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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.<sup>1</sup> 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

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<sup>1</sup> 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).<sup>2</sup> 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

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<sup>2</sup> 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).<sup>3</sup> 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'

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<sup>3</sup> 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.<sup>4</sup>

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

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<sup>4</sup> 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  $22 (= 50 + 20 \times 2 + 10 \times 2)/5$ .

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.<sup>5</sup> 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

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<sup>5</sup> 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  $25\% \times 2 + 20\% \times 2 + 10\% = 100\%$ ). 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.<sup>6</sup>

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,  $\pi_i$ , is expressed as follows:

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

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.

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<sup>6</sup> 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 ( $x_i \in \{0, 1, 2, \dots, E_i\}$ ). 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.<sup>7</sup> 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.<sup>8</sup> These elicited beliefs were used in analysis to calculate the (expected) payoff that each subject believed they would obtain under the selected regime.

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<sup>7</sup> For the sake of simplicity, we adopted a single-prize lottery contest design, rather than a multi-prize contest set-up.

<sup>8</sup> 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.<sup>9</sup> 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.<sup>10</sup> 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.<sup>11</sup> 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

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<sup>9</sup> Weighted voting rules are often used in organizations, such as IMF (e.g., Rapkin and Strand 2006) and shareholder meetings of corporations.

<sup>10</sup> 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.

<sup>11</sup> 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:

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

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:

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

Here,  $\mu_i$  is the utility weight of subject  $i$  on inequality and  $N$  is group size ( $N = 5$ ).<sup>12</sup> Subjects are assumed to be heterogeneous:  $\mu_i$  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  $\mu$ .

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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<sup>12</sup> 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  $\mu$ . 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).<sup>13</sup> 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.<sup>14</sup>

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

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<sup>13</sup> In this example, the Set *H*, *M*, and *L* subjects obtain payoffs of 30.8, 30.6 and 31.0 points, respectively.

<sup>14</sup> 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.<sup>15</sup> 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

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<sup>15</sup>  $E[u_i(\pi_i|\pi_{-i})|G_i] = E[\pi_i|G_i] - \mu_i \cdot \frac{1}{N-1} \sum_{j=1}^N E[(\pi_j - \pi_i)^2|G_i]$ , 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.  $\sum_{j=1}^N E[(\pi_j - \pi_i)^2|G_i]$  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  $\eta \in \{0, 1, 2, \dots, 10\}$ ) as a proxy of his/her risk preference. If Prediction 5 holds, then the average  $\eta$  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.<sup>16</sup>

### ***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

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<sup>16</sup> 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.<sup>17</sup>

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

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<sup>17</sup> 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.<sup>18</sup> 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.

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<sup>18</sup> 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).<sup>19</sup> 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).<sup>20</sup> 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).<sup>21</sup> 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.

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<sup>19</sup> 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.

<sup>20</sup> It also implies that the less frequent positive contributions of Set *H* subjects cannot be explained by reciprocity models.

<sup>21</sup> 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.<sup>22</sup>

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*

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<sup>22</sup> 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.<sup>23</sup> 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.<sup>24</sup> 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.

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<sup>23</sup> 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.

<sup>24</sup> 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.<sup>25</sup> 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.

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<sup>25</sup> 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).<sup>26</sup> 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.<sup>27</sup> 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

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<sup>26</sup> 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).

<sup>27</sup> 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 ( $\eta$ ) 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).<sup>28</sup> Our findings imply that strengthening democratic norms in the decision-making process could help resolve

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<sup>28</sup> 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.<sup>29</sup>

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.

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<sup>29</sup> 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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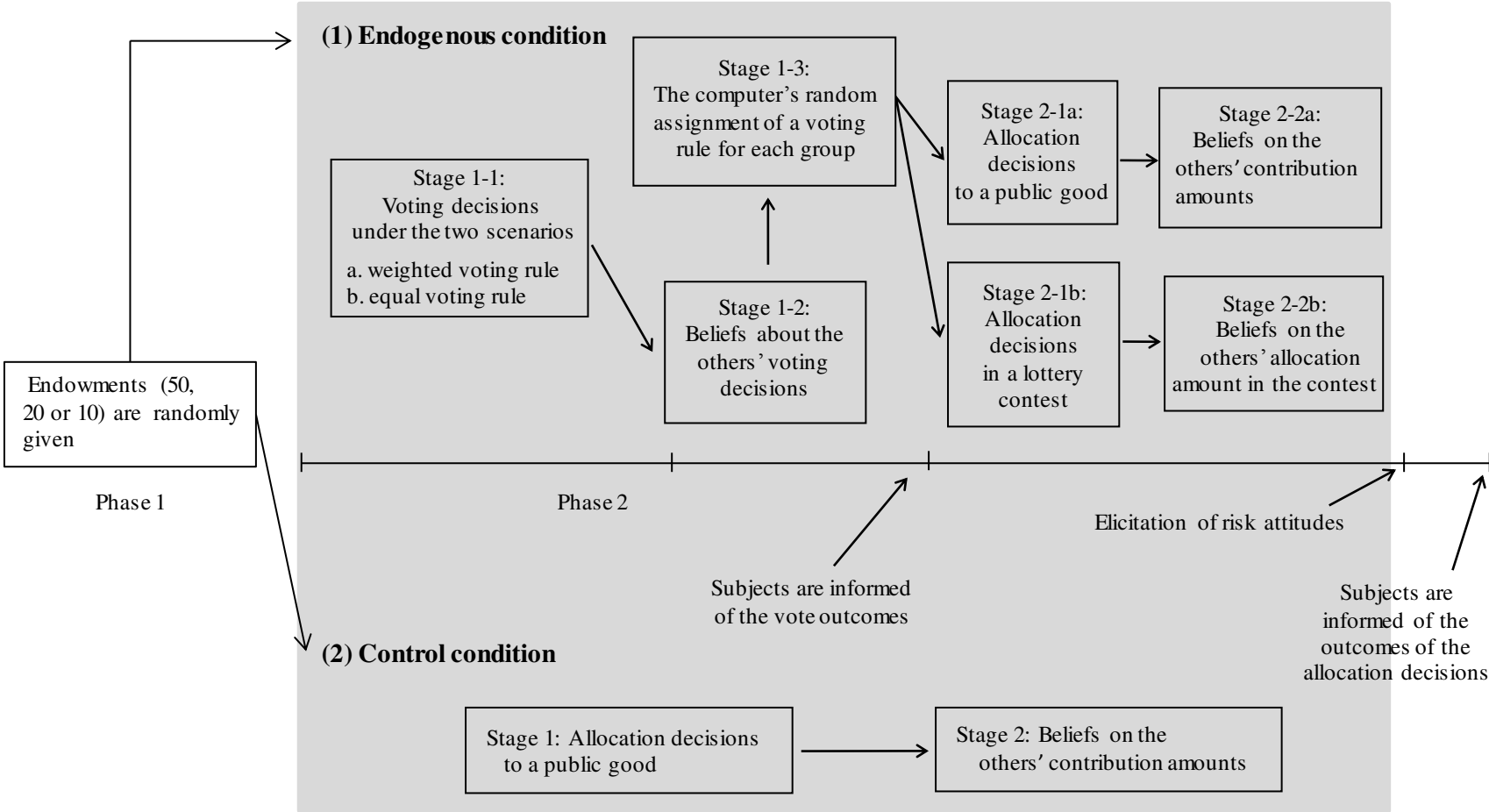
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**Figure 1. Experimental Design**



**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.  $\pi_H$ ,  $\pi_M$ , and  $\pi_L$  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		Percentage		
			under EV <sup>1</sup>	under WV <sup>1</sup>	under EV	under WV	
L	Set <i>H</i>	Public good	8	8	53%	53%	
		Contest	7	7	47%	47%	
	Set <i>M</i>	Public good	23	21	77%	70%	
		Contest	7	9	23%	30%	
	Set <i>L</i>	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 <i>H</i>	Public good	8	6	62%	46%
			Contest	5	7	38%	54%
Set <i>M</i>		Public good	21	20	81%	77%	
		Contest	5	6	19%	23%	
Set <i>L</i>		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 <i>H</i>	Public good	5	5	33%	33%
			Contest	10	10	67%	67%
	Set <i>M</i>	Public good	22	23	73%	77%	
		Contest	8	7	27%	23%	
	Set <i>L</i>	Public good	23	25	77%	83%	
		Contest	7	5	23%	17%	
	Subtotal		Public good	50	53	67%	71%
			Contest	25	22	33%	29%
	<b>Total</b>		Public good	152	151	71%	70%
			Contest	63	64	29%	30%

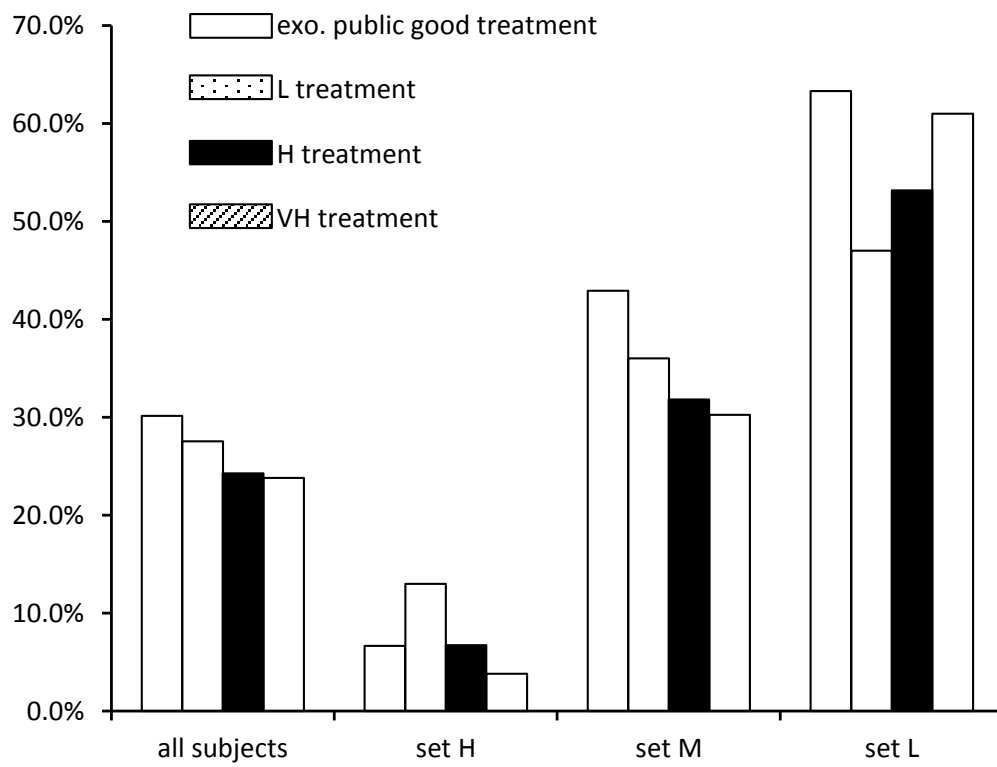
## (2) Realized Collective Vote Outcomes

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%
<b>Total</b>	Public good	89%	60%
	Contest	11%	40%

*Notes:* <sup>1</sup> 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.

<sup>2</sup> 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).

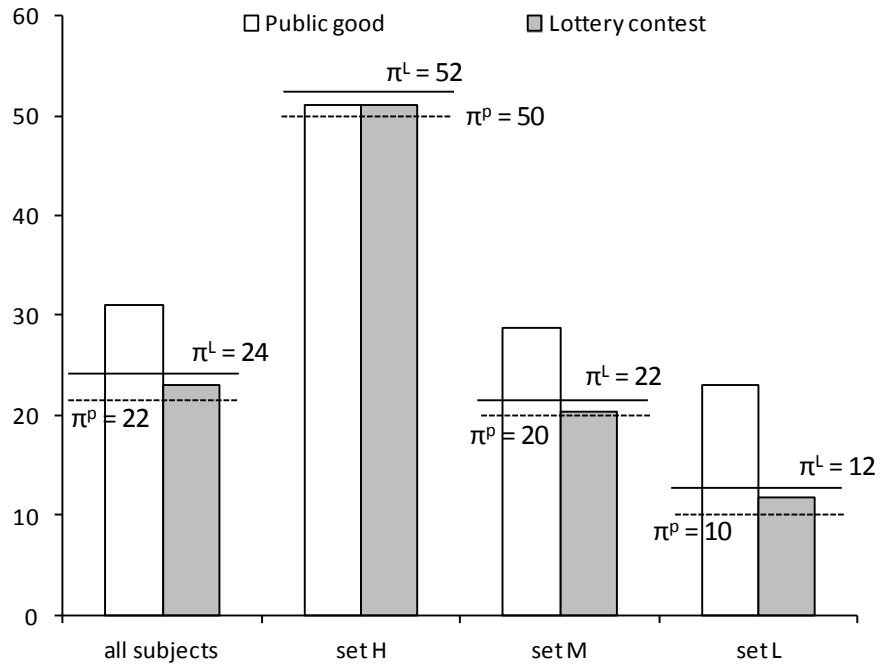
**Figure 2.** *Average Contribution in the Public Good Regime*



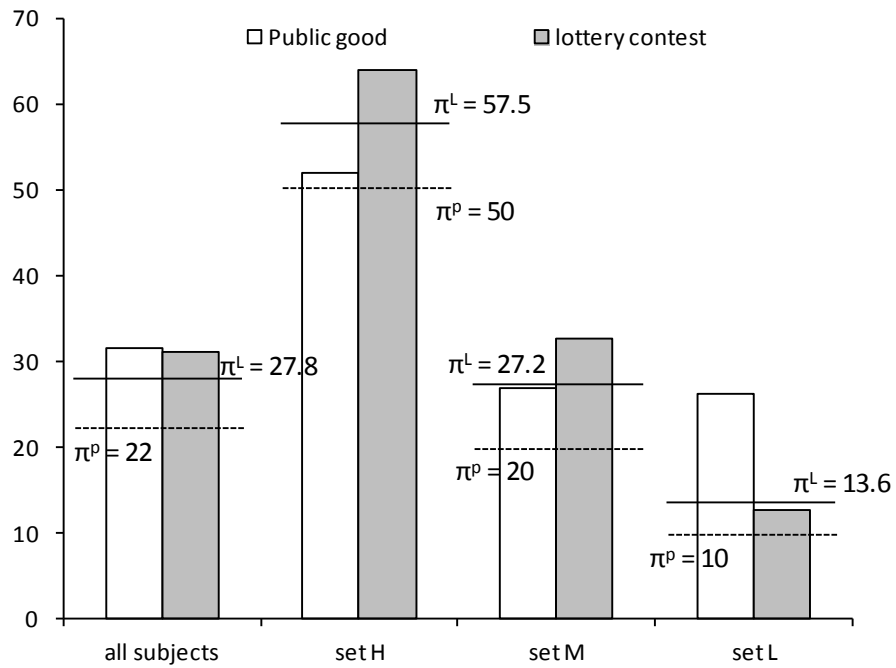
*Notes:* Each bar was calculated by:  $100 \cdot (\text{the average contribution in the category}) / (\text{their endowments})$ . Each of the “all subjects” bars was calculated by:  $100 \cdot (\text{the average contribution of all subjects in the corresponding treatment}) / 22$ . Here, 22 is the average endowment amount (=  $110/5$ ).

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

(a) L treatment

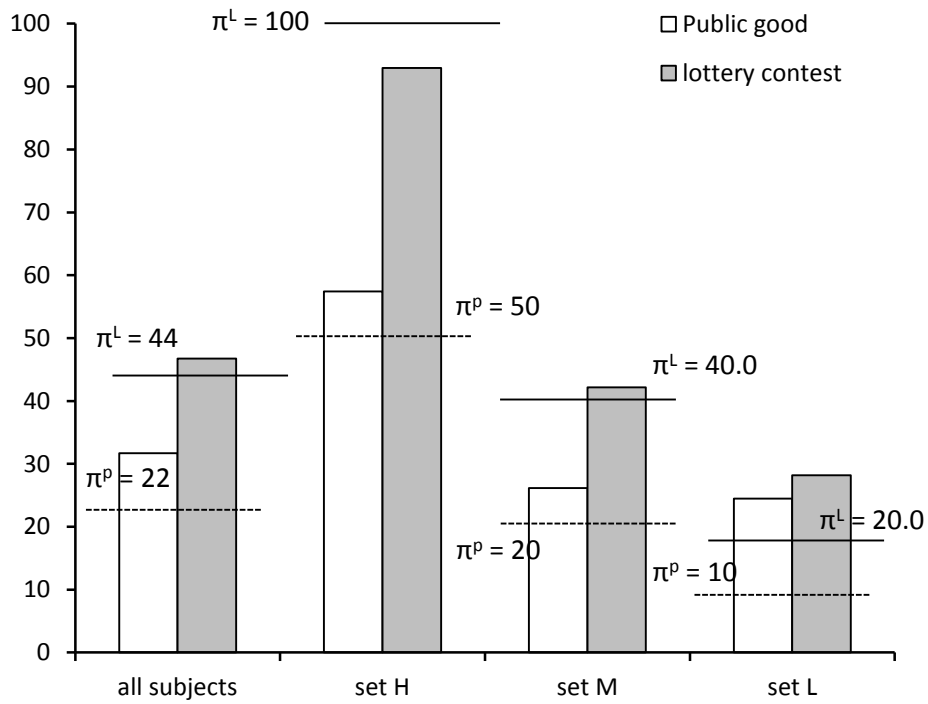


(b) H treatment





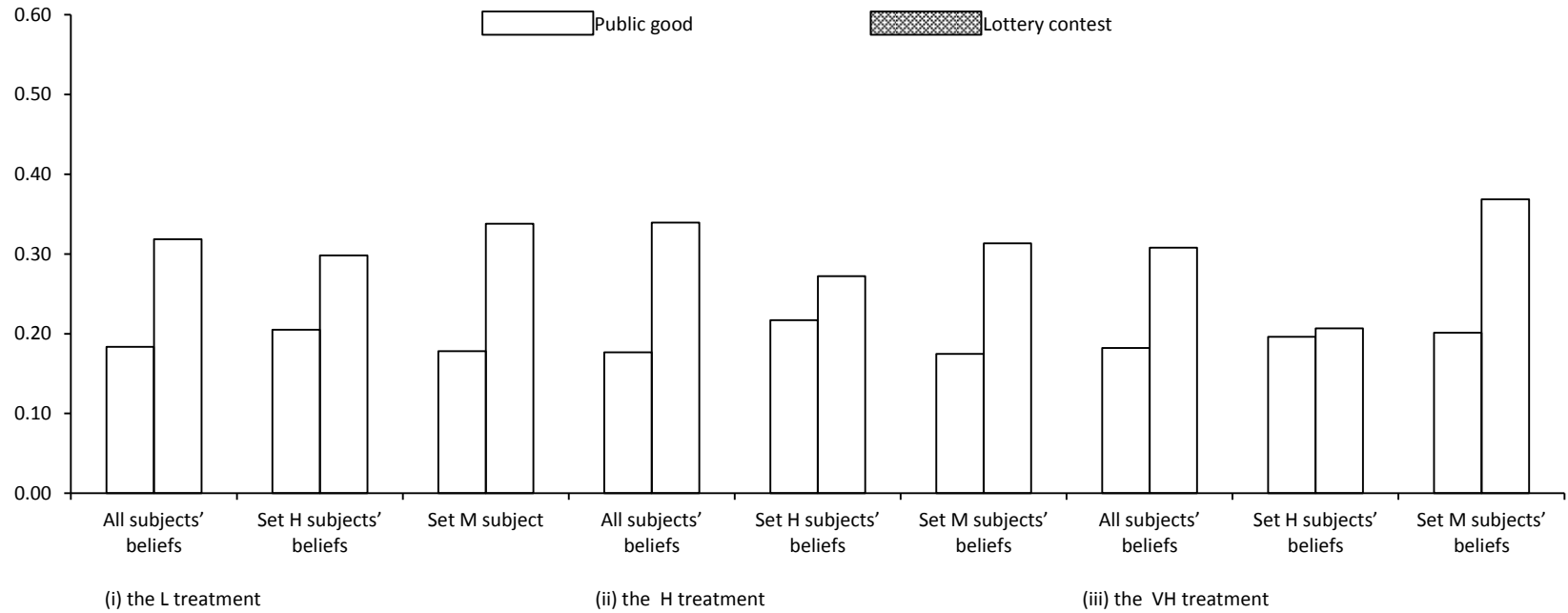
(c) VH treatment



Notes:  $\pi^p$  ( $\pi^L$ ) 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.

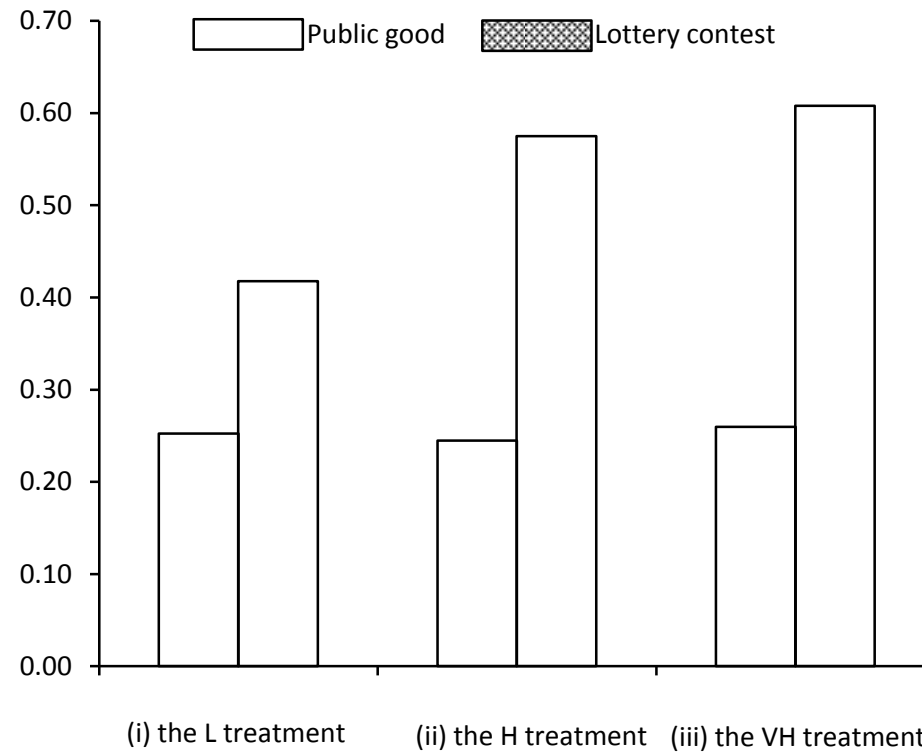
**Figure 4.** Average Gini Coefficients of Subjects' Payoffs by Regime

(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 ( $\eta$ ) {= 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.