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Abstract

This study examines whether attitudes toward risk and altruism are affected by being in a group or being alone. Subjects in our experiment were requested only to show their faces to other members without any further communication, differing from previous studies. In experiments of both anonymous investments and donations, we found that subjects who made decisions in a group offered significantly lower amounts than individuals who made decisions alone, even controlling for individuals' risk and altruistic preferences. Our results indicate that people are more risk averse and self-interested when they are in a group.

JEL classification: C91, C92, D81

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Introduction

Although a decision maker is almost always assumed to be an individual in normative models of economics, in real-life situations, many important decisions are made by groups, such as company boards, management teams, governments, and legislators. The importance of studies focusing on group decision-making is growing, and thus, economists have come to pay more attention to this area.

There is a long history in social psychology of studying group decision-making. Stoner (1961) reported the first experiment in which decisions made by groups led to riskier positions after the discussion, compared to individuals' decisions. Moscovici and Zavalloni (1969) labelled this phenomenon group polarisation, with risky/cautious shifts regarded as a special case of group polarisation. In social psychology, the two main explanations for these shifts are social comparison theory (Levinger and Schneider, 1969) and persuasive argument theory (Burnstein et al., 1973; Brown, 1974). Social comparison theory states that people are motivated to perceive and present themselves in a socially desirable way. To accomplish this, a person might behave in a group in a way that he or she regards as socially more favourable. According to persuasive argument theory, the reason that group decisions lead to a particular direction is that once certain novel arguments are shared during group discussions, then these arguments persuade other group members on the issue. Sunstein (2000, 2002) and Manin (2005) pointed out that groups indeed shifted to more extreme positions but the shifts were not systematic in one direction. In addition, a comprehensive survey by Kerr et al. (1996) concluded that 'there are several demonstrations that group discussion can attenuate, amplify, or simply reproduce the judgment biases of individuals' (p. 693). Furthermore, group interaction and discussion might deliver different results in group decisions.

In previous economic studies of group decision-making, two points of view were argued. The first explored whether groups were more rational than individuals were. Bornstein[1] and Yaniv (1998) studied individual versus group behaviour in the one-shot ultimatum game. They noted that groups were more game-theoretically rational players than individuals were, because groups demanded more than individuals did in the role of proposer and seemed to accept smaller offers in the role of responder. Cox and Hayne (2006) investigated the decision-making of groups and individuals in common value auctions. They found that groups tended to overbid

[1] In addition, Bornstein et al. (2004) reported that groups terminated the increasing-sum centipede game significantly earlier than individuals did.

significantly more than individuals did when distinct information was possessed by each member of a group. Kocher and Sutter (2005) studied the differences between individual and group decision-making in a beauty-contest game, and they found that groups won the contest significantly more often than individuals did. Charness and Sutter (2012) concluded that group decision-making was more likely to be close to standard game-theoretic predictions[2], because groups were more cognitively sophisticated, more productive owing to peer effects, and had more self-interested preferences.

The second perspective takes account of the differentials in preference toward risk and altruism between individuals and groups, which is fundamental to judge whether some decision is rational. Baker et al. (2008), Shupp and Williams (2008), and Masclet et al. (2009) reported that groups were more risk averse than individuals were in a lottery choice experiment, while Mifune et al. (2016) observed a similar tendency by using a kind of stag-hunt game and comparing individual-on-individual treatment with group-on-individual treatment. However, Zhang and Casari (2012) concluded that group decisions display a risky shift in comparison to individual decisions. Harrison et al. (2012) concluded that there were no significant differences between the risk aversion of individuals and groups. With regard to altruistic preference, Cason and Mui (1997) reported that a dictator group was less self-interested than an individual dictator was, whereas Luhan et al. (2009) concluded that a dictator group was more self-interested than an individual dictator was. The method of communication within the dictator group in Cason and Mui (1997) was face-to-face, whereas the method used in Luhan et al. (2009) was online chat. According to Luhan et al. (2009), whether group decision-making is more self-interested than individual decision-making depends on the anonymity within the dictator group.

Since all of the experimental economic literature in the previous paragraphs on group decision-making, except for Masclet et al. (2009), features groups that were allowed to communicate with other group members via face-to-face discussions or electronic chats, the observed decisions of groups were due to the mixed effect of the preference changes of individuals by being in a group and the group's formal or informal discussion process. Consequently, little is known about pure subjects' preference differentials in terms of how they decide – alone or in a team. This study differs from that of previous literature as we attempt to exclude the effects of group informal discussion, which are thought to be a 'black box' when individuals make decisions.

[2] Song (2008) found that representatives of three-person groups tended to trust less as first movers and reciprocated less as second movers in a trust game.

The question we focus on here is whether individuals' attitudes toward risk and altruism are influenced by the existence of other group members who have a common interest.

In order to compare the risk and altruistic attitude of groups and individuals, our experiment was composed of two parts. First, all subjects were asked to conduct an individual task. For risk attitude, we implemented a lottery choice task introduced by Holt and Laury (2002). For altruism attitude, we used a standard public goods game. These variables are utilized as controls for individuals' preferences toward risk and altruism in our regression model. Second, we separated the subjects into individual-choice and group-choice tasks, and then, played an anonymous investment game and donation game in each. For a group-choice task, subjects were requested only to show their faces to the other members, and each player made the same decision by median rule and received the same payoff as his or her group. We mainly noted that groups exhibit more risk aversion and are more self-interested than individuals are, even controlling for individuals' risk and altruistic preferences in the regression model.

The rest of the paper proceeds as follows. Our experimental design and procedure are introduced in Section 2. Section 3 presents the results of the experiment. Section 4 provides a theoretical framework for discussing our empirical results and Section 5 concludes.

Experimental Design

All subjects in our experiment were undergraduate students from various disciplines at Kochi University of Technology and Kyoto Sangyo University, and were recruited via the university website and e-mail solicitation. We conducted six sessions each with 24 subjects and two sessions each with 21 subjects between July 2015 and February 2016. No subject participated in more than one session. The experiment was programmed and conducted with the software z-Tree developed by Fischbacher (2007). Subjects were seated individually and in front of a computer screen in a lab.

Our experimental procedure consisted of two parts. First, all subjects in a session were asked to carry out an individual task as mentioned later in this section (Tasks 1 and 2). Second, in the case of the 24 participating subjects, 12 subjects were assigned randomly to the individual-choice task and 12 subjects to the group-choice task (divided into four groups of three people). Subjects were told that the members of groups were identical in Tasks 3 and 4. However, they were not allowed to communicate with each other, and each member of the group would stand up and show their face to the other member only when their number was called. The instruction sheets (available by request from the authors) for both the individual-choice task and the group-choice task were identical except for the parts related to the individual or group task. These were distributed to subjects at the beginning of each task independently and read aloud. There were few questions about the experimental procedures. All required one-shot anonymous decisions, and there was no feedback of any kind until the end of the experiments.

Here, we describe our task in detail. In Task 1, the risk preference elicitation experiment introduced by Holt and Laury (2002) was conducted, where subjects choose between a ‘safe’ (Option A) and a ‘risky’ (Option B) option. All 10 decisions appeared simultaneously, as shown in Table 1, and 110 yen equalled approximately 1 US dollar at the time of the experiment. One decision was chosen randomly by the computer for payment at the end of the experiment. We calculated the coefficient of relative risk aversion (CRRA) interval based on the CRRA utility function:

$$u_i(\mathrm{Y}_i) = \frac{Y_i^{1-\gamma_i}}{1-\gamma_i}$$

where γ_i is the coefficient of CRRA and Y_i represents the lottery outcomes for subject *i*. The CRRA is less than 0 for subjects who are risk seeking, equal to 0 for subjects who are risk neutral, and greater than 0 for subjects who are risk averse.

[Table 1 about here]

In Task 2, a standard public goods game was used to measure the individual altruistic preference. Subjects determined how much of the 200-yen endowment to keep or invest into public goods. Payoffs were determined by contributions of each member being doubled and divided evenly between the members of the group. While Mascret et al. (2009) controlled socio-demographic variables, such as salaried and self-employed workers, we used these variables as controls in the regression model (Task 1: risk preference; Task 2: altruistic preference).

In Tasks 3 and 4, we used the anonymous investment and donation game. Subjects received a 200-yen endowment and decided how much money to invest or donate, ranging from 0 yen to 200 yen (intervals of 10 yen). In Task 3, their investment options were as follows: 50% chance to win 2.5 times of their invested amount and 50% chance to lose their entire investment. In Task 4, they donated money to the Japanese Red Cross Society. For the group-choice task, the group decision was determined based on the median rule by group members and each team member received the same payoff in the group decision tasks. Thus, in the group choice task, each group member showed his or her choice for selection as the group decision and we consider that this choice appropriately reflects his or her altruistic and risk preference when he or she is in a group and shares a common interest with other members in each task. We observed and analysed these three values for the amount of investment and donation in each group, respectively, and hence, group choice is defined as 'individual choice in a group' for the rest of this paper. Following these tasks, we ran some experiments, and subjects were asked to answer the post-experimental questionnaire individually, including questions related to social value orientation (SVO) that we elaborate in the results section.

On average, a session lasted for about 1 hour and 15 minutes, including the post-experimental questionnaire and final payment of subjects. Each participant earned 2,230 yen on average.

Results

Of the 186 subjects in our experiment, we excluded the 7 subjects who switched backed more than twice and the 2 subjects who chose the safe option (Option A) in decision 10 of the risk attitude task (Task 1)[4].

For subjects who switched backed once, we followed the procedure utilized in Lusk and Coble (2005), Harrison et al. (2007), and Anderson and Mellor (2008) to calculate the range of relative risk attitude of CRRA for the 20 subjects.[5] The sample size we finally used consists of 177 subjects (71.2% male and 28.8% female).

Figure 1 presents the average amount of investment and donation categorized by individual

[4] Because choosing a safe option in the tenth decision means preferring a certain 200 yen over a certain 380 yen, we interpret this as a sign that the subject did not understand the instructions (see Anderson and Mellor, 2008, p. 1265).

[5] 'The lower bound of the range is determined by the first switch a subject made from the safe lottery to the risky lottery. The upper bound is determined by the last safe choice a subject makes' (Anderson and Mellor, 2008, p. 1265).

choice and group choice in each task. The average amount for individual choice is 116.2 yen for investment and 52.6 yen for donation; for group choice, the values are 101.7 yen and 31.2 yen, respectively. In fact, the mean of investment in group choice is 14.5 yen lower than that in individual choice, but there is no statistically significant difference, with a p-value of 0.128 by a non-parametric Mann–Whitney U-test. The mean of donation for group choice is significantly lower than that of individual choice (52.59 yen vs. 32.10 yen; $p<0.01$; Mann–Whitney U-test). It is noted that there is no significant difference between individuals and groups in variance of amount of investment and donation. The scatter plots with a regression line for both investment and donation are displayed in Figure 2. The figure clearly indicates that subjects who are assigned to group choice decrease the amount in both investment and donation. For investment, the horizontal axis represents the risk attitude measured for CRRA, ranging from −2 to 2 (Task 1),[6] and the vertical axis represents the amount of investment (Task 3). Similarly, for donation, the horizontal axis is the amount of contribution in public goods game (PGG, Task 2) and the vertical axis is the amount of donation (Task 4). In order to extract the effects of being assigned to groups more completely, we ran ordinary least squares (OLS) regression, controlling for some other factors.

[Figure 1 about here]

[Figure 2 about here]

We estimated both investment and donation equations separately in the OLS regression model, where dependent variables are individual attitudes measured in Task 1 (about risk) and Task 2 (about altruistic), ‘Group-choice’ dummy variables (whether assigned to group-choice tasks or not), and gender dummy variables. The descriptive statistics of variables appear in Table 1. Table 2 presents the estimation results of regression on investment and donation, where robust standard errors are utilized. The coefficient of risk attitude assessed by the CRRA is negative and significant at the level of 0.05, which indicates that more risk-averse subjects tend to decrease the amount of investment. Furthermore, in the donation equation, the amount of

[6] We take values of −2 and 2 for choosing the safe option in decisions 2 and 10, respectively, as the midpoint of the CRRA interval, following Reynaud and Couture (2012).

contribution in PGG is positively associated with the amount of donation at a significance level of 0.05. By focusing on the effects of being assigned to groups, subjects in group-choice tasks significantly decrease their investment and donation compared to those in individual-choice tasks, at a significance level of 0.05. To check the robustness of the donation equation, we controlled subjects' prosocial orientation, measured by SVO developed by Van Lange et al. (1997, 2007). This SVO variable is widely known to be associated with the results of the dictator game and it assesses the individual altruistic preferences (refer to Cornelissen et al., 2011). The dummy variable of prosocial equals 1 if subjects were defined as prosocial in the SVO method, and are 0 for any other case.[7] The coefficient of both the contribution and prosocial variables are positive and statistically significant at the level of 0.05. Hence, we might capture and control the other aspects of altruism by introducing the prosocial dummy variable, as defined in the SVO method. For both regression results, we conclude that subjects in a group tend to be more risk averse than individuals.

[Table 2 about here]

[Table 3 about here]

With respect to gender effect, males tended to invest more than females at a significance level of 0.05. This is consistent with the surveys in Eckel and Grossman (2008), who concluded that males are indeed more risk seeking than females. For altruism, evidence of gender difference is mixed in previous studies (see Kamas et al. 2008). Our results show that there is no significant gender difference toward the amount of donation. In addition, we examine gender differences in a group, more specifically, by comparing groups between same-gender (male) and mixed-gender. There is no statistically significant difference in the regression model with a value of around 0.15.

[7] In our sample, approximately 46% of subjects were defined as 'prosocial'. This is consistent with Au and Kwong (2004), who reported that by meta-analysis, about 45% were categorised as 'prosocial' on average in various studies.

Discussion

Our results indicate that people are more risk averse and self-interested when they are in a group. Here, we discuss why people in a group tend to decrease their amount of investment and donation on average. Tajfel et al. (1971) and Kramer (1991) reported that subjects were more likely to have other-regarding preferences toward in-group members than toward out-group members[8]. We consider other-regarding preferences that include not only own payoff but also others' payoffs in their utility functions. The established model of other-regarding preferences developed by Fehr and Schmidt (1999) generalizes to

$$U_i(x_i, x_{-i}) = \; x_i - \beta_1 \frac{1}{N-1} \sum_{j=1}^{N} max\left\{x_j - x_i, 0\right\} - \beta_2 \frac{1}{N-1} \sum_{j=1}^{N} max\left\{x_i - x_j, 0\right\} \quad (1)$$

with $\beta_1 \geq \beta_2$ and $0 \leq \beta_2 \leq 1$. This is well known as the model of inequity aversion[9]. However, in our group tasks, each player made the same decision by median rule and received the same payoff as his or her group. Therefore, this inequity aversion model might not work to explain the reasons for 'risk-averse shift' or 'self-interested shift' observed in our experiments.

Next, we introduce a simple model in which the utility function is influenced by others' utilities as follows. For i, j, k = 1, 2, 3, and $i{\neq}j, j{\neq}k, i{\neq}k$,

$$V_i(x_i) = \; U_i(x_i) + \lambda(U_j(x_j) + U_k(x_k)\,) \qquad (2)$$

We begin by discussing self-interested shift with our task that decided how much money to donate, ranging from 0 yen to 200 yen. For individual task, we assume that the symmetric utility function with a single peak is defined as follows.

$$U_i(x_i) = \; -(x_i - \alpha_i)^2 \qquad (3)$$

According to this utility function, the most desirable levels of donation for players 1, 2, and 3 are α_1, α_2, and α_3 respectively. For instance, if α_1, α_2, and α_3 are 80, 100, and 120, then utility-maximizing choices for each player are 80 yen, 100 yen, and 120 yen, respectively, in individual choice of donation. With regard to group choice, when the utility function is defined as (2), each

[8] Chen and Li (2009) incorporated social identity, such as in-group and out-group, into the social preference model in an other–other allocation game. They found that when subjects were matched with an in-group member, they showed more charity and less envy.

[9] Another stylized model of inequity aversion was introduced by Bolton and Ockenfels (2000).

player also considers the payoffs of others[10]. The amount of donation to maximize the utility for each player is represented in Table 4. In comparison with individual choice, Player 1 increases the level of donation; on the other hand, Player 3 decreases his or her donation in group choice. The median and sum of donation is unchanged between individual choice and group choice. In other words, this model may not account for self-interested shift, and thus, we introduce another model next.

[Table 4 about here]

We next assume that utility function $U_i(x_i)$ is asymmetric with a single peak, defined as follows.

$$U_i(x_i) = -max\{(\alpha_i - x_i)^2, 0\} - max\{(x_i - \alpha_i)^3, 0\} \quad (4)$$

This utility function implies that if subjects were forced to donate more than their desirable level of donation α_i by group decision, it would cause a higher disutility for that subject. The amount of donation to maximize the utility of each player is shown in Table 5. Players 2 and 3 decrease their donations in group choice compared to individual choice. These results are consistent with our data reported in Figure 2 – that more other-regarding subjects tend to decrease their donation in group choice. In this model, the median and sum of donation decreases between individual choice and group choice.

[Table 5 about here]

With regard to risk-averse shift, we assume that subjects in individual task maximize their expected utility $U_i(x_i)$, defined as follows:

$$U_i(x_i) = 0.5 \times u_i(200 - x_i + 2.5\, x_i) + 0.5 \times u_i(200 - x_i) \quad (5)$$

$$u_i(\mathrm{Y}_i) = \frac{{Y_i}^{1-\gamma_i}}{1-\gamma_i} \quad (6)$$

where γ_i is the coefficient of CRRA and Y_i represents the lottery outcomes in our investment

[10] We take values of 0.2 for λ in this section to evaluate their levels of utility defined as (2) and (7).

task (Task 2). With respect to group choice, we suppose that subjects maximize their expected utility $V_i(x_i)$, defined as (7). Because $U_i(x_i)$ defined as (5) converts various levels of utility depending on the coefficient of CRRA (γ_i), we normalize $U_i(x_i)$ as follows.

$$V_i(x_i) = \frac{U_i(x_i)}{U_i^{max}} + \lambda\left(\frac{U_j(x_j)}{U_j^{max}} + \frac{U_k(x_k)}{U_k^{max}}\right) \quad (7)$$

As shown in Figure 3, $U_i(x)$ has the same disposition of asymmetric utility function defined as (4), by which people may incur more disutility from over-investing compared to their most desirable level of investment than from under-investing. Under these assumptions, the results of expected utility maximization for each player are shown in Table 6[11], in which the median and sum of donation decreases between individual choice and group choice.

[Table 6 about here]

Eventually, we conclude that risk-averse shift and self-interested shift has occurred, owing to the assumption of other-regarding preferences and the asymmetric utility function, whose right side is more steeped than its left side. From our theoretical analysis developed below, we derive two hypotheses. First, more other-regarding and risk-seeking people tend to cause self-interested shift and risk-averse shift, respectively. Second, on the contrary, more self-interested and risk-averse people are affected by these group effects, but in the opposite direction.

In order to confirm these hypotheses from our data, we run a regression model adding group-choice interaction terms to our main model in Table 7. According to the results of donation, the coefficient of group-choice interaction term is negative but not significant. With reference to Figure 2 to aid the discussion, group choice has more of a smooth slope of the regression line than individual choice, which suggests that more other-regarding subjects with higher contributions in the PGG tend to decrease their donations on average, compared to more self-interested subjects with lower contributions in the PGG. We consider that these results are consistent with our hypotheses.

[11] We take values of γ_i for each player as follows: Player A (0.415), Player B (0.325), and Player C (0.26).

,

[Table 7 about here]

Regarding the risk task, the coefficient of the group-choice interaction term is negative but not significant. This suggests that more risk-averse subjects tend to decrease their investment than more risk-seeking subjects do, and therefore, our hypotheses are not supported. A possible explanation for this result is the difference of their beliefs between more risk-seeking and risk-averse subjects. A more risk-seeking subject might understand that his or her risk preference is relatively higher than those of other subjects, and then, such an individual decreases his or her level of investment slightly. However, a more risk-averse subject might have a false belief that other subjects must be more risk averse than himself or herself, so that he or she decreases the level of investment to a large extent. To validate our hypotheses, further empirical analysis is necessary in future studies.

Conclusions

We attempted to investigate pure subjects' preference differentials toward risk and altruism to decide whether to be alone or in a group. Our experiment was designed to exclude the effects of informal discussion in a group by forbidding communication with members of the group and adopting the median rule at the time of group decision making. Our empirical results and theoretical analysis show that subjects who made decisions in a group tended to decrease their amount of investment and donation on average. Therefore, we conclude that pure subjects' preferences appear to be more risk averse and self-interested when they are assigned to a group whose members have a common interest. These results are in line with some previous economic literature (see Shupp and Williams, 2008; Luhan et al., 2009; Masclet et al., 2009, as cited in the introduction). However, the prior literature talks about communication effects and different 'default rules' in order to reach agreement in group decision making (e.g. majority rule, unanimity, and dictator rule). Thus, both communication and default rules may affect the final results of the experiments.

Our results shed light on the 'black box' of group decision making, as mentioned in the introduction. Anbrus et al. (2015) found that median group members have a significant influence on group decisions via free discussion in the trust game and risk task of Holt and Laury (2002). Luhan et al. (2009) reported that most self-interested group members had the largest impact on the group decision via electronic chat in a dictator game. While median group members in prior works might have caused preference shifts when assigned to a group, these works focused only on how individual preferences were aggregated to a group attitude (preference aggregation). However, preference shifts also might have occurred by the existence of other group members. We suggest that these two effects (preference shifts and aggregation) were mixed up in prior works.

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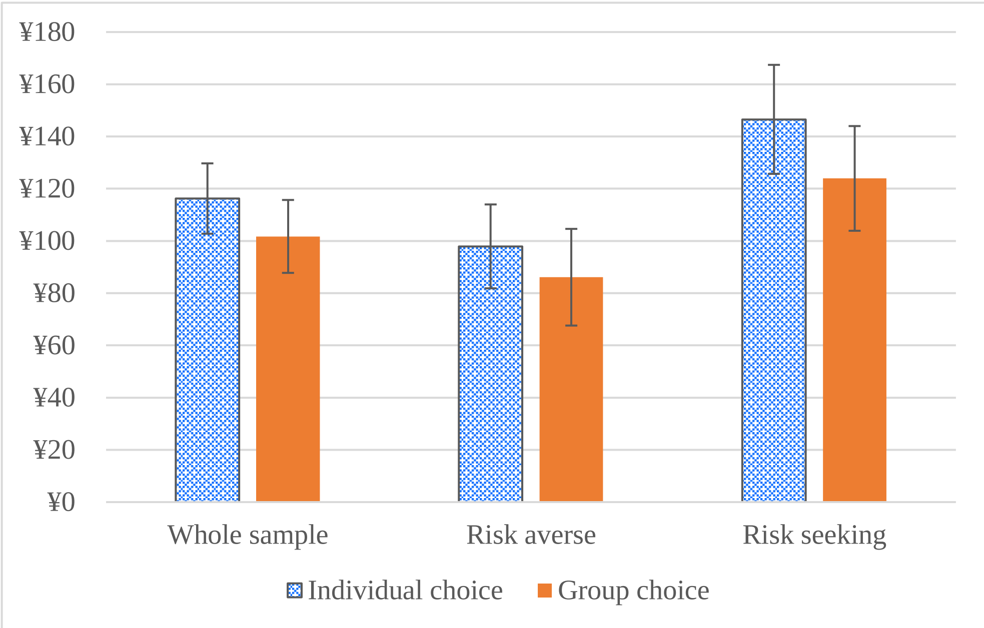
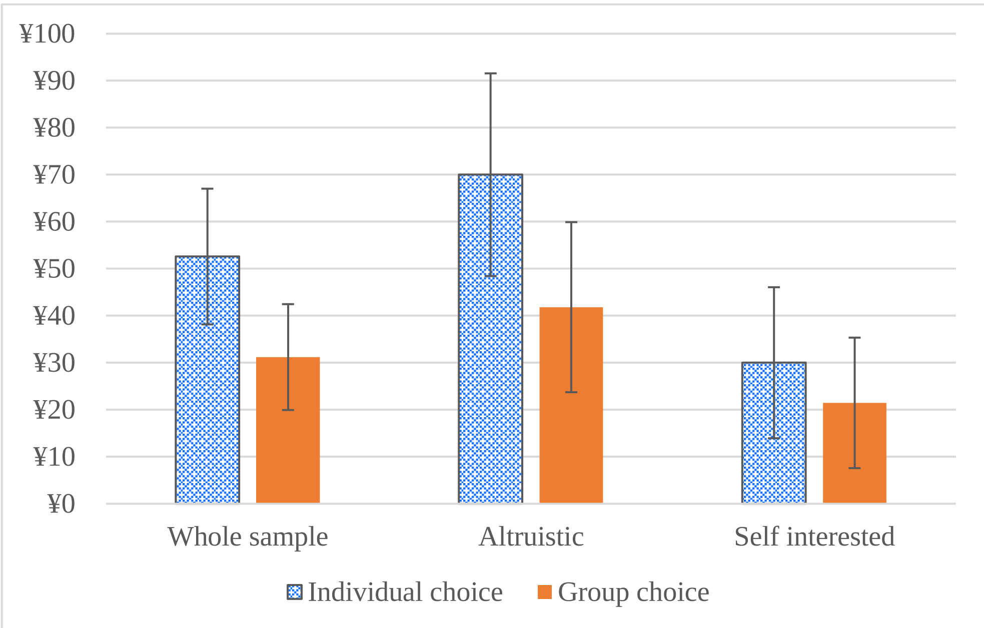
Figure 1. Average amounts: Investment and donation

investment



Note: ‘Risk seeking’ (N=70) is defined as subjects who exhibit CRRA lower than 0.5 in Task 1 and otherwise, subjects are defined as ‘Risk averse’ (N=107).

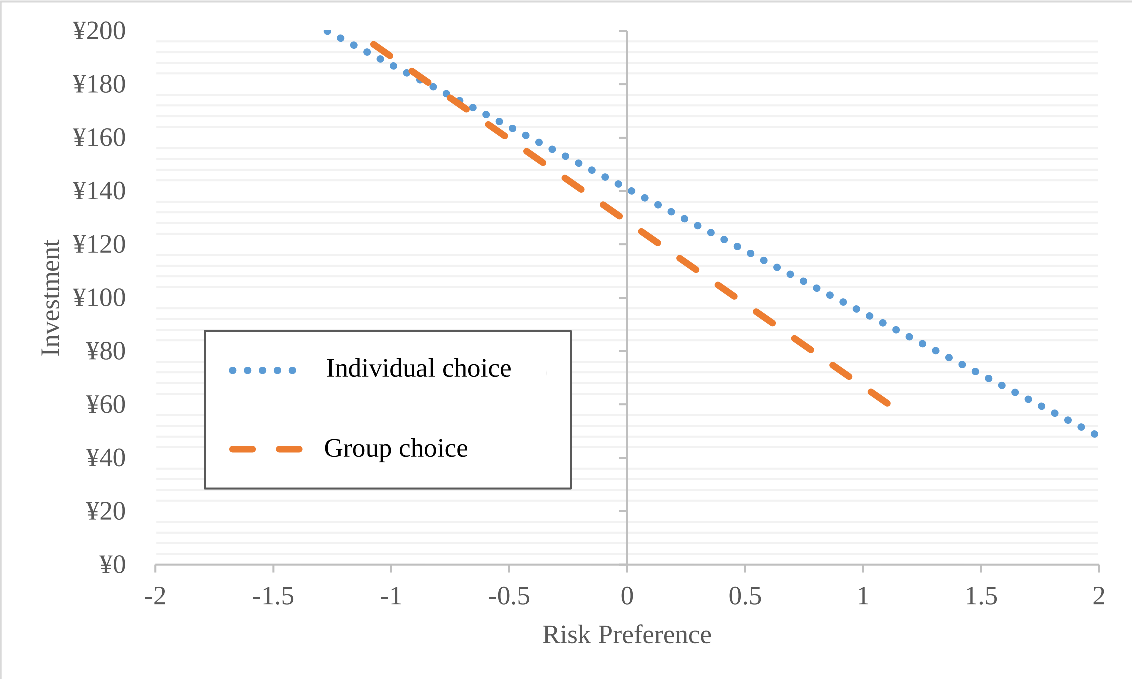
Donation



Note: ‘Self interested’ (N=85) is defined as subjects who contribute less than 40 yen to PGG in Task 2 and otherwise, subjects are defined as ‘Altruistic’ (N=92).

Figure 2. Scatter plots with a regression line

Investment



Donation

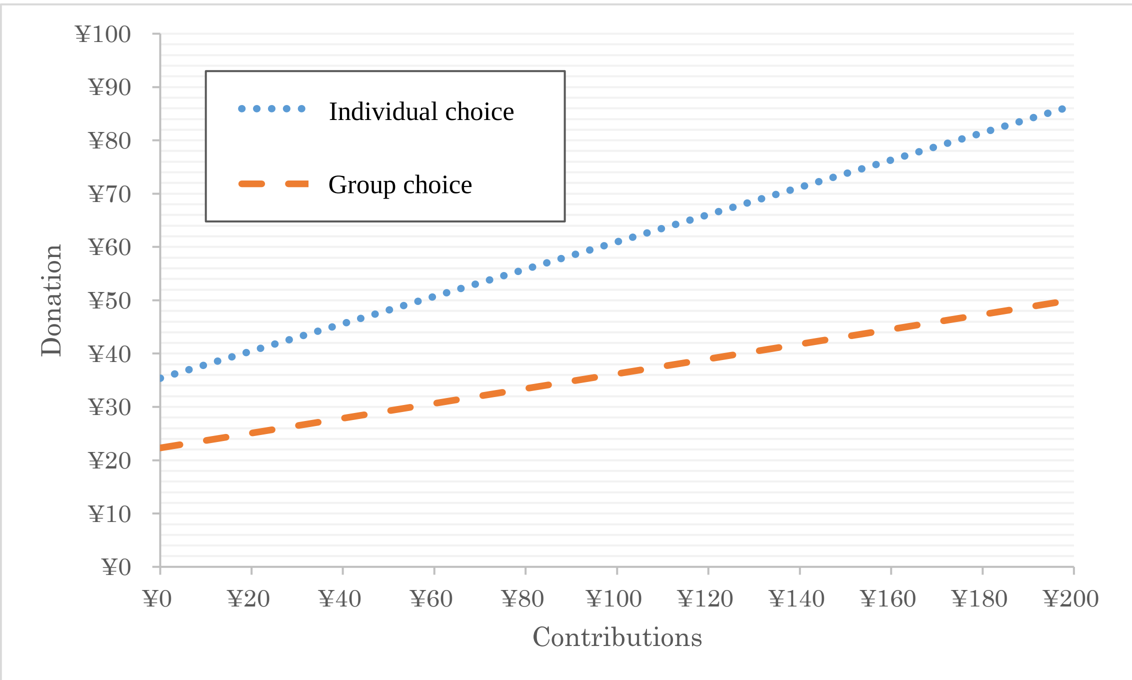


Figure 3. Form of utility function (unnormalized, the coefficient of CRRA = 0.2)

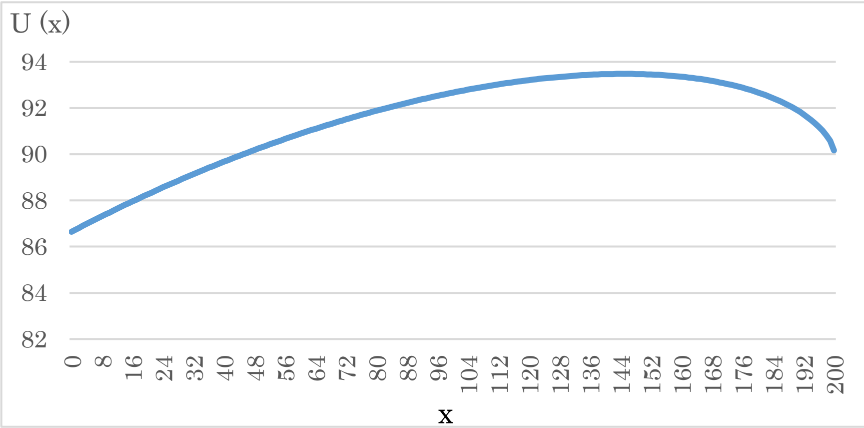


Table 1. Lottery choice experiment (Holt and Laury, 2002)

Decision	Option A				Option B			
	Probability	Payoff	Probability	Payoff	Probability	Payoff	Probability	Payoff
1	10%	200 yen	90%	160 yen	10%	380 yen	90%	10 yen
2	20%	200 yen	80%	160 yen	20%	380 yen	80%	10 yen
3	30%	200 yen	70%	160 yen	30%	380 yen	70%	10 yen
4	40%	200 yen	60%	160 yen	40%	380 yen	60%	10 yen
5	50%	200 yen	50%	160 yen	50%	380 yen	50%	10 yen
6	60%	200 yen	40%	160 yen	60%	380 yen	40%	10 yen
7	70%	200 yen	30%	160 yen	70%	380 yen	30%	10 yen
8	80%	200 yen	20%	160 yen	80%	380 yen	20%	10 yen
9	90%	200 yen	10%	160 yen	90%	380 yen	10%	10 yen
10	100%	200 yen	0%	160 yen	100%	380 yen	0%	10 yen

Table 2. Descriptive statistics

	Individual choice		Group choice			
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Min	Max
Investment	116.24	62.45	101.74	67.41	0	200
Donation	52.59	66.92	31.20	54.39	0	200
Risk preference	0.53	0.56	0.43	0.42	-2	2
Contributions	67.29	69.03	63.91	74.83	0	200
Prosocial	0.45	0.50	0.42	0.50	0	1
Male	0.64	0.48	0.78	0.41	0	1

Note: Individual choice (N=85), Group choice (N=92).

Table 3. Estimation results: Ordinary least squares

	Investment		Donation			
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Risk preference	-50.07	9.32 ***	—	—	—	—
Contributions	—	—	0.19	0.07 ***	0.17	0.07 **
Male	24.56	8.42 ***	-4.02	9.58	-4.15	9.62
Group choice	-22.97	8.85 **	-20.16	8.94 **	-19.75	8.93 **
Prosocial	—	—	—	—	20.05	9.27 **
Constant	127.24	9.68 ***	42.30	10.48 ***	34.96	10.93 ***
F-value	14.78 ***		4.26 ***		4.71 ***	
R-squared	0.18		0.06		0.09	
Sample size	177		177		177	

Note : Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 4. Utility-maximizing choices for each player between individual choice and group choice: Example 1

	Player 1	Player 2	Player 3
Individual choice	80	100	120
Group choice	89	100	111

Table 5. Utility-maximizing choices for each player between individual choice and group choice: Example 2

	Player 1	Player 2	Player 3
Individual choice	80	100	120
Group choice	83	88	89

Table 6. Utility-maximizing choices for each player between individual choice and group choice: Example 3

	Player 1	Player 2	Player 3
Individual choice	80	100	120
Group choice	88	99	111

Table 7. Estimation results: Adding group-choice interaction terms (OLS)

	Investment		Donation			
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Risk preference	-44.13	11.89 ***	—	—	—	—
Risk preference × Group choice	-15.62	17.42	—	—	—	—
Contributions	—	—	0.26	0.11 **	0.23	0.11 **
Contributions × Group choice	—	—	-0.12	0.15	-0.11	0.14
Male	24.61	8.44 ***	-4.21	9.63	-4.34	9.67
Group choice	-15.61	11.67	-12.37	10.73	-12.23	10.63
Prosocial	—	—			19.93	9.28 **
Constant	124.05	10.20 ***	37.98	11.11 ***	30.84	11.34 ***
F-value	13.28 ***		3.14 ***		3.71 ***	
R-squared	0.18		0.06		0.08	
Sample size	177		177		177	

Note : Significance levels: *** p<0.01, ** p<0.05, * p<0.1.