%)	9.3 (93.0%)
(ii) Set *M* subjects	7.5 (15.0%)	6.5 (32.5%)	5.2 (52.0%)
(iii) Set *L* subjects	9.5 (19.0%)	9.7 (48.5%)	6.1 (61.0%)
Mann-Whitney Tests[1]			
(i) vs. (ii)	---	.0023***	.0034***
(i) vs. (iii)	---	.1235	.0222**
(ii) vs. (iii)	.4358	.0533*	.4444

Notes: The numbers in parenthesis indicate contribution amounts as percentages of the column players' endowments.
[1] The numbers are *p*-values (two-sided).
*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(c2) Contribution amounts as percentages of their endowments

We tested whether Set *M* or Set *L* subjects believed that their peers in the Set *H* would contribute significantly smaller percentages of their endowments than subjects in the other two categories do in the VH treatment.

	H0: $\%_H^b = \%_M^b$	H0: $\%_H^b = \%_L^b$
(ii) Set *M* subjects	.0002***	.0028***
(iii) Set *L* subjects	.0003***	.0005***

Notes: Wilcoxon signed ranks. The numbers are *p*-values (two-sided). $\%_H^b$ indicates the average belief by the row subjects on the contribution amounts of Set *H* subjects as percentages of the endowment size (which is 50). $\%_M^b$ and $\%_L^b$ are defined likewise. $\%_H^b$, $\%_M^b$ and $\%_L^b$ are shown in the parentheses in Panel (c1). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Table B.5. *Relation between Subjects' Contribution Amounts and their Beliefs on the Other Four Members' Contribution Amounts in the Public Good Regime*

(I) Set *H* subjects

Dependent variable: The contribution amount of Set *H* subject *i*

	L treatment		H treatment		VH treatment	
	(1)	(2)	(4)	(5)	(6)	(7)
(a) Subject *i*'s belief on the average contribution amount of two Set *M* subjects	2.68* (1.26)	----	.66 (.49)	----	.012 (.17)	----
(b) Subject *i*'s belief on the average contribution amount of two Set *L* subjects	----	2.50 (1.98)	----	.075 (.64)	----	.55 (.54)
Constant	-18.5 (12.5)	-10.0 (13.9)	-1.23 (3.79)	3.00 (3.59)	1.75 (2.43)	-3.23 (5.06)
# of observations	10	10	11	11	10	10
F	4.50	1.59	1.83	.01	.00	1.06
Prob > F	.0666	.2430	.2096	.9094	.9487	.3340
Adjusted R-squared	.2801	.0614	.0763	-.1094	-.1244	.0063

Notes: Linear regressions. In order to avoid a multi-colinearity issue, one of the two beliefs is used as an independent variable. The numbers in parenthesis are standard errors. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(II) Set *M* subjects

Dependent variable: The contribution amount of Set *M* subject *i*

	L treatment			H treatment			VH treatment		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(a) Subject *i*'s belief on the contribution amount of Set *H* subject	.26** (.12)	----	----	.23 (.15)	----	----	.30 (.17)	----	----
(b) Subject *i*'s belief on the contribution amount of the other Set *M* subject	----	1.11*** (.23)	----	----	1.04*** (.12)	----	----	1.27*** (.32)	----
(c) Subject *i*'s belief on the average contribution amount of two Set *L* subjects	----	----	.50 (.34)	----	----	.99*** (.28)	----	----	.66* (.38)
Constant	4.37** (1.81)	-1.66 (2.07)	3.69 (2.78)	4.31** (1.67)	-1.12 (.96)	1.30 (1.68)	3.80* (1.87)	-2.23 (2.32)	2.62 (2.42)
# of observations	20	20	20	22	22	22	20	20	20
F	5.19	23.64	2.15	2.40	80.10	12.14	3.21	16.28	3.02
Prob > F	.0352	.0001	.1602	.1372	.0000	.0023	.0899	.0008	.0922
Adjusted R-squared	.1806	.5437	.0569	.0624	.7902	.3466	.1043	.4457	.0962

Notes: Linear regressions. In order to avoid a multi-colinearity issue, one of the three beliefs is used as an independent variable. The numbers in parenthesis are standard errors. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(III) Set *L* subjects

Dependent variable: The contribution amount of Set *L* subject *i*

	L treatment			H treatment			VH treatment		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(a) Subject *i*'s belief on the contribution amount of Set *H* subject	.0038 (.13)	----	----	.097 (.057)	----	----	.10 (.11)	----	----
(b) Subject *i*'s belief on the average contribution amount of two Set *M* subjects	----	.40** (.15)	----	----	.55*** (.12)	----	----	.42*** (.13)	----
(c) Subject *i*'s belief on the contribution amount of the other Set *L* subject	----	----	.85*** (.18)	----	----	.91*** (.14)	----	----	.97*** (.074)
Constant	4.68*** (1.27)	.91 (1.65)	.037 (1.20)	4.14*** (1.05)	-.29 (1.40)	.70 (.87)	5.14*** (1.33)	2.06 (1.49)	.15 (.53)
# of observations	20	20	20	22	22	22	20	20	20
F	.00	6.97	21.02	2.90	19.60	40.32	.92	9.74	172.06
Prob > F	.9772	.0166	.0002	.1041	.0003	.0000	.3508	.0059	.0000
Adjusted R-squared	-.0555	.2391	.5130	.0830	.4697	.6519	-.0044	.3151	.9000

Notes: Linear regressions. In order to avoid a multi-colinearity issue, one of the three beliefs is used as an independent variable. The numbers in parenthesis are standard errors. *, **, and *** indicate significance at the .10 level, at the 0.05 level and at the .01 level, respectively.

Table B.6. *Average Allocations to the Lottery Accounts in the Lottery Contest Regime*

	L Treatment	H Treatment	VH Treatment
Average allocations to the lottery accounts[1]			
(i) Set *H* subjects	6.80 (5)	20.0 (2)	12.0 (5)
(ii) Set *M* subjects	5.90 (10)	11.3 (4)	12.1 (10)
(iii) Set *L* subjects	6.10 (10)	3.25 (4)	6.30 (10)
Mann-Whitney Tests[2]			
(i) = (ii)	.9011	.1336	.9003
(i) = (iii)	.8989	.0565*	.1272
(ii) = (iii)	.8166	.0796*	.0526*

Notes: [1] The numbers in parenthesis are the numbers of subjects. [2] The numbers are *p*-values (two-sided). *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Table B.7. *Average Beliefs on the Allocation Amounts of the Other Four Members in the Lottery Contest Regime*

(a) The L treatment

(a1) Average beliefs by the row subjects

	The allocation by Set *H* subject	The (avg.) allocation by Set *M* subject(s)	The (avg.) allocation by Set *L* subject(s)
(i) Set *H* subjects	---	9.4	7.6
(ii) Set *M* subjects	21.0[1] (i)	8.5 (ii)	5.5 (iii)
(iii) Set *L* subjects	15.6[2] (iv)	8.6 (v)	4.1 (vi)

Notes: [1] A Wilcoxon signed ranked test finds that this average is significantly different from 8 points (standard theoretical prediction with risk neutrality) at the 1% level (*p*-value = .005, two-sided). [2] A Wilcoxon signed ranked test finds that this average is significantly different from 8 points at the 10% level (*p*-value = .058, two-sided).

(a2) Wilcoxon signed ranks test results

	H_0: (i) = (ii)	H_0: (i) = (iii)	H_0: (iv) = (v)	H_0: (iv) = (vi)
p-value (two-sided)	.0045***	.0048***	.0453**	.0141**

Note: *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(b) The H treatment

(b1) Average beliefs by the row subjects

	The allocation by Set *H* subject	The (avg.) allocation by Set *M* subject(s)	The (avg.) allocation by Set *L* subject(s)
(i) Set *H* subjects	---	12.5	10.0
(ii) Set *M* subjects	18.8 (i)	8.8 (ii)	5.0 (iii)
(iii) Set *L* subjects	36.25 (iv)	7.5 (v)	1.5 (vi)

(b2) Wilcoxon signed ranks test results

	H_0: (i) = (ii)	H_0: (i) = (iii)	H_0: (iv) = (v)	H_0: (iv) = (vi)
p-value (two-sided)	.0656*	.0588*	.0656*	.0679*

Note: *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(c) The VH treatment

(c1) Average beliefs by the row subjects

	The allocation by Set *H* subject	The (avg.) allocation by Set *M* subject(s)	The (avg.) allocation by Set *L* subject(s)
(i) Set *H* subjects	---	11.4	6.2
(ii) Set *M* subjects	38.9 (i)	12.1 (ii)	5.9 (iii)
(iii) Set *L* subjects	24.5 (iv)	11.0 (v)	5.8 (vi)

(c2) Wilcoxon signed ranks test results

	H_0: (i) = (ii)	H_0: (i) = (iii)	H_0: (iv) = (v)	H_0: (iv) = (vi)
p-value (two-sided)	.0050***	.0049***	.0057***	.0069***

Note: *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Table B.8. *A Comparison of Subjects' Ex-ante Expected Payoffs based on Beliefs against the Standard Theoretical Predictions in the Public Good Regime (supplementing Figure 3 of the paper)*

(a) The L treatment

	Total # of subjects in the public good regime	# of subjects whose ex-ante expected payoffs in the public good regime is greater than or equal to their Nash Equilibrium payoffs under the public good regime (50, 20 or 10)[1]	# of subjects whose ex-ante expected payoffs in the public good regime is greater than or equal to their Nash Equilibrium expected payoffs under the lottery contest regime (52, 22 or 12)[2]
Set *H* subjects	10	8 (80.0%) [.1255]	7 (70.0%) [.3059]
Set *M* subjects	20	20 (100.0%) [.0001***]	19 (95.0%) [.0002***]
Set *L* subjects	20	20 (100.0%) [.0001***]	18 (90.0%) [.0001***]
Total	50	48 (96.0%)	44 (88.0%)

(b) The H treatment

	Total # of subjects in the public good regime	# of subjects whose ex-ante expected payoffs in the public good regime is greater than or equal to their Nash Equilibrium payoffs under the public good regime (50, 20 or 10)[1]	# of subjects whose ex-ante expected payoffs in the public good regime is greater than or equal to their Nash Equilibrium expected payoffs under the lottery contest regime (57.5, 27.5 or 17.5)[2]
Set *H* subjects	11	9 (81.8%) [.1547]	0 (0.0%) [.0033***]
Set *M* subjects	22	22 (100.0%) [.0000***]	9 (40.9%) [.1884]
Set *L* subjects	22	22 (100.0%) [.0000***]	20 (90.9%) [.0005***]
Total	55	53	30

(c) The VH treatment

	Total # of subjects in the public good regime	# of subjects whose ex-ante expected payoffs in the public good regime is greater than or equal to their Nash Equilibrium payoffs under the public good regime (50, 20 or 10)[1]	# of subjects whose ex-ante expected payoffs in the public good regime is greater than or equal to their Nash Equilibrium expected payoffs under the lottery contest regime (100.0, 40.0 or 20.0)[2]
Set *H* subjects	10	10 (100.0%) [.0047***]	0 (0.0%) [.0047***]
Set *M* subjects	20	20 (100.0%) [.0001***]	0 (0.0%) [.0001***]
Set *L* subjects	20	20 (100.0%) [.0001***]	15 (75.0%) [.0287**]
Total	50	50	15

Notes: [1] The numbers in square brackets indicate *p*-value (two-sided) for Wilcoxon signed ranks tests. The null hypothesis of each test is that a subject's ex-ante expected payoff in the public good regime is equal to her own endowment amount (Nash Equilibrium payoffs under the public good regime).

[2] The numbers in square brackets indicate *p*-value (two-sided) for Wilcoxon signed ranks tests. The null hypothesis of each test is that a subject's ex-ante expected payoff in the public good regime is equal to the Nash Equilibrium payoffs under the other regime (the lottery contest regime).

*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Table B.9. *Ex-ante Expected Payoffs based on Beliefs in the Public Good Regime and in the Lottery Contest Regime (supplementing Figure 3 of the paper)*

(a) The L treatment

	All subjects	Set *H* subjects	Set *M* subjects	Set *L* subjects
Public good regime[1]	31.0 (50)	51.2 (10)	28.7 (20)	23.1 (20)
Lottery contest regime[1]	23.1 (25)	51.1 (5)	20.3 (10)	11.8 (10)
p-value (two-sided)[2]	.0006***	.2678	.0001***	.0004***

Notes: [1] The numbers are average ex-ante expected payoffs. The numbers in parenthesis are the numbers of subjects. [2] Mann-Whitney tests.*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Results: The average ex-ante expected payoff is not statistically different between the public good regime and the lottery contest regime for Set H subjects. By contrast, the average ex-ante expected payoffs are significantly higher in the public good regime than in the lottery contest regime for Set M subjects and Set L subjects.

(b) The H treatment

	All subjects	Set *H* subjects	Set *M* subjects	Set *L* subjects
Public good regime[1]	31.5 (55)	52.0 (11)	26.7 (22)	26.1 (22)
Lottery contest regime[1]	30.9 (10)	64.0 (2)	32.7 (4)	12.7 (4)
p-value (two-sided)[2]	.8060	.0297**	.0301**	.0054***

Notes: [1] The numbers are average ex-ante expected payoffs. The numbers in parenthesis are the numbers of subjects. [2] Mann-Whitney tests. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Results: The average ex-ante expected payoffs are significantly higher in the lottery contest regime than in the public good regime for Set H subjects and Set M subjects. By contrast, the average ex-ante expected payoff is significantly higher in the public good regime for Set L subjects.

(c) The VH treatment

	All subjects	Set *H* subjects	Set *M* subjects	Set *L* subjects
Public good regime[1]	31.7 (50)	57.4 (10)	26.1 (20)	24.5 (20)
Lottery contest regime[1]	46.7 (25)	93.0 (5)	42.1 (10)	28.2 (10)
p-value (two-sided)[2]	.0300**	.0065***	.0005***	.5229

Notes: [1] The numbers are average ex-ante expected payoffs. The numbers in parenthesis are the numbers of subjects. [2] Mann-Whitney tests. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Results: The average ex-ante expected payoffs are significantly higher (insignificantly higher) in the lottery contest regime than in the public good regime for Set H and M subjects (Set L subjects).

Table B.10. *Realized Payoffs in the Public Good Regime and in the Lottery Contest Regime (supplementing Appendix Figure B.1 in the Appendix)*

(a) The L treatment

	All subjects	Set *H* subjects	Set *M* subjects	Set *L* subjects
Public good regime[1]	28.1 (50)	49.6 (10)	24.9 (20)	20.5 (20)
Lottery contest regime[1]	25.8 (25)	63.2 (5)	24.1 (10)	8.90 (10)
p-value (two-sided)[2]	.0360**	.9021	.0858*	.0005***

Notes: [1] The numbers are average realized payoffs. The numbers in parenthesis are the numbers of subjects.
[2] Mann-Whitney tests. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(b) The H treatment

	All subjects	Set *H* subjects	Set *M* subjects	Set *L* subjects
Public good regime[1]	27.3 (55)	52.0 (11)	24.3 (22)	18.0 (22)
Lottery contest regime[1]	34.2 (10)	140.0 (2)	8.75 (4)	6.75 (4)
p-value (two-sided)[2]	.0067***	.0288**	.0028***	.0017***

Notes: [1] The numbers are average realized payoffs. The numbers in parenthesis are the numbers of subjects.
[2] Mann-Whitney tests. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(c) The VH treatment

	All subjects	Set *H* subjects	Set *M* subjects	Set *L* subjects
Public good regime[1]	27.2 (50)	53.3 (10)	24.4(20)	17.0 (20)
Lottery contest regime[1]	56.2 (25)	38.0 (5)	73.9 (10)	47.7 (10)
p-value (two-sided)[2]	.0703*	.0069***	.0987*	.0106**

Notes: [1] The numbers are average realized payoffs. The numbers in parenthesis are the numbers of subjects.
[2] Mann-Whitney tests. *, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Table B.11. *Average Gini Coefficients by Regime (supplementing Figure 4 of the paper)*

(a) Gini Coefficients for Distributions of Ex-ante Expected Payoffs

We first calculated (i) each subject's own expected payoff as explained in the paper and (ii) the subject's belief on four group members' expected payoffs based on her allocation amount and belief about the four other members' allocation amounts. Here, each payoff based on the belief in the public good regime was calculated using Eq. (1); and each of the expected payoff in the lottery contest regime was calculated using Eq. (2). We then calculated a Gini coefficient for each subject.

	L treatment				H treatment			
	All subjects	Set *H* subjects	Set *M* subjects	Set *L* subjects	All subjects	Set *H* subjects	Set *M* subjects	Set *L* subjects
(i) Public good regime[#1]	.184 (50)	.205 (10)	.178 (20)	.179 (20)	.177 (55)	.217 (11)	.175 (22)	159 (22)
(ii) Lottery contest regime[#1]	.319 (25)	.298 (5)	.338 (10)	.310 (10)	.339 (10)	.272 (2)	.313 (4)	.399 (4)
p-value (two-sided) [#2]	.0000***	.0100***	.0000***	.0003***	.0000***	.1671[#3]	.0056***	.0018***

	VH treatment			
	All subjects	Set *H* subjects	Set *M* subjects	Set *L* subjects
(i) Public good regime[#1]	.182 (50)	.196 (10)	.201 (20)	.156 (20)
(ii) Lottery contest regime[#1]	.308 (25)	.207 (5)	.368 (10)	.298 (10)
p-value (two-sided) [#2]	.0000***	.2198	.0001***	.0008***

Notes: [#1] The numbers indicate average Gini coefficients based on ex-ante expected payoffs. The numbers in parenthesis indicate the numbers of subjects. [#2] Mann-Whitney tests for the null hypothesis: (i) = (ii). [#3] Note that the number of Set *H* subjects in the lottery contest regime is only two (not suitable for a statistical analysis).

(b) Gini Coefficients for Realized Distributions of Payoffs within Groups

We calculated an ex-post Gini coefficient for each group using the five members' realized payoffs under the collectively selected regimes.

	L treatment	H treatment	VH treatment
(i) Public good regime[1]	.252 (10)	.245 (11)	.260 (10)
(ii) Lottery contest regime[1]	.417 (5)	.575 (2)	.608 (5)
p-value (two-sided)[2]	.0022***	.0299**	.0022***

Notes: [1] The numbers indicate average realized Gini coefficients. The numbers in parenthesis indicate the numbers of groups.

[2] Mann-Whitney tests for the hypothesis: (i) = (ii).

Table B.12. *Average Risk Attitudes by Voting Decision and Treatment*

(a) The L treatment

	Set *H* subjects	Set *M* subjects	Set *L* subjects
(i) Subjects who voted for the public good	4.63 (8)	4.36 (22)	4.50 (24)
(ii) Subjects who voted for the lottery contest	4.29 (7)	5.00 (8)	5.17 (6)
p-value (two-sided)[1]	.6306	.4748	.2302

(b) The H treatment

	Set *H* subjects	Set *M* subjects	Set *L* subjects
(i) Subjects who voted for the public good	3.5 (8)	4.00 (22)	4.25 (20)
(ii) Subjects who voted for the lottery contest	4.8 (5)	4.75 (4)	4.33 (6)
p-value (two-sided)[1]	.2290	.5848	1.000

(b) The VH treatment

	Set *H* subjects	Set *M* subjects	Set *L* subjects
(i) Subjects who voted for the public good	3.2 (5)	4.43 (23)	3.82 (22)
(ii) Subjects who voted for the lottery contest	3.9 (10)	5.71 (7)	4.13 (8)
p-value (two-sided)[1]	.3795	.0992*	.6806

Notes: The numbers indicate average risk attitudes (η). The numbers in parenthesis indicate the numbers of subjects.
[1] Mann-Whitney test results for the null hypothesis: (i) = (ii).
*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

REMARK: Theoretically, a rational subject should have at most one shift from safe to risky options between the first and the last choice questions in the risk elicitation task. Holt and Laury

(2002) find that very few subjects exhibit inconsistent choice patterns (i.e., choices shift between safe and risky options more than once) in their data. In our study as well, the number of subjects with inconsistent choices in this task is only 16 subjects out of 245 subjects (all subjects), which accounts for only 6.53% of the total subjects. Results on Mann-Whitney tests are similar to those in Table B.12 even if tests are run without having the inconsistent subjects.

Table B.13. *Subjects' Voting Decisions, Beliefs on the Other Four Group Members' Voting Decisions and Contribution Amounts to the Public Accounts*

(1) Relation between Subjects' Voting Decisions and Beliefs

We examined whether the voting decisions of subjects were conditional upon their beliefs on the voting decisions of the other four group members.

(1a) The L treatment

Dependent variable: / Data: / Independent variable:	Subject i's vote under equal voting rule[1]			Subject i's vote under weighted voting rule[1]		
	Set H subjects	Set M subjects	Set L subjects	Set H subjects	Set M subjects	Set L subjects
	(1)	(2)	(3)	(4)	(5)	(6)
(a) Subject i's belief on the number of votes in favor of the public good under equal voting rule ($\in \{0, 1, 2, 3, 4\}$)[2]	.0093 (.12)	.19*** (.053)	.22*** (.071)	----	----	----
(b) Subject i's belief on the number of votes in favor of the public good under weighted voting rule ($\in \{0, 1, 2, 3, 4\}$)[2]	----	----	----	-.16 (.17)	.26*** (.063)	.20*** (.068)
Constant	.51 (.33)	.35 (.14)	.18 (.18)	1.01 (.53)	.13 (.16)	.28 (.18)
# of observations	15	30	30	15	30	30
F	.01	12.35	9.66	.90	16.56	8.48
Prob > F	.9372	.0015	.0043	.3610	.0003	.0070
Adjusted R-squared	-.0764	.2813	.2300	-.0075	.3492	.2051

Notes: Linear regressions. The numbers in parenthesis indicate standard errors.

[1] The dependent variable equals 1 if subject i voted in favor of the public good; 0 otherwise.

[2] For example, the belief of a Set H subject is calculated by $N_M + N_L$. Here, N_M (N_L) is the belief of the Set H subject on the number of support for the public good by the Set M (Set L) subjects under the equal voting rule. Here, $N_M \in \{0, 1, 2\}$, and $N_L \in \{0, 1, 2\}$.

*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(1b) The H treatment

Dependent variable: / Data: / Independent variable:	Subject *i*'s vote under equal voting rule[1]			Subject *i*'s vote under weighted voting rule[1]		
	Set *H* subjects	Set *M* subjects	Set *L* subjects	Set *H* subjects	Set *M* subjects	Set *L* subjects
	(1)	(2)	(3)	(4)	(5)	(6)
(a) Subject *i*'s belief on the number of votes in favor of the public good under equal voting rule ($\in\{0, 1, 2, 3, 4\}$)[2]	.043 (.13)	.16** (.065)	.084 (.085)	----	----	----
(b) Subject *i*'s belief on the number of votes in favor of the public good under weighted voting rule ($\in\{0, 1, 2, 3, 4\}$)[2]	----	----	----	.062 (.11)	.23** (.091)	.11 (.10)
Constant	.52 (.31)	.39 (.18)	.59 (.23)	.33 (.27)	.19 (.24)	.50* (.26)
# of observations	13	26	26	13	26	26
F	.12	5.94	.98	.33	6.38	1.18
Prob > F	.7346	.0225	.3313	.5754	.0185	.2882
Adjusted R-squared	-.0791	.1651	-.0007	-.0588	.1772	.0071

Notes: Linear regressions. The numbers in parenthesis indicate standard errors.

[1] The dependent variable equals 1 if subject *i* voted in favor of the public good; 0 otherwise.

[2] For example, the belief of a Set *H* subject is calculated by $N_M + N_L$. Here, N_M (N_L) is the belief of the Set *H* subject on the number of support for the public good by the Set *M* (Set *L*) subjects under the equal voting rule. Here, $N_M \in\{0, 1, 2\}$, and $N_L \in\{0, 1, 2\}$.

*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(1c) The VH treatment

Dependent variable: / Data: / Independent variable:	Subject *i*'s vote under equal voting rule[1]			Subject *i*'s vote under weighted voting rule[1]		
	Set *H* subjects	Set *M* subjects	Set *L* subjects	Set *H* subjects	Set *M* subjects	Set *L* subjects
	(1)	(2)	(3)	(4)	(5)	(6)
(a) Subject *i*'s belief on the number of votes in favor of the public good under equal voting rule ($\in$ {0, 1, 2, 3, 4})[2]	.05 (.14)	.15* (.076)	-.16* (.082)	----	----	----
(b) Subject *i*'s belief on the number of votes in favor of the public good under weighted voting rule ($\in$ {0, 1, 2, 3, 4})[2]	----	----	----	-.064 (.13)	.22*** (.066)	-.086 (.078)
Constant	.20 (.39)	.32 (.22)	1.17*** (.22)	.49 (.33)	.28 (.16)	1.04*** (.20)
# of observations	15	30	30	15	30	30
F	.13	4.06	3.80	.25	10.66	1.21
Prob > F	.7229	.0536	.0613	.6221	.0029	.2810
Adjusted R-squared	-.0662	.0955	.0881	-.0562	.2498	.0071

Notes: Linear regressions. The numbers in parenthesis indicate standard errors.

[1] The dependent variable equals 1 if subject *i* voted in favor of the public good; 0 otherwise.

[2] For example, the belief of a Set *H* subject is calculated by $N_M + N_L$. Here, N_M (N_L) is the belief of the Set *H* subject on the number of support for the public good by the Set *M* (Set *L*) subjects under the equal voting rule. Here, $N_M \in \{0, 1, 2\}$, and $N_L \in \{0, 1, 2\}$.

*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

(2) Contribution Amounts under the Public Good Regime by Voter Type

(2a) The L treatment

	Set *H* subjects	Set *M* subjects	Set *L* subjects
Avg. contribution amounts			
(i) Subjects who voted for the public good	8.13 (8)	7.13 (16)	4.95 (19)
(ii) Subjects who voted for the lottery contest	0.00 (2)	7.50 (4)	0.00 (1)
Mann-Whitney test results for the null: (i) = (ii)			
p-value (two-sided)	.3351	.9234	.2141

(2b) The H treatment

	Set *H* subjects	Set *M* subjects	Set *L* subjects
Avg. contribution amounts			
(i) Subjects who voted for the public good	4.63 (8)	7.16 (19)	5.83 (18)
(ii) Subjects who voted for the lottery contest	0.00 (3)	1.33 (3)	3.00 (4)
Mann-Whitney test results for the null: (i) = (ii)			
p-value (two-sided)	.0941*	.0292**	.2210

(2c) The VH treatment

	Set *H* subjects	Set *M* subjects	Set *L* subjects
Avg. contribution amounts			
(i) Subjects who voted for the public good	1.40 (5)	6.00 (16)	5.88 (17)
(ii) Subjects who voted for the lottery contest	2.40 (5)	6.25 (4)	7.33 (3)
Mann-Whitney test results for the null: (i) = (ii)			
p-value (two-sided)	.9107	.7003	.5394

Notes: The numbers in parenthesis indicate the numbers of subjects.

*, **, and *** indicate significance at the .10 level, at the .05 level and at the .01 level, respectively.

Appendix C: Instructions for the H treatment

Appendix C contains the instructions for the H treatment. The instructions for the L and VH treatments are identical except the prize size in the contest regime (We omitted them to conserve space).

Welcome

You are now taking part in a decision-making experiment. Depending on your decisions and the decisions of other participants, you will be able to earn money in addition to the $5 guaranteed for your participation.

During the experiment you are not allowed to communicate with other participants. If you have a question, raise your hand. One of us will come to answer your question.

During the experiment your earnings will be calculated in points. At the end of the experiment, points will be converted to U.S. dollars at the following rate:

2 points = 1 dollar

(This means each point will be exchanged for **50** cents of real money). At the end of the experiment your total earnings (including the $5 participation fee) will be paid out to you in cash.

The main part of the experiment has two phases. Some additional questions may be asked in these phases. After the main part of the experiment is over you will be asked to answer some questions including your gender and years in school.

Instructions for Phase 1

In the experiment, each of you is randomly assigned to **a group of 5 individuals**. This means that you and 4 other participants belong to one group.

You will be part of the same group in both Phase 1 and Phase 2. No one will be informed as to who was in which group during and after the experiment.

In Phase 1, each member in your group will be randomly given an **endowment.** Out of 5 members in your group, **1 member receives 50 points, 2 members receive 20 points, and the remaining 2 members**

receive 10 points. The probabilities with which you will receive 50 points, 20 points and 10 points are 1/5, 2/5 and 2/5, respectively.

Once all participants receive their endowment, Phase 1 is over and you will move on to Phase 2. Any questions?

Comprehension questions:

Please answer the following questions. Raise your hand if you need help.

1. In Phase 1, each member in a group will be randomly given an endowment.

a) How many members in a group obtain an endowment of 50 points? [____________]

b) How many members in a group obtain an endowment of 20 points? [____________]

c) How many members in a group obtain an endowment of 10 points? [____________]

Instructions for Phase 2

This phase consists of 2 stages: a voting stage and an allocation stage.

At the onset of Phase 2, each participant votes on whether to have a **group fund** or a **lottery** in your group.

(1) Option 1: Group fund

If your group decides to have a group fund, then, you will have 2 accounts in this phase: a **private account** and a **group account**. You will decide how to use your endowment assigned in Phase 1. Other members in your group will also simultaneously make allocation decisions between the 2 accounts. You will be asked to indicate the number of points you want to allocate to the group account. Only integers between 0 and your endowment (10, 20, or 50) are allowed for this purpose. The remaining points will be automatically allocated to your private account. Your earnings are the sum of those from your private account and those from your group account. Your earnings depend on the number of points in your private account, the total number of points in your group account, and your endowment given in Phase 1.

Earnings from your private accounts:

Your earnings from your private account equal the number of points you allocate to that account. In other words, for each point you allocate to your private account you get 1 point as earnings. For example, your earnings from your private account equal 5 points if you allocate 5 points to that account. The points you allocate to your private account do not affect the earnings of the other members in your group.

Earnings from your group accounts:

Your earnings from your group account are dependent on your endowment and the allocation made by you and other members in your group. The amounts allocated by you and other members to the group account **will be doubled and be distributed among all group members**. If your endowment is 50 points, then, you will get 10% of the amounts. If your endowment is 20 points, then you will obtain 20% of the amounts. And if your endowment is 10 points, then you will obtain 25% of the amounts. Thus, the smaller your endowment is, the more you obtain from the group account. For example, if the sum of points in the group account is 30 points, then your earnings from the group account are $30 \times 0.1 = 3$ if your endowment is 50 points, $30 \times 0.2 = 6$ if your endowment is 20 points, and $30 \times 0.25 = 7.5$ if your endowment is 10 points. Note that by allocating 1 extra point to the group account, the earnings of the other members in your group also increase by amounts that depend on their own endowments. Similarly, if someone in your group allocates 1 extra point to the group account, your earnings also rise by an amount specified by your endowment (0.1, 0.2 or 0.25).

In short, if the group fund is introduced in your group, your earnings are calculated by:

(your endowment) – (points you allocated to your group's group account) + α * 2 * (sum of points allocated by you and the other members in your group to the group account),

where $\alpha = 0.1$ if your endowment is 50, $\alpha = 0.2$ if your endowment is 20, and $\alpha = 0.25$ if your endowment is 10.

Example:

Suppose that you collectively chose a group fund for your group. Also suppose that you have an endowment of 20 points, and allocate 10 points to the group account and the other member that also has an endowment of 20 points allocates 8 points to the group account. The member that has an endowment of 50 points allocates 15 points. The remaining 2 members that have an endowment of 10 points allocate 1 and 4 points each to the group account.

In this case, the sum of points in the group account is 10 + 8 + 15 + 1 + 4 = 38 points. Since your endowment is 20, $\alpha = 0.2$; and you get earnings of 0.2 * 2 * 38 = 15.2 points from the group account. Therefore, your total earnings are: (20 – 10) + 15.2 = 10 + 15.2 = 25.2 points.

If you have any questions about the group fund, raise your hand. When all questions are answered, we will explain the other option.

(2) Option 2: Lottery

If your group decides to have a lottery in your group, then, as in the case of having the group fund, you have 2 accounts: a **private account** and a **lottery account**. You will decide how to use your endowment assigned in Phase 1. You will be asked to indicate the number of lottery tickets you want to purchase using your endowment. The price of one ticket is 1 point. Only integers between 0 and your endowment (10, 20, or 50) are allowed for this purpose. The remaining points will be automatically allocated to your private account. Other members in your group will also simultaneously make allocation decisions between the 2 accounts. Your earnings depend on the number of points in your private account, the number of tickets in your lottery account, the total number of tickets in your group members' lottery accounts, and your endowment given in Phase 1.

Earnings from your private accounts:

Your earnings from your private account equal the number of points you allocate to that account, as in the case of the group fund.

Earnings from your lottery accounts:

You have a chance of winning a prize of 110 points from a lottery. The probability that you win the prize is dependent on the number of tickets in your lottery account and the total number of tickets in your group members' lottery accounts. More lottery tickets you purchase, the more likely you will win the prize. The probability of winning the prize is calculated as:

> (the number of tickets in your lottery account)/(the number of tickets in your lottery account + total number of tickets in your group members' lottery accounts).

For example, suppose that your endowment is 20 points, and you purchase 14 lottery tickets. Also, suppose that the other 4 members purchase 25 tickets, 10 tickets, 15 tickets, and 0 tickets each. Then, the total number of tickets in your groups' lottery accounts is: 14 + 25 + 10 + 15 + 0 = 64 tickets. Therefore, your probability of winning is 14/64 * 100 = 21.9%. The computer program operates so that it randomly draws one ticket from all tickets (64 tickets in this example). (Since you purchased 14 tickets, your earnings from your private account is 20 − 14 = 6 points.)

If all five members in your group do not purchase any tickets, then, the prize of 110 points will be assigned randomly to one of the members (i.e., with a probability of 1/5).

In short, if a lottery is introduced in your group, your earnings are calculated by:

(your endowment) – (points you spent in purchasing lottery tickets) + (a prize of 110 points if you win the lottery).

If you have any questions about the lottery, raise your hand. When all questions are answered, we will explain the rules for choosing which option to be used in your group.

Voting Rule:

Every member, including you, votes on whether to have a group fund or to have a lottery in your group. You make your voting decisions for each of the following 2 scenarios. The first scenario is that the degree to which your vote impacts your group's outcome is based on your endowment. We call this voting rule the "weighted voting rule." The total amount of endowments in each group is 110 (= 50 + 20 + 20 + 10 + 10). Under this scenario, the votes by those who have an endowment of 50 points, 20 points and 10 points are counted as 50 votes, 20 votes and 10 votes, respectively. Each member must vote either for a group fund or for a lottery fund, and they cannot split their votes between the two options. Under this voting rule, whichever option collecting more than or equal to 60 votes will be implemented in your group. The second scenario is that the degree to which your vote impacts your group's outcome is the same among all members. That is, whichever option collecting more than or equal to three person's supports will be implemented in your group (majority rule).

Once you submit your two voting decisions, the computer randomly selects one of the two scenarios for your group. The introduction of a group fund or a lottery will be exerted according to the voting result in your group. The computer's choice of a voting rule is completely random. It will not be affected by your votes.

Example 1: Suppose that the computer randomly assigned the weighted voting rule in a group. Also, suppose that on the voting stage, each member voted as follows for the scenario of the weighted voting rule:

- The member with an endowment of 50 points voted for a group fund.

- 1 member with an endowment of 20 points voted for a group fund and the other member with an endowment of 20 points voted for a lottery.
- The 2 members with an endowment of 10 points both voted for a lottery.

In this case, the votes for having a group fund are: 50 * 1 + 20 * 1 = 70 votes in total, and the votes for having a lottery are: 20 * 1 + 10 * 2 = 40 votes. Therefore, a group fund will be put into place in this group.

Example 2: Suppose that the computer randomly chose the majority rule in a group. Also, suppose that on the voting stage, each member voted as follows for the scenario of the majority rule:

- The member with an endowment of 50 points voted for a lottery.
- 1 member with an endowment of 20 points voted for a group fund, and the other member with an endowment of 20 points voted for a lottery.
- 1 member with an endowment of 10 points voted for a group fund and the other member with an endowment of 10 points voted for a lottery.

In this case, 3 members, which are the majority in the group, supported an introduction of a lottery. Therefore, a lottery will be put into place in this group.

Summary for Phase 2

In Phase 1, you were randomly assigned an endowment of 50, 20 or 10 points.

In Phase 2, you and each of other members in your group first vote on whether to have a group fund or a lottery in your group under the 2 scenarios: weighted voting rule and majority rule. Once all members make their voting decisions, the computer randomly selects one of the two scenarios. If the weighted voting rule is assigned to your group, then the degree to which your vote impacts your group's outcome is proportional to your endowment amount given in Phase 1. Specifically, if your endowment is 50 points, then, your vote is counted as 50 votes. If your endowment is 20 points, then your vote is counted as 20 votes. If your endowment is 10 points, then your vote is counted as 10 votes. Whichever option collecting more than or equal to 60 votes will be implemented in your group. If the majority rule is assigned to your group, then, the degree to which your vote impacts your group's outcome is the same across the members. Whichever option collecting more than or equal to 3 members' supports will be introduced in your group.

If a group fund is created, you and each of the other members in your group make an allocation decision between the private account and the group account. Your earnings are the sum of earnings from your private account and earnings from your group account. Points allocated to the private account raise the allocator's earnings by 1 point for every 1 point allocated (with no effect on others' earnings). Points allocated to the group account is doubled and then shared among group members. The distribution rule is that the less endowment you have the more you are redistributed from the group account. You will also obtain earnings when other members allocate positive amounts to the group account.

If a lottery is created in your group, you and each of the other members in your group make an allocation decision between the private account and the lottery account. Your earnings are the sum of earnings from your private account and earnings from your lottery account. Points allocated to the private account raise the allocator's earnings by 1 point for every 1 point allocated (with no effect on others' earnings). You may win a prize of 110 points from a lottery. Points allocated to the lottery account by you and your group members will determine your probability of winning the prize of 110 points.

At the end of Phase 2, you will be informed of the outcome of the allocations made by all of the group members.

Once Phase 2 is over, the main part of the experiment is over. You will be asked to answer several questions such as your gender. After that, you will be immediately paid based on your earnings (conversion rate: 2 points = $1).

You may also be asked to answer some additional questions, unrelated to the present experiment during the experiment. You may add extra points, dependent on your responses to some questions.

Please raise your hand if you have any questions. Once all questions have been answered, the experiment will begin.

Comprehension questions:

Please answer the following questions. Raise your hand if you need help. A member of the experiment team will come to help you and will check your answers when you are done.

1. At the onset of Phase 2, you will vote on whether to have a group fund or to have a lottery in your group under the 2 scenarios: weighted voting rule and majority rule. With what probability is the weighted voting rule selected to be used by the computer?

[ ]

2. Suppose that the weighted voting rule was randomly selected. Answer the following questions.

(1) Your vote is counted as _________ votes if your endowment is 50, as ___________ votes if your endowment is 20 and as ___________ votes if your endowment is 10.

(2) In total how many votes are needed so as to introduce a group fund in your group?

[____________]

(3) In total how many votes are needed so as to introduce a lottery in your group?

[____________]

3. Suppose that the majority rule was randomly assigned. In total how many group members' votes are needed so as to introduce an option that you prefer, whether a group fund or a lottery, in your group?

[____________]

4. Suppose that a group fund is put into place in your group. Answer the following questions.

(I) Suppose that all 5 members in your group allocate 0 points to the group account.

a) How much do you earn if your endowment is 50? ___________________ points
b) How much do you earn if your endowment is 20? ___________________ points
c) How much do you earn if your endowment is 10? ___________________ points

(II) Suppose that all 5 allocate their own full endowments to the group account.

a) How much do you earn if your endowment is 50? ___________________ points
b) How much do you earn if your endowment is 20? ___________________ points
c) How much do you earn if your endowment is 10? ___________________ points

5. Suppose that a lottery was put into place in your group. Suppose also that a member with an endowment of 50 points purchased 20 lottery tickets, 2 members with an endowment of 20 points purchased 5 tickets and 15 tickets each, and 2 members having an endowment of 10 points purchased 0 tickets and 9 tickets, respectively. Answer the following questions.

a) With what probability does the member with an endowment 50 points win a prize of 110?

b) With what probability does the member that has an endowment 20 points and purchased 5 tickets win a prize of 110?

c) With what probability does the member that has an endowment 10 points and purchased 9 points win a prize of 110?

Guessing Part 1:

The following guessing questions appear on participants' computer screen once every participant completes their voting decision.

Now that every participant completed their voting decision, we are interested in knowing your guess on how other members in your group voted for the introduction of a group fund or a lottery. Your responses to the questions do not affect your earnings.

(a) For which option do you think the member in your group that had an endowment of 50 points voted?

(a1) Under weighted voting rule:

Having a group fund [ ]

Having a lottery [ ]

(a2) Under majority rule:

Having a group fund [ ]

Having a lottery [ ]

[Note: This question appears only on the computer screen of those whose endowments are either 20 points or 10 points]

(b) For which option do you think the other member in your group that had an endowment of 20 points voted?

(b1) Under weighted voting rule:

Having a group fund [ ]

Having a lottery [ ]

(b2) Under majority rule:

Having a group fund [ ]

Having a lottery [ ]

[Note: This question only appears on the computer screen of those whose endowments are 20 points]

(b) How many of the 2 members in your group that had an endowment of 20 points do you think voted for the introduction of a group fund or a lottery? Fill in the blanks with either 0, 1 or 2.

(b1) Under weighted voting rule:

Having a group fund [ ]

Having a lottery [ ]

Note: The sum of your answers must be equal to 2.

(b2) Under majority rule:

Having a group fund [ ]

Having a lottery [ ]

Note: The sum of your answers must be equal to 2.

[Note: This question appears only on the computer screen of those whose endowments are either 10 points or 50 points]

(c) For which option do you think the other member in your group that had an endowment of 10 points voted?

(c1) Under weighted voting rule:

Having a group fund [ ]

Having a lottery [ ]

(c2) Under majority rule:

Having a group fund [ ]

Having a lottery [ ]

[Note: This question appears only on the computer screen of those whose endowments are 10 points]

(c) How many of the 2 members in your group that had an endowment of 10 points do you think voted for the introduction of a group fund or a lottery? Fill in the blanks with either 0, 1 or 2.

(c1) Under weighted voting rule:

Having a group fund [ ]

Having a lottery [ ]

Note: The sum of your answers must be equal to 2.

(c2) Under majority rule:

Having a group fund [ ]

Having a lottery [ ]

Note: The sum of your answers must be equal to 2.

[Note: This question appears only on the computer screen of those whose endowments are 50 points or 20 points]

Guessing Part 2-1: When a group fund is put into place:

[The following guessing questions appear on participants' computer screen once every participant completes their allocation decisions, before they are informed of the outcome of the allocation stage.]

We are interested in knowing your guess on how many points are allocated to the group account by other members in your group. Your responses to the questions do not affect your earnings. Note that in your group, {weighted voting, majority} rule was used.

(a) Your guess on the allocation to your group account made by the member that had an endowment of 50 points [ ]
[Note: This question appears only on the computer screen of those whose endowments are either 20 points or 10 points]

(b) Your guess on the allocation to your group account made by the other member in your group that had an endowment of 20 points [ ]
[Note: This question appears only on the computer screen of those whose endowments are 20 points]

(b) Your guess on the average allocation to your group account made by the 2 members in your group that had an endowment of 20 points [ ]
[Note: This question appears only on the computer screen of those whose endowments are either 10 points or 50 points]

(c) Your guess on the allocation to your group account made by the other member that had an endowment of 10 points [ ]

[Note: This question appears only on the computer screen of those whose endowments are 10 points]

(c) Your guess on the average allocation to your group account made by the 2 members in your group that had an endowment of 10 points [ ]
[Note: This question appears only on the computer screen of those whose endowments are 50 points or 20 points]

Guessing Part 2-2: When a lottery is put into place:

[The following guessing questions appear on participants' computer screen once every participant completes their allocation decisions, before they are informed of the outcome of the allocation stage.]

We are interested in knowing your guess on how many lottery tickets are purchased by other group members. Your responses to the questions do not affect your earnings. Note that in your group, {weighted voting, majority} rule was used.

(a) Your guess on the number of lottery tickets purchased by the member that had an endowment of 50 points [ ]

[Note: This question appears only on the computer screen of those whose endowments are either 20 points or 10 points]

(b) Your guess on the number of lottery tickets purchased by the other member in your group that had an endowment of 20 points [ ]

[Note: This question appears only on the computer screen of those whose endowments are 20 points]

(c) Your guess on the average number of lottery tickets purchased by the 2 members in your group that had an endowment of 20 points [ ]

[Note: This question appears only on the computer screen of those whose endowments are either 10 points or 50 points]

(b) Your guess on the number of lottery tickets purchased by the other member that had an endowment of 10 points [ ]

[Note: This question appears only on the computer screen of those whose endowments are 10 points]

(c) Your guess on the average number of lottery tickets purchased by the 2 members in your group that had an endowment of 10 points [ ]

[Note: This question appears only on the computer screen of those whose endowments are 20 points or 50 points]

<u>Last Task</u>: Risk attitude elicitation task - before subjects are informed of the outcome in Phase 2.

Note: We use the same 10 choices employed in Holt and Laury (2002) as below. We amended their instructions. The following instructions appear on subjects' computer screen:

There is one more task before you are informed of the outcome of the allocation decisions made by your group members. You will be asked to make 10 decisions on the next computer screen. Specifically, you are given option A and option B for each decision, and you will select one of them. Although there are 10 decisions in this task, only one of them will be randomly selected by the computer to determine your earnings for this final task. In other words, each choice will be realized at a probability of 10%.

We will explain the decision task by using one of the real questions that you will answer in this part. You will be given the following two options.

Option A: $2 at a probability of 1/10, and $1.60 at a probability of 9/10

Option B: $3.85 at a probability of 1/10, and $0.10 at a probability of 9/10

If you choose option A, then with a probability of 10% you will be given $2; and with a probability of 90%, you will be given $1.60.

If you choose option B, then with a probability of 10% you will be given $3.85; and with a probability of 90%, you will be given $0.10.

The random drawing process to choose which amount ($2 or $1.6 for Option A, $3.85 or $0.10 for Option B) to be realized will be conducted by the computer at the end of the experiment.

You will make this kind of decision for 10 pairs of options A and B.

Any questions? If you do not have questions, please click “Continue” button. When all questions are answered and all participants click the “Continue” button, you will be asked to make 10 decisions for 10 pairs of two options.

Choice 1:

Option A: $2 at a probability of 1/10, and $1.60 at a probability of 9/10

Option B: $3.85 at a probability of 1/10, and $0.10 at a probability of 9/10

Choice 2:

Option A: $2 at a probability of 2/10, and $1.60 at a probability of 8/10

Option B: $3.85 at a probability of 2/10, and $0.10 at a probability of 8/10

Choice 3:

Option A: $2 at a probability of 3/10, and $1.60 at a probability of 7/10

Option B: $3.85 at a probability of 3/10, and $0.10 at a probability of 7/10

Choice 4:

Option A: $2 at a probability of 4/10, and $1.60 at a probability of 6/10

Option B: $3.85 at a probability of 4/10, and $0.10 at a probability of 6/10

Choice 5:

Option A: $2 at a probability of 5/10, and $1.60 at a probability of 5/10

Option B: $3.85 at a probability of 5/10, and $0.10 at a probability of 5/10

Choice 6:

Option A: $2 at a probability of 6/10, and $1.60 at a probability of 4/10

Option B: $3.85 at a probability of 6/10, and $0.10 at a probability of 4/10

Choice 7:

Option A: $2 at a probability of 7/10, and $1.60 at a probability of 3/10

Option B: $3.85 at a probability of 7/10, and $0.10 at a probability of 3/10

Choice 8:

Option A: $2 at a probability of 8/10, and $1.60 at a probability of 2/10

Option B: $3.85 at a probability of 8/10, and $0.10 at a probability of 2/10

Choice 9:

Option A: $2 at a probability of 9/10, and $1.60 at a probability of 1/10

Option B: $3.85 at a probability of 9/10, and $0.10 at a probability of 1/10

Choice 10:

Option A: $2 at a probability of 10/10, and $1.60 at a probability of 0/10

Option B: $3.85 at a probability of 10/10, and $0.10 at a probability of 0/10