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Identifying the warm glow giving in a laboratory experiment

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Abstract

We examine what lies behind the act of warm glow giving in a laboratory experiment. Making use of the experimental design in Crumpler and Grossman (2008), we separate the warm glow motivations from the altruistic ones. We find that the contributions generated by the warm glow motivations are highly sensitive to the reference contributions, indicating to the complementary relationship between own and the others' contributions. Finally, we specify a complicated form of the warm glow giving.

Keywords: warm glow giving; laboratory experiment; reference contribution

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1 Introduction

Understanding the underlying motivational drives of contributions has been widely recognized as an important theme preoccupying the literature of social science on

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volunteering. Abe et al. (2011) examine the motivation on contributions in Japan, showing the top ten of motivations in Figure 1 where in May 2011, 8420 respondents answered the questionnaire.[1] For instance, the fifth and seventh motivations indicate the altruistic motives. Helping others and benefiting society are consistent reasons why individuals make contributions. In addition, the tenth motive points out the egoism, which asserts that actual motives for volunteering are self-seeking, not helping others and society. The motivations caused by altruism and egoism are primary constructs in the literature examining volunteer motivation.

Since the seminal papers by Andreoni (1988, 1989), the warm glow giving is incorporated into the motivation on voluntary contributions. The warm glow giving means that donors receive utility from the private joy of giving. In that sense, such an individual has a purely egoistic motivation for donating. Andreoni (1988, 1989) show that if donors hold a so-called warm glow from the act of giving itself, own and the others' contributions cannot be seen as perfect substitutes, concluding that the incomplete crowding–out can be observed.

While the warm glow giving was a major step toward an economic understanding of voluntary contributions, the simple incorporation of warm glow giving into utility function allows us not to explain the complicated behavior of individuals. For example, a review of the psychological literature indicates that motivation for voluntarism is a multifaceted phenomenon. The field is highly complex, and related theories are so varied and contradictory that no single conceptual model has received general support (See Anderson and Moore 1978, Clary and Snyder 1999, and Anderson and Cairncross 2005).

Figure 1 also presents interesting motivations. The first and sixth motives are related to moral principles and obligations.[2] In addition, the reason occupied by 4.9

[1]In 2010, 373 million Japanese made contributions, which occupies about 34 percent of Japanese population over 15 years old. Furthermore, the sum of individual contributions was about 487 billion yen (about 6 billion dollar).

[2]With respect to moral motivations, see Kahneman and Knetsch (1992), Brekke et al.(2003) and Dellavigna et al.(2012).

percent of respondents out of top ten motives is "Because I want to conduct what is fair or ethical". In sum, it shows that people want to behave what is morally correct. Alternatively, the fifth reason shows conformity.[3] Since people want to keep or strengthen their social relationships, they care about others and want to keep up with the donating behavior of others. Importantly, both motives lead to the complementary relationship between own and others' contributions, that is, people want to make contributions when their peers contribute because of morality and conformity. However, even if the simple formation of warm glow giving is applied under the standard assumptions of utility function, the complementary relationship cannot be seen. Then, the doubts of simplicity are raised in the basic specification of warm glow giving.[4]

In this paper, we examine what lies behind the act of warm glow giving in a laboratory experiment. The merit of laboratory experiment is that, in principle, the experimental method provides *ceteris paribus* observations of individual economic agents, which are otherwise difficult to obtain. More specifically, to examine what lies behind the warm glow, we can require a restriction on the amount of total contributions as in Crumpler and Grossman (2008), which allows us to separate the warm glow giving from the altruism. Our main result is that contributions derived by the warm glow giving are highly sensitive to the reference contributions. We reveal the complementary relationship between own and the others' contributions.

2 Experimental designs

To examine the motivations generated the act of warm glow giving, we performed two experiments, called the first stage and the second stage. In the first stage,

[3]See Fischbacher and Gächter (2010) in this field of economics.

[4]Schokkaert (2006) also mentions the motivation on the warm glow giving as follows:*More importantly, the rejection of perfect crowding-out does not give us any clue about what really lies behind the "warm glow". It seems that we need to incorporate more explicit information about preference differences if we want to get a better insight into the motivations of the givers.*

we employed a dictator game which is essentially the same as the method used in Crumpler and Grossman (2008). In the second stage, under the optimal selection of subjects in the first stage, we asked for an additional contribution based on the rule of the first stage (a detailed description is given in the Appendix).

Our experiment was conducted at two large universities, Kyushu Sangyo University (KSU) and Kyushu University (KU) where subjects from various academic disciplines voluntarily applied for our experiment. Five sessions were conducted on twenty or thirty subjects; a total of one hundred ten students (fifty-six males and fifty-four females). One session of thirty subjects was conducted at KSU and the remaining four sessions of twenty subjects each were performed at KU where four sessions were conducted separately.

Upon arrival each student selected an ID number by drawing from a sealed box. The subjects were instructed they could not have any contact with each other. To maintain subject anonymity, each subject was seated individually at a table marked with their ID number and was never informed of the identity of the other subjects. The subjects were given a large packet containing an instructions booklet, a list of charities, one white colored-small paper, four colored-small papers, five envelops, a pencil, and a sealed envelope to be opened at the beginning of the second stage.

At each session, the proctor read the instruction booklet aloud with the subjects following the directions given where any subject was not allowed to read ahead maintaining uniformity. At first, the subjects were informed that the preferred charity they choose would receive a set donation amount. After they had chosen their preferred from the given list, they wrote their ID number and the charity on the white piece of paper and sealed it in an envelop to be collected by the other proctor.

2.1 The first stage

We used a repeatedly random choice experiments where the first stage is almost the same with Crumpler and Grossman (2008) except for the repeat of questions in our first stage. Four allocation problems (A, B, C, and D) were presented to the

subjects. For each problem the subjects were asked how they would allocate 2000 yen (about 22 dollar) between themselves and their selected charities. They were informed that after they answered all four problems, the assistant would randomly draw one ball labeled A, B, C, or D from a sealed box, and that the subject's decision for the problem which corresponds to the selected ball would be played out for real. Knowing this procedure of the experiment gave the subjects an incentive to make seriously all choices.[5] For each problem the subjects would write their donation amount on the remaining four pieces of paper, each sealed separately in corresponding envelopes. The envelopes were collected and the proctor continued reading the following question.

Four allocation problems differ in reference contributions (RC) and the number of subjects in smaller groups. Twenty or thirty subjects in the same session were divided into smaller groups composed of two, five or ten persons where the subjects did not reassemble into smaller groups, but kept their original seats to keep anonymity. Alternatively, the subjects were informed that the different levels of RC would be given among the divided groups. The purpose of introducing the smaller groups is mainly to collect a richer set of data based on the limited number of participants.[6]

In our experiment, we suppose that the RC has three possible values; 400, 800, 1200 yen.[7] Crumpler and Grossman (2008) assume the amount of RC is the same as the amount of the subjects' endowment to examine whether the warm glow giving exists or not. Alternately, we did not use the level of endowment as the RC based

[5]In fact, we gave all participants a constant yen's amount 2000 yen at the end of experiments; however, throughout our experiments, they were informed that they would receive the amount of yen they selected in our experiments. Thus, the participants believed that he/she would obtain "2000 yen − his/her donation" until the end of experiments.

[6]Because we guaranteed the subjects the full anonymity as written in this section, we guessed that a change in the number of subjects does not have significant impacts on the determination of individual contributions.

[7]Because the established amount of hourly wage in KSU is around 800 yen, the middle amount of RC was determined as 800 yen.

on the following. When an endowment is given by the level of RC, most respondents would make contributions less than the RC, and all respondents cannot make contributions greater than the level of RC, which can be expected that their warm glow motivations would be restricted. Instead, to observe various warm glow motives, we set at RC$= 400, 800$, and 1200.

In this time, the following instructions were read: *Regardless of the amount of your chosen contributions in each project, your selected charity will receive neither more nor less than the amount of your reference contribution. In other words, if the amount of your contributions is more than the level of your reference contribution, the charity receives total amount of your contributions; instead, the amount contributed by the proctor to your selected charity decreases so that the total amount of contributions is not changed. Alternatively, if your selected contribution is less than the level of reference contribution, the amount the proctor contributes increases. As a result, regardless of the amount of your chosen contributions, the total amount of contributions is fixed.*

The above description is very similar to that in Crumpler and Grossman (2008), which separates the motivation based on warm glow from the altruism. This is because regardless of subjects' selected donations, the total amount of donations is constant.

2.2 The second stage

After the subjects' gains were determined in the first stage, the subjects opened the sealed envelope containing the second stage instruction, a piece of paper and an envelope. The essence of instructions is as follows.[8]

First of all, notice that the optimal choice for each individual in the first stage was completed. Then, in the second stage the additional appeal for contributions was executed. In fact, the subjects were informed that 50 yen additionally made forcible collection from each subject (hereafter, FC), and that one subject chosen

[8]See Appendix for the detail explanation.

by random was given the freedom to decide the amount of own additional donation. In keeping with the rule of the first stage, we assume regardless of the subject's choice, the selected charity receives neither more nor less than 50 yen. As a result, the increase in total amount of contribution is fixed. Three sessions (sixty persons) were executed in FC; however, to collect data of a richer range, the remaining two sessions (fifty persons) were given different instructions with the forcible repayment (hereafter, FR), meaning that we forcibly returned 50 yen to all members except for one person.

Supposing that the subjects were one person who could be freely able to choose the amount of their additional donations by the random selection, they decided and wrote down whether they would additionally increase, decrease, or keep the donation amount the same. This information was also sealed in an envelope and collected.

Finally, the subjects were asked to answer gender, the participation in a part-time job and pocket money as general demographic attributes. In addition, they were to answer questions to ascertain achievement motives, self-fulfillment achievement motive (SAM) and competitive achievement motive (CAM) used in the contributing field of psychology. The explanation will be concretely given in next subsection.

Table 1 shows summary data. At first, there are five sessions and eleven subsessions where the participants did not know that we made use of subsessions, that is, for a convenience each session was divided into subsessions unified by 10 persons according to ID number. For instance, session 1 (thirty persons) was divided into three subsessions 11-13. The difference among subsessions is the levels of RC and male-female ratio where we refer to our treatments as 400, 800, and 1200 which denote RC. Moreover, in our uses of the terms 'FC' and 'FR', we refer to the cases of forcible collection and forcible return conducted in the second stage.

For instance, subsession 11 was composed of five males and five females (i.e., M(F)=5(5)). Besides, in subsession 11, the levels of RC in each round were given by 800 yen, 800 yen, 800 yen, and 400 yen where each number in parentheses shows the size of group. The average amount of donations in all rounds (Ave) is 566 yen in subsession 11, and the standard deviation (Std) is 64.1. Since the number of

the drawn ball, referenced as 'Ball', was C, the subjects in session 1 were told that they would receive money following their decision in C's round. In the second stage, because Table 1 points out 'FR' in session 1, the subjects in session 1 were informed that 50 yen were forcibly returned. In subsession 11, if the subjects were the person who could make their own decision, four persons wanted to decrease the amount of donation (DOWN) and the remaining six persons wanted to neither increase nor decrease its amount.

2.3 Factor analysis: SAM and CAM

First of all, we explain why we picked up SAM and CAM. CAM is the achievement motive that people want to be socially evaluated by conforming or competing with others. As seen in third motivation of Figure 1, it seems that CAM does play an important role of the motivation on contribution except for the altruism because individuals contribute due to strong normative or social pressure, or to get along with others in his or her reference group. However, it would be expected that such the motivation is sufficiently excluded in a fully anonymous design. Therefore, by introducing CAM, we confirm whether the contributing motivation generated by the conformity exists or not.

Next, SAM is defined as the achievement motive that people aim at their goals by themselves.[9] This factor is likely to be the egoistic motivation because their purpose of contribution is to accomplish their goals or targets, not purely to help others. As argued in Andreoni (1988,1989), we can confirm whether the rest motivation on contributions is strongly related to the egoistic component of the utility function.

Table 2 shows psychological tests with twenty-four items regarding SAM and CAM where their items are the same as those used in some psychological literature (e.g., Horino and Mori 1991, Horino 1994 and Kobayashi 2009). The subjects were

[9]In the field of psychology, Anderson and Moore (1978) examine the frequency with which various motives for volunteering are identified, showing that around 40 percent of 1037 respondents are motivated by self-fulfillment.

asked to select their preference using 1 (completely disagree) to 7 (completely agree). A principal components factor analysis of these items followed by a varimax orthogonal rotation identifies SAM and CAM where the rotation converged after repetition at three times.[10] We finally omit one item because the value of communality was extremely low (0.031) compared with the others. The value of factor correlation is 0.167.[11]

Taking account of the varimax-rotated factor loadings in table 2, the factor structure would be very clear and interpretable where the loading I (II) shows SAM (CAM). Using these values in table 2 we derive the individual scores of SAM and CAM where each mean of SAM and CAM takes zero and the values of standard deviation are one. Taking account of the gender difference, the mean of female (SAM=0.433) is higher than male (SAM=-0.417), a statistically significant difference ($t = 11.00,\ p = 0.00$). Instead, in the case of CAM, the mean of male (CAM=0.090) is greater than that of female (CAM=-0.093) ($t = -2.16,\ p = 0.03$).

3 Main Results

3.1 The first stage

Total data collected in the first stage is four hundred forty because four questions were repeated for each individual. Then, one may wonder if the learning effects exist because of the repetition. However, ANOVA accepts the null hypothesis that contributing decisions of our four treatments from the order of questions stem from the same distribution (F =0.33 and p =0.81). Thus, even if the learning effects exist, it would be considered that they are not important. Hence, we take no account of the effects.

[10]Because many of these items have been used to identify SAM and CAM, we restricted two components from the initial treatment.

[11]Kobayashi (2009) confirm similar value of correlation between SAM and CAM when he conducts achievement motive test for 115 university students.

Figure 2(a) gives the results of average donations and table 3 shows the distribution of contributions under each level of RC. First, from figure 2(a) we confirm one of our main results, which is that more RC yields considerably more individual contributions. At 400 yen's RC, the mean amount of contributions is 430 yen. At 800 yen's, it increases by 210 yen, a statistically significant difference ($t = -5.19$, p=0.00) making use of Welch's test. At 1200 yen's, it furthermore increases by 153 yen, itself a statistically significant increase over 800 yen's RC ($t = -2.79$, p=0.01). The difference of nearly 360 yen between mean donation at 400 yen's and that at 1200 yen's is, of course, highly significant ($t = -6.91$, p=0.00). We find it remarkable that the average amount of contributions is clearly increasing in the levels of RC.[12] Besides, as the amount of RC is larger, the standard error is increasing, indicating to 27.26 at 400 yen's RC, 30.45 at 800 yen's, and 44.85 at 1200 yen's.

We confirm the concrete distribution of individual contributions in table 3. First, from the last column of table 3 about ninety-three percent of subjects' answers takes a positive value, meaning that the warm glow motivation can be seen in most subjects.[13] Next, it can be seen from table 3 that a large rate of individual contributions selects the levels of contributions which stick to the levels of RC. For example, in the second column (400 yen), when RC is given by 400 yen, forty-four percent of sixty-two subjects donated the amount of 400 yen. Furthermore, thirty-eight percent of sixty-four persons contributed 800 yen under 800 yen's RC, and twenty-two percent of twenty-nine persons contributed 1200 yen under 1200 yen's RC. Finally, seven percent selected zero contributions where five persons answered zero yen for

[12]Some papers compare the amount of donations with RC and no RC. See Bardsley and Sausgruber (2005), Alpizar et al (2008) and Shang and Croson (2009). Because the main purpose in our experiments is to separate the warm glow from the altruism, questions with no RC were not used.

[13]This percentage seems to be somewhat high relative to that in Crumpler and Grossman (2008) where in their experiments, over 55 percent of total participants contributes a positive amount. As to this difference, Crumpler and Grossman (2008) write that the number of givers increases steadily with endowment. Since our endowment (22 dollar) is more than twice the amount of Crumpler and Grossman (2008) endowment (10 dollar), we expect our percentage to be higher than that in Crumpler and Grossman (2008).

all four questions and the remaining five persons answered zero yen at least once. Alternatively, three percent made the full levels of contribution which are equal to their endowment. In particular, one person answered 2000 yen for all four questions and four persons answered 2000 yen at least once.

3.2 The second stage

At first, we explain a purpose of the second stage. In all rounds of the first stage, the subjects optimally allocated own endowment between own contributions and themselves. Furthermore, their allocations were determined by drawing the ball randomly before proceeding to the second stage. Therefore, the second stage corresponds to a comparative static analysis in the sense that after completing the optimal choice, the level of RC unexpectedly increases in FC or decreases in FR.

Figure 2(b) presents the percentage of each determination (i.e., additionally increased, decreased, or did not change their contribution). Table 4 shows the distribution of contributions in the second stage.[14] Then, we reveal striking facts. First, in both FC and FR, almost subjects keep up with the change in RC or do not change the optimal amount of their contribution. In FC, around forty-three percent of subjects (UP) selects to make an additional donation. More concretely, we can see from table 7 that eighteen percent of subjects in FC select to make additional contributions more than 100 yen. About fifty-two percent of those ('STAY') select not to change their contribution, implying that they do not have any interest in a change in total contributions. The rest five percent of subjects ('DOWN') alone decrease their contribution. Making use of a standard t test to supplement our findings, we suppose that Ho: mean=0 and Ha: mean$\neq$0 (Ha: mean $>$0) so that we significantly reject the null hypothesis, t=3.61 and p=0.00 (p=0.00).

The results of FR in figure 2(b) and table 4 strongly support the above findings in FC. That is, almost subjects have a tendency to show that they keep up with

[14]We confirmed that the sum of determined contribution in the first stage and additional contribution in the second stage by each subject is from 0 yen to 2000 yen.

the change in RC or do not make any changes. In detail, ninety-six percent of subjects selects to decrease it (thirty-six percent) or not to change own donation (sixty percent), whereas the remaining four percent of subjects increases it (the null hypothesis Ho: mean=0 and Ha: mean $\neq$ 0 (Ha: mean $<$ 0) is rejected, $t = -2.66$ and p=0.01 (p=0.01)).

In the end, figure 2(c) represents the gender differences in the second stage, showing that the rate of females who make additional contribution is greater than that of males regardless of FC or FR. In FC, about sixty-nine percent of females and about twenty-four percent of males make additional contribution. In FR, about seven percent of females additionally make contributions, however any males do not make any contributions. Next, we confirm the rate of males and females who follow the change in RC. In FC, the rate of females who follow in the direction of RC, that is, who additionally make contributions is more than that of males; however, in FR, the rate of males is greater than of females.

4 Results: Regression analysis

We present our regression results where the dependent variable is defined as the amount of individual contributions in the first and second stages. Firstly, because our data in the first stage is observed with two censored observations (zero yen's and 2000 yen's contributions), we execute the tests of normality and homoskedasticity following Cameron and Trivedi (2010, chapter 16) after the tobit regression with two limits. Although some independent variables have significant impacts on the dependent variables in this model, the assumptions of normality and homoskedasticity are strong rejection (The p-values of both tests below 1 percent).

Therefore, we divide total data in the first stage with three categories: (i) zero contribution (thirty data of ten persons);(ii) full contribution (eleven data of five persons); (iii) the others (three hundred ninety-nine data) where we notice that the identical individuals selected the censored values of contributions at multiple times. Assuming that two parts (i) and (iii) or (ii) and (iii) are independent respectively, we

finally omit the forty-one data of (i) and (ii) after some procedures are confirmed.[15] The reason why we omit the censored data is firstly that the number of *individuals* who select zero or full contribution is few so that some demographic features are extremely biased. For instance, individuals who selected zero contribution are all males. Next, our focus is to confirm what lies behind the warm glow giving by examining how the amount of own contribution changes according to the change in RC. Hence, even if the censored observations of zero and full contributions are omitted, the main effect of changing the levels of RC would be confirmed.

Table 5 reports the results of OLS regressions where the dependent variable is used as the amount of individuals' contributions in the first stage. First, the variable "RC" has significant effects on the determination of individuals' contributions at the 0.01 level in the columns (1) and (2). As expected, the greater the level of RC, the greater the amount of individuals' contributions. Next, we confirm the negatively significant gender impact in the column (1), meaning that the amount of contributions by females is greater than by males. It would be plausible based on the results of figure 2(a).[16] However, in the column (2) we cannot confirm the impact. The column (2) shows that the greater score of SAM leads to the greater amount of individual contributions. It would be reasonable because the persons with high scores of SAM have stronger motives to satisfy or accomplish own purposes through volunteering behavior. In other words, the egoistic persons make more contributions as argued since the pioneer work of Andreoni (1988,1989). The variable "Pocket

[15]We used Heckman selection model; however, it was not adopted. This is because the convergence of regression was not observed unless some independent variables are omitted. If some independent variables were omitted, we confirmed that (i) and (iii) or (ii) and (iii) are respectively independent from the likelihood-ratio test. We would like to send the results in response to readers' request.

[16]Some papers examine the gender effects in individual contributions (e.g., Brown-Kruse and Hummels 1993, Bolton and Katok 1995, Gilligan 1982, and Crosen and Gneezy 2009). For instance, Brown-Kruse and Hummels (1993) find that males contributed at higher rates than females in a public goods provision game. Instead, Gilligan (1982) posits that females are more cooperative and community minded than males.

money" is an amount of money that the subjects freely spend in their student lives, a statistically significant at the 0.01 level, showing that the wealthier persons tend to spend money for the contribution. The variable "Part time job" means whether the subjects have a part-time job or not. The significant negative impact implies that the subjects who have a part-time job contribute less than the others. Intuitively, since the students in the face of their tight financial circumstances have a part-time job to earn their livings, the subjects who have a part-time job tend to save own money in our experiment.

The remainder variables by "CAM", "Order of questions" and "Number of subjects in group" do not have significant impacts. Taking into account the variable "Order of questions", the repetition of the questions in the first stage does not have a strong impact on the determination of individuals. As expected, the learning effects in our experiment do not have critical effects. From the results of "CAM" and "Number of subjects in group", our experimental motivation for contributions given by the conformity is excluded because of the anonymity of our experiment.

In table 5(3) and (4), the dependent variable is replaced by the ratio $y_i/\bar{y}$ where the regressors are the same with those used in the columns (1) and (2). We are only interested in the regressor "RC" which is negatively related to the $y_i/\bar{y}$. That is, the increase in the levels of RC makes the ratio $y_i/\bar{y}$ decreased. This finding would be evident from Figure 2(a) because the mean value of individual contributions is slightly greater than 400 yen under the level of 400 yen's RC; however, when the levels of RC are 800 yen and 1200 yen, each mean value is lower than the corresponding RC. It means that as the level of RC increases, the tendency to keep up with RC is gradually weaker.

Table 6 presents the results of OLS regression when the dependent variable is defined as the answers in the second stage.[17] Only the variable "FC or FR" has a significant effect, meaning that the additional increase (decrease) in the level of RC

[17]We omitted the data which select zero or full contribution in the first stage. Besides, we confirmed that the rest data does not include the censored observations even if the second stage is considered.

makes own contribution increased (decreased). That is, the relationship between own contribution and the others is complementary. Alternatively, the remaining variables do not have significant impacts.

5 Model specification of warm glow giving and an application

Although some independent variables have significant impacts on the warm glow giving as seen in table 5(2), the adjusted R-square is at most 0.23. Because it would not be better to fit, we investigate what kinds of warm glow giving is better to fit in our experiment related to the specified utility function where the specification is somewhat ad hoc to derive the linear demand function and to identify the parameters.

5.1 A simple formation of warm glow giving

Denoting by x_i, Y and y_i the levels of consumption, the aggregate contribution and the subject i's contribution respectively, we consider the general utility function u^i with the warm glow giving:

$$u^i = u^i(x_i, Y, y_i), \quad w = x_i + y_i, \quad Y = y_i + Y_{-i}, \tag{1}$$

where Y_{-i} is the level of contribution by the rest persons except for the subject i and w is the level of endowment. Because the level of endowment w is the same among the subjects in our experiment, we omit subscript i. In the first stage of our experiment, regardless of the subject i's contributing behavior, the aggregate level of contribution is fixed, that is, $Y = \bar{Y}$ so that the subjects do not have the altruistic motivation by increasing the aggregate level of contribution.[18]

First, if the preference of warm glow is the standard utility function such as CES type, the argument shown by total contribution is canceled out in our experiment

[18]Even if some subjects care about not only the others in own group but also all the donors to the charity, the subjects do not have the altruistic motivation because the aggregate level of contribution by total members is also fixed.

because the amount of total contribution is fixed. Concretely, the demand function of the subject i's contribution does not include the others' contributions except for the subject i. For instance, let us consider the following type of utility function:

$$u^i = x_i^{\alpha_i} Y^{\beta_i} y_i^{1-\alpha_i-\beta_i}, \tag{2}$$

where α_i and β_i are positive parameters. In that time, the demand function based on our experiment is $y_i = \frac{(1-\alpha_i-\beta_i)w}{1-\beta_i}$, thereby showing that the individual demand function of contribution does not depend on the others' contributing behavior.

We rewrite the aggregate contribution as $Y = n \times \bar{y}$ where n is the number of subjects in the smaller group and $\bar{y}$ is the level of RC. Then, we must conclude that if the preferences of the subjects show a type of standard CES such as (2), the number of subjects in the smaller group as well as the levels of RC do not have any impacts. However, from some findings in sections 3 and 4, it would be difficult to apply for such a simple formation of warm glow giving because the increase in RC makes individual contribution increased, and furthermore a large rate of subjects sticks to the levels of RC when they make contributions.

Next, we apply for the quasi-linear preferences used in Cornes and Sandler (1994):

$$u^i(x_i, Y, y_i) = x_i + F(Y, y_i) = x_i + Y^{\gamma_i} y_i^{\delta_i}, \tag{3}$$

where γ_i and δ_i are positive parameters. Although the utility function has a special form, the element of warm glow is sill assumed to be a simple form. In this case, even if the aggregate level of contribution is fixed, from the utility maximization the demand function of individual contribution depends on RC and the number of subjects as follows:

$$\log(y_i) = \frac{\log(\delta_i)}{1-\delta_i} + \frac{\gamma_i}{1-\delta_i}\log(Y) = \frac{\log(\delta_i)}{1-\delta_i} + \frac{\gamma_i}{1-\delta_i}(\log(\bar{y}) + \log(n)). \tag{4}$$

Looking at table 7(1), we can confirm that the logarithm RC shown by log(RC) has a positive impact; however, the adjusted R-square is 0.0319 which is very low. It can be said that the quasi-linear preference does not fit our data very well.

Considering that RC equals the average level of contribution in each group and the number of subjects in groups does not have significant impacts, we assume that

the preference is shown by $u^i = u^i(x_i, \bar{y}, y_i)$ rather than (1) where $\bar{y}$ is the average level of contributions given in each group, which equals the level of RC. That is, we suppose that the subjects care about the average level of contribution in own group, not the aggregate level. However, when the quasi-linear utility function (3) is applied again (i.e., $u^i = x_i + \bar{y}^{\gamma_i} y_i^{\delta_i}$), the conclusion is not almost changed as in table 7(2).

5.2 A complicated formation of warm glow giving

We consider a complicated formation of warm glow giving. Specifying the form of warm glow, it would be useful to refer to the results of SAM and CAM in table 5(2). Because CAM does not have a statistically significant impact on the warm glow in our experiment, we exclude the component of conformity in our model specification. Alternatively, the factor of SAM has a positively significant impact, implying that the subjects who have a goal or a target for contributing behavior make more contributions. Therefore, we use the following type of utility function:

$$u^i = u^i(x_i, y_i, I_i). \tag{5}$$

First, the subjects are motivated only by the warm glow in (5). In other words, for simplicity, we intentionally take away the altruistic motivation by increasing the aggregate level of contribution. This is because the subjects in our experiment do not have such motivation.[19] Next, the warm glow has two roles in (5). First part is based on Andreoni (1988, 1989), which is given in the second argument y_i in (5). That is, it indicates to the private joy of giving. Second part is expressed by I_i which is a measure of dissatisfaction generated when they cannot accomplish their goals contentedly.[20] For instance, people may not receive endowment enough so that the

[19]If the term of aggregate contribution is incorporated in (5), the utility function would be more complicated. It is possible that the indirect effect of altruistic motivation can be considered as shown in (3); however, we do not consider such a complex form.

[20]This type of utility function is used in Brekke et al (2003) where they interpret the variable I_i as a measure of the individual's self-image for a socially (or morally) responsible person. Alternatively, along the result of our experiment, we apply to somewhat different interpretation.

tradeoff between consumption and contribution does not allow them to accomplish their target or goal of contribution. As a result, they may feel dissatisfaction.

Therefore, we consider the utility function as follows:

$$u^i = u^i(x_i, y_i, I_i) = x_i y_i - \underbrace{\epsilon_i (y_i - \lambda_i \bar{y})^2}_{(\#1)}, \quad \epsilon_i > 0, \quad \lambda_i > 0. \tag{6}$$

where because the parameter ϵ_i has a positive sign, this function is concave in own contribution y_i. The role of $\lambda_i \bar{y}$ in (#1) denotes the ideal contribution when the level of RC is given. Then, the component of warm glow given in (#1) forms a quadratic form of difference between own contribution and the ideal contribution based on RC where the part in (#1) faithfully follows Brekke et al (2003). If the parameter λ_i is not included, all subjects have an identical level of ideal contribution. However, as in Brekke et al (2003), it would be plausible that the levels of ideal contribution differ among subjects so that λ_i is incorporated. For example, when λ_i is smaller than the unity, the level of ideal contribution is lower than that of RC. Besides, when the level of own contribution equals that of ideal one, the subject i's dissatisfaction related to (#1) is globally maximized.

Making use of (6), the demand function becomes the linear function as follows:

$$y_i = \frac{w}{2(1+\epsilon_i)} + \frac{\epsilon_i \lambda_i}{1+\epsilon_i} \bar{y}. \tag{7}$$

This result of regression is given in table 7(3). The variable "RC" and the constant term have both positive signs, which are consistent with the signs of parameters in (6). Next, the intercept is 293.47 and the coefficient for "RC" is 0.421 ($\tilde{\epsilon} = 2.41$ and $\tilde{\lambda} = 0.596$), which are statistically significant where each tilde parameter omitted i represents the average value. It means that when $\bar{y} = 0$, the average level of contribution by subjects is 293.47 yen. It is caused by the part of the enjoyment for the act of giving itself because their target of contribution does not exist. Next, for every one-yen increase in RC, we would predict that the contribution of subjects increases by 0.421 yen. Furthermore, because $\tilde{\lambda} = 0.596$, the ideal level of contribution by subjects is about 60 percent of RC. The adjusted R-square is 0.1340 greater than that in (3).

To present the third type of utility function, the subjects are divided into two categories based on whether the amount of contribution is above RC or not. Suppose that a subject makes contribution above RC. Then, it would be difficult to consider that he/she reluctantly makes contributions above RC. In that regard, he/she would be actively reacted in the face of our solicitation. Therefore, he/she is called as the active subject. Alternatively, the subjects who make contribution less than RC are called as non-active subjects who would reluctantly make contributions relative to the active subjects. In the first stage the questions in the first stage were repeated at four times, and as a result the twenty-six subjects are applied in two categories, that is, their amounts of contribution are more than RC in some questions and those are less than RC in the rest questions.

Taking account of the score of SAM, the above-given categories can be interpreted from the different viewpoint. When we compare the average score of SAM between the active subjects and the non-active ones, the average score of SAM by the non-active subjects is -0.175 and its score by the active subjects is given by 0.157 (with a two-tailed p-value of 0.00). Thus, the SAM results show that the active subjects have the greater score of SAM than the non-active ones, meaning that the active subjects have a stronger tendency of making contributions based on their goals.

Finally, by extending (6) we present the third type of utility function:

$$I_i = \begin{cases} -\epsilon_i(y_i - \lambda_{1i}\bar{y}) & \text{if RC} > y_i \\ -\epsilon_i(y_i - \lambda_{2i}\bar{y}) & \text{if RC} \leq y_i \end{cases} \tag{8}$$

We suppose that the difference of two categories is given by the parameters λ_{1i} and λ_{2i} which determine the levels of ideal contribution. Based on the above-description, we guess $\lambda_{2i} > \lambda_{1i}$, meaning that the level of ideal contribution by the active subjects is greater than by the non-active ones. Using a dummy variable d, the nested type of utility function is as follows:

$$u^i = x_i y_i - d\epsilon_i(y_i - \lambda_{1i}\bar{y})^2 - (1-d)\epsilon_i(y_i - \lambda_{2i}\bar{y})^2. \tag{9}$$

where $d = 1$ if $RC > y_i$ and $d = 0$ if otherwise.[21]

[21]One may wonder which category include the subjects who make the RC-level of contribution,

The optimizing behavior leads to the following demand function:

$$y_i = \frac{w}{2(1+\epsilon_i)} + \frac{\epsilon_i}{1+\epsilon_i}\left(d\lambda_{1i} + (1-d)\lambda_{2i}\right)\bar{y}. \tag{10}$$

Because the values of λ_{1i} and λ_{2i} are not necessarily equal, this type of demand function has a kink at the level of RC.

Looking at table 7(4), the adj R-square for this model is 0.5884, which is highly large relative to the other models. Hence, including the different ideal-contribution into this model would be an important term. The intercept is 95.61, the coefficient of "RC" for the non-active subjects is 0.383 and that for the active subjects is 0.597 where they all are statistically significant ($\tilde{\epsilon} = 9.459$, $\tilde{\lambda}_1 = 0.423$ and $\tilde{\lambda}_2 = 0.660$). It means that the enjoyment for the act of giving would yield 95.61 yen's contribution. Because $\tilde{\lambda}_1 < \tilde{\lambda}_2$, the level of ideal contribution by the active subjects is greater than by the others. Specifically, the level of ideal contribution by the non-active subjects is below fifty percent of RC.

In the model (8) the value of ϵ_i is assumed to be identical between two categories, meaning that when $(y_i - \lambda_{1i}\bar{y}) = (y_j - \lambda_{2j}\bar{y})$ between two subjects i and j, the dissatisfaction between I_i and I_j also becomes the same. Intuitively, even if its difference is the same, the dissatisfaction between the active and the non-active subjects would not be necessarily the same. Therefore, applying for (10) under the different values of ϵ_i, we shall use the following:

$$y_i = d\left(\frac{w}{2(1+\epsilon_{1i})} + \frac{\epsilon_{1i}\lambda_{1i}}{1+\epsilon_{1i}}\bar{y}\right) + (1-d)\left(\frac{w}{2(1+\epsilon_{2i})} + \frac{\epsilon_{2i}\lambda_{2i}}{1+\epsilon_{2i}}\bar{y}\right). \tag{11}$$

As can be seen in the demand function (11), the intercept of the demand function differs between two groups. We guess that $\frac{w}{2(1+\epsilon_{1i})} < \frac{w}{2(1+\epsilon_{2i})}$, that is, the active subjects would make more contribution than the others at zero level of RC because the active subjects enjoy the act of giving itself compared with the others.

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that is, $y_i = RC$. In our paper, it is assumed that they are the active subjects. This is because the difference of SAM between two categories is larger. If the subjects who make $y_i = RC$ were the non-active subjects, each score is given by SAM=-0.06 for the non-active subjects and SAM=0.26 for the active subjects (p value=0.01).

Table 7(5) presents the regression result. The intercept dummy named by "cons(A)" shows the level of contribution by the active persons under zero level of RC; alternatively, the intercept "cons" in table 7(5) shows the non-active subjects' one. As expected, the value "cons(A)" is greater than "cons", which implies that because of the enjoyment of act of giving itself, the active subjects make 172 yen's contribution, which is statistically significant at the 0.01 level. However, the non-active persons do not make positive contributions at the zero level of RC where the intercept is not statistically significant. In the end, the adjusted R-square is 0.5938.

5.3 Regression revisited

Using the data collected in the first and the second stages, we make regression analysis again where we incorporate a dummy variable which divides total data into two categories RC$> y_i$ and RC$\leq y_i$ as in (8). We obtain table 8 where the answers of the first stage in the columns (1)-(4) and those of the second stage in the column (5) are defined as the dependent variables, respectively. The variables with (N) and (A) show those by the non-active and by the active subjects. In addition, we omit variables "CAM", "Order of questions" and "Number of subjects in group" on the ground that their variables are not statistically significant in table 5.[22]

Since we confirmed the effects of "RC(N)" and "RC(A)" in table 7, our interest is now to confirm the effects of remaining variables except for "RC(N)" and "RC(A)". First, from table 7(1) and (2) the variables named by "Gender(N)", "SAM(N)" and "Part time job (A)" have significant effects at the 0.01 or 0.05 level. More concretely, the non-active males make contribution less than the non-active females, the greater scores of SAM among the non-active subjects generate the higher levels of contributions, and the participation in a part time job leads to decrease the level of contribution among the active subjects. However, the similar effects cannot be seen in the other category, "Gender(A)", "SAM(A)" and "Part time job (N)". The

[22]We confirmed that even if the omitted variables are applied for the models in this subsection, these variables do not have significant impacts.

variables "Pocket money (A)/(N)" are not statistically significant at the 0.1 level; however, their variables have both positive signs, which leads to the result that the wealthier subjects have more contribution as confirmed at table 5(2).

Finally, we apply the dummy variable to the regression in table 8(3) when the answers in the second stage are defined as the dependent variables. The variables "FC or FR(N)/(A)" show the effects of the change in RC based on the positive or the active or non-active reaction in the first stage. In that case, it can be seen that the variable "FC or FR(A)" has a positively significant impact; however, the variable "FC or FR(N)" does not have it, meaning that the active subjects additionally make contributions for an additional increase in the levels of RC (FC session), and they decrease contributions in FR session. Because the coefficient of "FC or FR(A)" is 2.03, they would additionally increase contribution by 203 yen when 100 yen's contribution is additionally solicited. Alternatively, the variable "FC or FR(N)" does not have strong impacts, that is, they may not respond to an appeal for additional contribution.

6 Discussion: the active subjects

The second stage was executed after the optimal choice of the first stage, a comparative static analysis how the optimal level of subject i's contribution changes when the level of RC unexpectedly changes. Therefore, table 8(3) gives us informations for the demand function of contributions. Then, we must interpret the difference of impacts by "FC or FR(A)" and "FC or FR(N)", that is, the variable "FC or FR(A)" has a significant positive impact and the variable "FC or FR(N)" does not have such a significant impact.

First, taking account of the result of "FC or FR(A)" in table 8(3), it can be concluded that the additional contribution for the active subjects depends on the change in RC. Therefore, it would be difficult to argue that the contribution demand function is linear as in (10) because a comparative static effect under linear regression derives a constant parameter, not depends on RC. Then, it is considered that the

demand function of the active persons is nonlinear. For instance, when a simple extension such as a quadratic form $\bar{y}^2$ is given, we obtain the estimated results as follows:

$$y_i = \begin{cases} -18.26(-0.32) + 0.49\bar{y}(8.52), & \text{if RC} > y_i, \\ 470.97(7.65) + 0.0006\bar{y}^2(16.76), & \text{if RC} \leq y_i, \end{cases} \tag{12}$$

where the round brackets show t-values. Besides, the adjusted R-square of this model is 0.5887. The quadratic term of RC is statistically significant and has a positive sign, implying that the greater the level of RC, the greater the level of individual contributions. Because the coefficient of $\bar{y}^2$ is 0.0006, it holds that $\frac{\partial y_i}{\partial \bar{y}} = 0.0012\bar{y}$, meaning that the comparative static effect is positively related to the change in RC, which would be applicable for the result in table 8(3).

However, its application is not plausible for the following reasons. First, the adjusted R-square in the model (12) is almost the same as in table 7(4) and (5), implying that the quadratic element does not play any particular role. Second, the coefficient of $\bar{y}^2$ is largely low compared with that in table 8(3). Thus, it is difficult to support the larger coefficient of "FC or FR(A)" in table 8(3). Finally and most importantly, because the ideal contribution by the active subjects is given by $\lambda_i \bar{y}^2$, not $\lambda_i \bar{y}$, we cannot give an interpretation to the role of $\bar{y}^2$. More concretely, because the parameter λ_i is used to scale up/down the ideal contribution, incorporating the quadratic term does not have any meaning. In other words, we cannot explain why the ideal contribution for the active persons is exogenously scaled up from $\bar{y}$ to $\bar{y}^2$.

Based on these results, we guess that their preferences for the active subjects may be updated by an unexpectedly additional request for contributions. This is because SAM does not have significant impacts in table 8(3) and the altruistic motivations are excluded in our experiment. We guess that the motivation may be caused by somewhat negative elements, for example, they cannot decline the request in front of the solicitors or somehow manage to respond such request so that they may try to update their preferences. This guess is based on Andreoni et al (2012) who found dramatic avoidance of the solicitors when solicitors were asked "please give"

to passersby at main entrances to a supermarket,

7 Concluding remarks

Our goal of this study was to investigate what lies behind the act of warm glow giving in a laboratory experiment. We obtained the data by making use of the experimental design in Crumpler and Grossman (2008), which allows us to isolate the warm glow motives from the altruistic ones.

Our findings showed that the contributions generated by the act of warm glow giving are highly sensitive to RC, indicating to the complementary relationship between own and the others' contributions. Based on this result, we modified the formation of warm glow giving, and estimated the preference parameters of individuals about the modified formation of warm glow giving. Finally, it would be interesting to evident how the motivations on contributions in front of solicitors or without them are changed.

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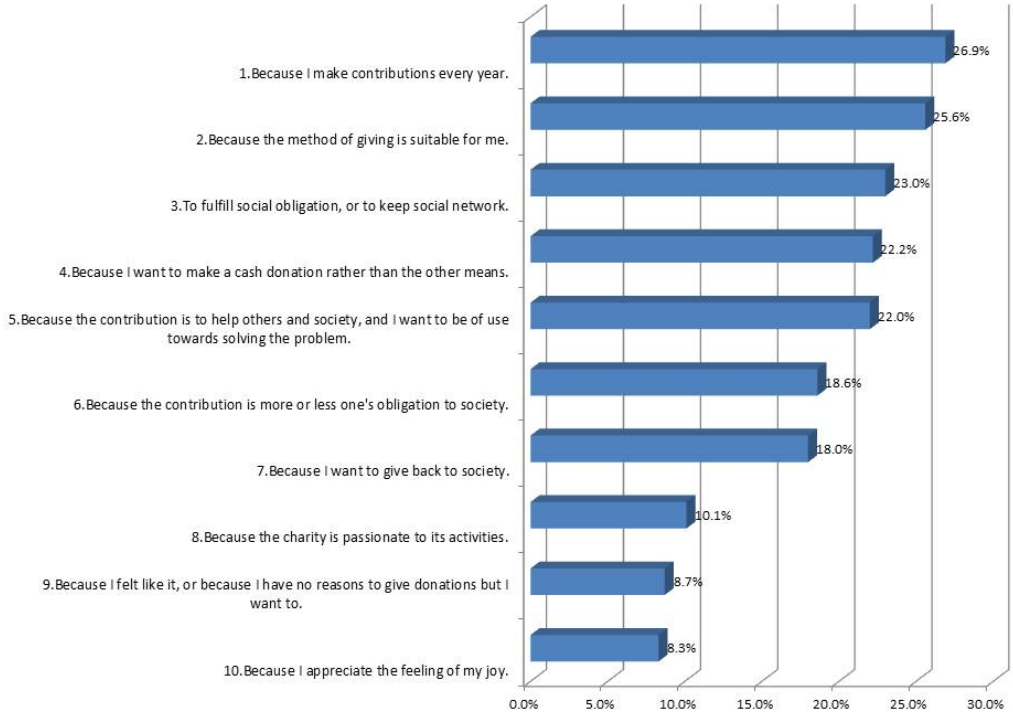
8 Appendix: Instructions (in Japanese)

First stage: Because the instruction in the first stage is almost the same in Crumpler and Grossman (2008), I omit it.

Second stage: Now, we are soliciting further contributions in addition to your contributions determined in the first stage. In the second stage, we provide the different explanations for [9] persons and the remaining one person.[23] In the second stage, we forcibly collect 50 yen from [9] persons so that the amount of total donations decreases by [450] yen. The remaining one person can freely select their own contributions. This person is randomly determined later when we draw one ball from the sealed box. In next page, you will obtain a number. If the number of the drawn ball is the same as your number, you are the person who can choose the amount of your contribution. Second, regardless of your choice, your selected charity will obtain neither more nor less than 50 yen. In other words, if your donation is less than 50 yen to your selected charity, the charity receives the total amount of your donation; instead, the amount contributed to your selected charity by the proctor increases so that the total amount of contributions does not change. Alternatively, if your selected donation is more than 50 yen, the amount contributed by the proctor to your selected charity decreases. Now, we forcibly collect the additional contribution of 50 yen. In this case, supposing that you are the person who can freely select your amount of contributions, please circle a method from the following answers. [1. I additionally make the contribution.] [2. I do not make the additional contribution, but decrease the amount of my contribution determined in the first stage.] [3. I make neither.] How much is your additional contribution? Please notice that the sum of amounts in the first stage and in the second stage is not over 2000 yen and not below zero yen. If you do not change your amount of contribution, please write 0. After writing your answer, please put the pink-colored paper into the envelope and seal it.

[23]The number of brackets is different among each group.

Figure 1. Motivations on contributions



Notes: Multiple answers allowed. The number of respondents is 8420.

Figure 2: The results of the first stage and the second stage

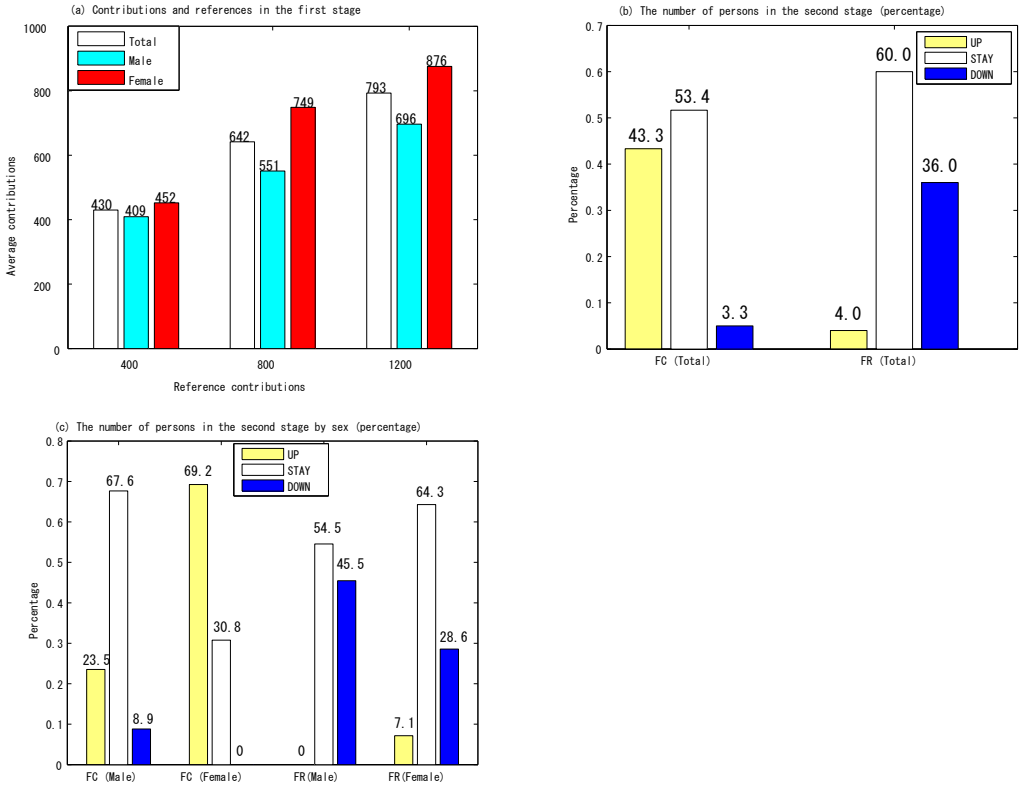


Table 1: A summary in our experiments

			First stage						Second stage		
			Rounds: Parameters y (n)								
Sessions	Subsessions	M (F)	A	B	C	D	Ave (Std.)	Ball	FC or FR	UP	DOWN
1	11	5 (5)	800 (10)	800 (2)	800 (5)	400 (10)	566(64.1)	C	FR	0	4
	12	4 (6)	1200 (10)	1200 (2)	1200 (5)	800 (10)	774(89.9)			0	5
	13	7 (3)	800 (10)	1200 (2)	1200 (5)	1200 (10)	875(78.8)			0	3
2	21	6 (4)	800 (5)	400 (10)	800 (2)	800 (10)	580(49.4)	D	FC	4	1
	22	3 (7)	1200 (5)	800 (10)	1200 (2)	1200 (10)	746(86.7)			6	0
3	31	3 (7)	400 (10)	400 (2)	1200 (10)	400 (5)	385(35.8)	B	FR	1	4
	32	3 (7)	400 (10)	800 (2)	1200 (10)	800 (5)	566(50.1)			1	2
4	41	6 (4)	800 (2)	800 (5)	400 (10)	800 (10)	775(61.7)	D	FC	4	0
	42	4 (6)	400 (2)	400 (5)	400 (10)	1200 (10)	600(76.7)			6	0
5	51	7 (3)	400 (10)	800 (10)	800 (5)	800 (2)	397.5(45.5)	D	FC	3	0
	52	8 (2)	1200 (10)	400 (10)	400 (5)	400 (2)	538(59.0)			3	1

Table 2: Factors, factor loadings and items of the SAM and CAM

Item	1. Self-fulfillment achievement motivation	Loading I	Loading II
23	I want to make innovated contribution using my skills.	0.693	-0.035
18	I want to do excellent works which make everyone satisfied.	0.661	0.214
21	I want to work energetically without being restricted by the results.	0.656	-0.289
2	I want to grapple with any problems using my unique attributes.	0.625	0.177
20	I want to have the motivation to reach any goals at any time.	0.619	0.198
24	I will work hard to gain better knowledge in what I am interested in.	0.612	-0.078
7	It is important to give it your all rather than winning.	0.566	-0.331
22	It is always enjoyable to think about what one does daily.	0.553	-0.038
8	I want to demonstrate my creativity even if the work is predetermined.	0.499	0.191
10	I am excited when I think of my future dreams.	0.472	0.054
6	I want to deepen my knowledge through work experience and education.	0.393	-0.143
9	I want to give my best efforts no matter how hard the challenge may be.	0.372	-0.11
1	I want to do my best in handling my problems.	0.311	-0.216
19	I like to design simple devices.	0.273	0.21
	2. Competitive achievement motivation		
14	I strongly desire a bright and successful future after graduation.	-0.044	0.833
13	I want to surpass others in works.	0.102	0.715
5	It is important to strive for a higher social status.	-0.149	0.712
15	I want to work in a company that is highly regarded by the public.	0.09	0.707
16	Success is to achieve honor or high status.	-0.19	0.612
11	I am pleased when I compete with others and succeed.	-0.157	0.578
4	I strongly desire to be greater than others.	0.114	0.577
12	The reason I have studied and worked so hard is not to be inferior to others.	-0.107	0.532
3	I am distressed when I lose the competitive opponent.	0.338	0.488
17	The present society believes that ones own potential influences success in life.	Omit	

Table 3: Distribution of contributions with respect to RC in the first stage

	400 Yen		800 Yen		1200 Yen		Total	
Amount	Obs.(M)	%	Obs.(M)	%	Obs.(M)	%	Obs.(M)	%
0	12(12)	0.09	12(12)	0.07	6(6)	0.05	30(30)	0.07
0-200	18(12)	0.12	24(18)	0.14	20(13)	0.15	62(43)	0.14
201-399	12(5)	0.09	6(4)	0.04	8(4)	0.06	26(13)	0.06
400	62(24)	0.44	8(4)	0.05	1(0)	0.01	71(28)	0.16
401-600	18(9)	0.13	18(9)	0.11	22(9)	0.17	58(27)	0.13
601-799	0	0.00	8(0)	0.05	0	0.00	8(0)	0.02
800	2(1)	0.01	64(33)	0.38	3(1)	0.02	69(35)	0.16
801-1000	13(6)	0.09	23(9)	0.14	28(10)	0.22	64(25)	0.15
1001-1199	0	0.00	0	0.00	2(0)	0.02	2(0)	0.00
1200	0	0.00	2(1)	0.01	29(13)	0.22	31(14)	0.07
1201-1400	1(1)	0.01	0	0.00	1(0)	0.01	2(1)	0.00
1401-1600	0	0.00	0	0.00	3(0)	0.02	3(0)	0.01
1601-1800	0	0.00	1(0)	0.01	2(1)	0.02	3(1)	0.01
1801-2000	2(2)	0.01	4(2)	0.02	5(3)	0.04	11(7)	0.03
Total:	140(72)	1.00	170(92)	1.00	130(60)	1.00	440(224)	1.00

Table 4: Distribution of contributions in the second stage

	FC		FR	
	Obs.(M)	%	Obs.(M)	%
less than -100	1(1)	0.02	2(1)	0.04
-100 to -51	1(1)	0.02	6(3)	0.12
-50	0	0.00	9(5)	0.18
-49 to -1	0	0.00	1(1)	0.02
0	32(24)	0.53	30(12)	0.60
1 to 49	0	0.00	0	0.00
50	9(2)	0.15	1(0)	0.02
51 to 100	6(1)	0.10	1(0)	0.02
more than 100	11(5)	0.18	0	0.00
	60(34)	1.00	50(22)	1.00

Table 5: The results of OLS regression in the first stage

	(1)	(2)	(3)	(4)
RC	0.418***	0.444***	−0.001***	−0.0005***
	(7.91)	(8.44)	(−6.82)	(−6.58)
Gender	−88.51***	-28.97	−0.09*	−0.01
(0=female,1=male)	(−2.67)	(−0.81)	(−1.92)	(−0.28)
SAM		58.07***		0.08***
		(3.21)		(2.93)
CAM		-27.18		−0.04
		(−1.59)		(−1.70)
Part time job		−180.08***		−0.30***
(0=no job, 1=job)		(−4.90)		(−5.70)
Pocket money		6.29***		0.01***
		(4.15)		(7.24)
Order of questions		−4.54		−0.002
		(−0.32)		(−0.08)
Number of subjects in group		−5.73		−0.01
		(−1.23)		(−0.78)
cons	337.62***	324.84***	1.36***	1.27***
	(7.03)	(4.53)	(19.11)	(12.64)
adj R-square	0.1471	0.2212	0.1049	0.2370

Table 6: The results of OLS regression in the second stage

	(1)	(2)
FC or FR	1.35***	1.43***
(50=FC, -50=FR)	(4.57)	(3.88)
Gender	−40.86	−34.81
(0=female,1=male)	(−1.39)	(−1.02)
SAM		13.94
		(0.82)
CAM		10.53
		(0.65)
Part time job		−31.71
(0=no job, 1=job)		(−0.93)
Pocket money		0.33
		(0.23)
Number of subjects in group		−2.86
		(−0.55)
cons	43.72**	53.34***
	(2.18)	(3.06)
adj R-square	0.1663	0.1409

Table 7: Model specification

	(1)	(2)	(3)	(4)	(5)
Dependent variable	$\log(y_i)$	y_i	y_i	y_i	y_i
RC			0.421***		
			(7.91)		
$\log(RC)$	0.380***	0.382***			
	(3.78)	(3.81)			
RC (N)				0.383***	0.495***
				(10.42)	(8.57)
RC (A)				0.980***	0.91***
				(21.60)	(17.01)
$\log(n)$	−0.51				
	(−0.77)				
cons (A)					171.89**
					(2.50)
cons	3.77***	3.67***	293.47***	95.61***	−18.26
	(5.58)	(5.54)	(6.46)	(2.92)	(−0.33)
adj R-square	0.0319	0.0329	0.1340	0.5884	0.5938

Table 8: The results of OLS regression revisited

	First stage		Second stage
	(1)	(2)	(3)
RC(N)	0.47***	0.49***	
	(8.25)	(8.49)	
Gender(N)	−134.07***	−96.66***	
(0=female,1=male)	(−3.96)	(−2.67)	
SAM(N)		50.38***	
		(2.74)	
Part time job(N)		−19.95	
(0=no job, 1=job)		(−0.47)	
Pocket money(N)		0.34	
		(0.18)	
RC(A)	0.91***	0.91***	
	(17.31)	(17.57)	
Gender(A)	−4.38	1.72	
(0=female,1=male)	(−0.14)	(0.05)	
SAM(A)		14.61	
		(0.83)	
Part time job(A)		−84.30**	
(0=no job, 1=job)		(−2.51)	
Pocket money(A)		1.58	
		(1.14)	
FC or FR(N)			0.58
(50=FC, -50=FR)			(1.44)
FC or FR(A)			2.03***
(50=FC, -50=FR)			(5.05)
cons(A)	84.65	117.18	40.39
	(1.17)	(1.40)	(1.42)
cons	70.92	49.07	4.49
	(1.19)	(0.75)	(0.22)
adj R-square	0.6075	0.6155	0.2160