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**Abstract**

   This paper aims to identify psychological characteristics of potential investors of socially responsible investment (SRI) in Japan to explain its possible motivation by economic experiments. We asked subjects to make decisions regarding stock investments on the basis of three attributes of return, variance, and corporate social responsibility (CSR). We also conducted a dictator game and two lottery-choice experiments to measure subjects' psychological characteristics: altruism, risk aversion, and time discount rate. Applying a conditional logit model as well as mixed logit model, we found that people who have a higher time discount rate tend to be SRI investors.

## 1. Introduction

Socially Responsible Investment (SRI) is an investment process that takes into accounts for financial performance as well as their Corporate Social Responsibility (CSR) activities. SRI has grown rapidly around the world over recent decades, especially in Europe and the US. The market size of SRI amounts to 58.8 per cent and 17.9 per cent in Europe and the US, respectively, enough to have a potentially considerable impact on the whole financial market (The Global Sustainable Investment Alliance 2015). Reflecting the importance of SRI, many studies have compared the performances of SRI funds and conventional funds, however, they have found no significant difference between them (Hamilton et al., 1993; Gregory et al. 1997; Goldreyer et al. 1999; Bauer et al. 2005; Kreander et al. 2005; Bauer et al. 2006; Bauer et al. 2007; Ziegler et al. 2007; Galema et al. 2008; Ziegler 2009; Gil-Bazo et al. 2010; Climent and Soriano 2011; Lobe and Walkshausl 2014).

Several studies on investment flow found that SRI investors do not follow economically rational behaviour, and choose assets that do not maximise return on investment given a certain risk. Bollen (2007), for example, examined the relationship between fund flows and returns, using data on US mutual funds. He found that even though lagged returns were negative, SRI investors did not sell as many funds as conventional investors rationally did. Benson and Humphrey (2008) provided a further insight into SRI investor behaviour by incorporating both monthly and annual returns to see if investors react to current and/or past information, and by incorporating lagged flow to take into account the persistence of fund flow. They found that SRI fund flows were less sensitive to returns than conventional funds, and SRI investors were more likely to invest in a fund they already own. In line with the previous studies, Renneboog et al. (2011), by using fund data from around the world, confirmed that SRI investors seemed to be more inelastic regarding returns than conventional investors. Some studies used economic experiments to show how SRI and conventional investors differ their investment decisions (Webley et al., 2001; Pasewark and Riley, 2010). Using an experiment with experienced investment professionals, Arnold et al. (2017) investigate how the timing of CSR disclosure influences firm valuations by professional investors. The results suggested that simultaneous disclosure of CSR and financial information in an integrated report prevented investors' judgements from being anchored.

While findings of these studies suggest that the behaviour of SRI investors is different from that of rational investors as defined by classical economics, how different is still unclear. SRI investors do not seem to make random decisions regarding investment; rather, they seem to have a certain investment decision-making process that evaluates both financial and non-financial factors. Recent developments in behavioural finance emphasise psychological

aspects that might play a critical role in investor behaviour (Barberis and Thaler 2003). Focusing on these psychological aspects of investors would help towards a better understanding the behaviour of the SRI investor.

This paper aims to uncover the psychological features of potential SRI investors to explain why they invest in SRI by using several laboratory experiments. We asked subjects to make decisions on stock investments with regard to three attributes: return, variance, and CSR, so that we could estimate their utility function. We also conducted a dictator game and lottery-choice experiments to measure subjects' heterogeneity in regard to three psychological factors: altruism, risk aversion, and time preference. We used the psychological factors to apply a conditional logit model so as to examine the following hypotheses about psychological features of SRI investors. *Hypothesis 1: Investors who are more altruistic are more likely to be SRI investors. Hypothesis 2: Investors who are more risk averse are more likely to be SRI investors. Hypothesis 3: Investors who have a lower time discount rate are more likely to be SRI investors.* The main findings of this study support the first hypothesis, that people who are more altruistic are more likely to be SRI investors, but not the second and third hypotheses. With regard to our third hypothesis, the estimation results show that people who have a higher time discount rate also incline to be SRI investors.

In addition to the psychological characteristics of investors, the design of investment opportunity is also important for promoting SRI. We examined whether an availability for investors to choose CSR activity influences their decisions. When subjects are allowed to choose the project for a firm's CSR activity, they obtain significantly higher utility from the CSR attribute. This suggests that reflecting investors' preferences in CSR activities would lead to a higher evaluation of CSR efforts. Taken together, the results of this study offer a helpful insight into the characteristics of potential SRI investor and how their demand can be stimulated.

The contribution of our paper is threefold. First, we employ a behavioural economic approach and consider how psychological factors relate to investigate motivations for SRI. We particularly focus on altruism, risk aversion, and time preference as internal factors leading to investment in socially responsible companies. Second, we use methodologies that have been developed in studies in the field of experimental economics to measure the extent of altruism, risk aversion, and time preference. Methodologies that have been used in such studies are theoretically rigorous, thereby providing a more consistent estimate of the characteristics of investors. Third, we used Japanese respondents to investigate why individuals invest in SRI.

The rest of this paper proceeds as follows. Section 2 reviews relevant literature and

explains our hypotheses. Section 3 presents our methodology, including our data, experimental design, and theoretical framework. The empirical results follow in Section 4. The effect of choosing destination of donation on SRI is discussed in Section 5. We then summarise our findings in Section 6.

## 2. Hypothesis Development

### 2.1 Demographics and Psychology

There are many papers that analyse why some people invest in SRI and others do not (Rosen et al. 1991; Tippet and Leung 2001; Junkus and Berry 2010; McLachlan and Gardner 2004; Williams 2007; Owen and Qian 2008). The majority of existing studies focus on comparing the demographic attributes of SRI and conventional investors. Some of these studies conclude that demographic information can explain the difference between these two types of investors. Rosen et al. (1991) conducted a mail survey of 1,493 individual SRI investors in the United States and compared their demographic characteristics with those of conventional investors. They found that SRI investors were younger and better educated but had less income than general mutual fund investors. Similar results were obtained from a survey conducted by Tippet and Leung (2001) of Australian investors. Their results additionally suggested that SRI investors in Australia were less likely to be retired investors, tended to be part-time workers, owned fewer stocks, and invested less money than conventional investors. Junkus and Berry (2010) conducted a large survey that had 5,391 responses from individual investors in the United States. Their findings were also in line with the earlier studies just mentioned above, with the added information that single people were more likely to be SRI investors. On the other hand, McLachlan and Gardner (2004) compared the demographic attributes between SRI investors and conventional investors in Australia and found that there were no statistically significant differences between them. Williams (2007) obtained similar results; using a wide survey of investors across five countries, he confirmed that demographics did little to distinguish SRI investors from conventional investors. Although earlier studies suggest that demographic characteristics can explain the difference between SRI investors and conventional investors, the results of more recent studies no longer support such a conclusion.[1]

In contrast to studies that focus on demographic variables, some studies have tried to explain the characteristics of SRI investors from a psychological point of view. McLachlan and Gardner (2004) concluded that differences between SRI and conventional investors were caused by cognitive, personality, and environmental factors. They found that SRI investors rated ethical issues as being more important in their investment decisions than conventional

investors did. Although the statistical significance was marginal, it was shown that SRI investors were more altruistic than conventional ones. Owen and Qian (2008) surveyed 1,808 respondents from the United States and found that investors with higher environmental concerns for their shopping were more likely to be SRI investors. Psychological motives such as warm glow, expectations of social environment, or the membership in an environmental organisation have significantly positive impacts on the shares of investments of SRI (Gutsche et al., 2016) and on WTP for SRI (Gutsche and Ziegler, 2016). Some studies showed that there is a heterogeneity of preference to SRI. For example, SRI investors (Anand and Cowton, 1993) and pension funds investors (Borgers and Pownall, 2014) have different preferences towards exclusionary screenings, which indicates that there is a variation in attitudes to SRI criteria. Another example is that SRI investors are divided into three sub-groups by the degree of trade-off between a better ethical performance and sacrifice of financial performance (Berry and Yeung, 2013; Dorfleitner and Utz, 2014). Bauer and Smeets (2015) found that investors with a stronger social identification tend to invest a greater amount of SRI. They show that SRI investors exhibit the different level of importance to ethical performance. Riedl and Smeets (2017) used economic experiments and found that people with higher social preference and social signalling are more likely to be SRI investors. From these findings, the importance of psychological factors to explain the investment behaviour for SRI has been accepted. Acting on these findings, our study also focuses on psychological factors namely altruism, risk aversion and time preference to explain why some investors choose SRI and others do not.

## 2.2 Altruism, Risk Aversion, and Time Preference

Andersen et al. (2008) characterised utility functions in three dimensions: preferences over goods, time, and uncertainty. Following this line of discussion, we hypothesise that three psychological factors might play a significant role in decision-making in regard to SRI: altruism, risk aversion, and time preference.

### *Altruism*

The first hypothesis is intuitive and straightforward. Since one of the aims of CSR activities is to take responsibility towards society as a whole, this fact is expected to have a positive impact on members of the local and global community. Whether the pro-social attitude attracts potential investors depends on the extent to which the investors care about the well-being of society as a whole. Therefore, investors with higher altruism would have a higher tendency to be SRI investors.

Some studies examined the relationship between pro-social attitudes and investment behaviour. Nilsson (2008) and Wins & Zwergel (2016) surveyed mutual fund investors in Sweden and Germany, respectively, to ask respondents about investment their behaviour and about their attitudes towards CSR aspects related to companies from which they buy products. They found that SRI fund investors place higher importance on CSR issues compared to conventional investors. Additionally, they also found that people with a higher proportion of SRI assets tend to be more pro-social relative to people with less SRI assets.

*Hypothesis 1: Investors who are more altruistic are more likely to obtain higher utility from the attribute of Corporate Social Responsibility.*

*Risk aversion*

According to the modern portfolio theory, investors attempt to minimise risk for a given level of expected return (Markowitz 1952). In other words, lower risk is one of the important factors in determining investment. Researchers have discussed whether or not implementing CSR activities could reduce management risk, which leads to a lower risk of stock values plunging (Heal 2005). Hamilton (1995), for example, examined how an announcement of the Toxics Release Inventory (TRI) by the US Environmental Protection Agency impacted on the stock values of TRI firms, using event study methodology. The results showed that investor reactions to the news of the environmental pollution caused by those firms was significantly negative; on the day the TRI data was released, there was a drop in stock prices, and an average loss in stock value of \$4.1 million. Flammer (2012) also showed that environmentally unfriendly actions by firms led to negative impacts on the stocks of such firms, and the negative reaction by shareholder was increasing over time. These findings showed that firms' socially irresponsible behaviour is assessed negatively in the financial market. Therefore, there is a possibility that investors might avoid investing in such firms, or be likely to invest in socially or environmentally responsible firms because they are less risky investments. Indeed, Nakai et al. (2016) found that funds holding stocks of firms actively engaged in CSR significantly increased their performance even on a critical day of the global financial crisis. They examined the negative impact of the Lehman Brothers bankruptcy on SRI funds and conventional funds in the Japanese market and found SRI funds did not suffer from the global financial crisis; rather, the performance was significantly increased—a result that showed SRI funds were less risky than conventional funds. Rosen et al. (1991) also showed that SRI investors in the United States were somewhat risk averse in terms of Likert-scaled statement when asked if they are willing to take investment risks in the hope of

bigger gains (though they carried out no comparison with conventional investors). Prompted by these findings, we hypothesise that SRI investors appreciate CSR activities because they contribute to making their investment less risky.

*Hypothesis 2: Investors who are more risk averse are more likely to obtain higher utility from the attribute of CSR.*

*Time Discount Rate*

Another advantage of CSR is that such activities by a firm differentiate its goods or services from those of other firms, and this might contribute to better profits in the future. While companies are required to make significant investments in the short run when pursuing CSR, they could gain financial return in the long run through improved corporate governance and competitiveness. Using cross-sectional return regressions and buy-and-hold abnormal returns, Dorfleitner et al. (2018) found that, in certain areas, firms with strong CSR significantly outperformed firms with weak CSR in the mid and long run. Thus one of the potential benefits of investing in a company with a higher CSR orientation can be such a return over a longer period of time if the investors have enough patience to wait until the gain is realised. Actually, Jansson et al. (2014) found that pension fund investors in Sweden believe that SRI funds perform better in the long run rather than in the short run.

Cox et al. (2004) investigated the pattern of institutional investors in the UK and how it related with CSR activities by companies, using a sample of over 500 UK companies. They found that the proportion of a company owned by long-term investors (e.g., pension funds, life insurance funds, and charitable funds) was significantly and positively related to company social performance. Benson and Humphrey (2008) showed that SRI fund investors were prone to invest longer than conventional fund investors. It could be due to the fact that SRI investors expect SRI funds to outperform conventional funds in the long run (Bauer and Smeets, 2015). Winnett and Lewis (2000) examined popular models of financial markets in financial journalism and concluded that much of the discussion suggests that ethical financial decisions were linked to long-term prospects rather than to irresponsible short-term prospects. Some studies show that SRI investors If SRI investors appreciate the advantage of long-term investment, we can expect that they are more patient and have a lower time discount rate.

*Hypothesis 3: Investors who have a lower time discount rate are more likely to obtain higher utility from the attribute of CSR.*

This study differs from the literature reviewed above in the following ways. First, we used a choice experiment question in the incentivized economic experiment setting. Therefore, there should be much less hypothetical bias compared to related studies with choice experiment using web surveys (Gutsche and Ziegler, 2016). Second, in our experimental setting, respondents had to make investment decisions considering return, variance, and CSR simultaneously. Riedl and Smeets (2017) also conducted an incentivized experiment, but only for measuring respondents' risk preference and social preference, since they used actual data of investment information, such as if respondents held any SRI. Therefore, their study did not measure respondents under a situation where they made a trade-off between financial performance indicators and CSR attribute. This indicates that our experimental setting could estimate preference towards CSR more clearly, given that other variables remain constant. Third, we use time preference to explain why people invest in SRI. As far as we know, there are no previous studies that use time preference to understand its impact on investment decision for SRI. As we discuss the reason for using it in the next section, time preference is a good proxy to show if investors have a long-term perspective. Finally, our study is one of the first attempt to examine why Japanese individuals invest in SRI. There are many studies using investor data from Europe and the US, but there are no studies on Japanese data.

## 3. Methodology

3.1 Data and Experimental Design

We conducted laboratory experiments on 22 December 2012 and 16 January 2013 at Kyoto Sangyo University, Japan. We had 50 participants in total, but of these we used for our estimation were 46 people due to incomplete answers. Those who participated in our experiments were undergraduate students at Kyoto Sangyo University who were recruited through a website.[2] In both sessions, male subjects and economics students were dominant, as shown in Table 1. Participants were allowed to attend only one session. The experiments were carried out through a paper-based system on 22 December, and through a computer-based system on 16 January; what the subjects were asked to do was much the same on each date except for the donation settings (discussed in more detail in Section 5). [3] In the computer-based system we used SurveyMonkey[4] to have our subjects answer the questions and to collect their answers immediately. Once subjects accepted the terms of the experiment and signed their consent forms, the experimenters explained to them the schedule and the rewards the subjects were going to receive at the end of the entire experiment (See "Instruction for the Experiment" in supplemental material). Each subject received 1,000 Japanese yen (equivalent to US$9.03 as of 15 June 2018) as a show-up bonus and an

additional amount of money depending on their performance in the experiment. Each session included four experiments, the first of which was a choice experiment to elicit subjects' preferences regarding the return, risk, and CSR attributes of stock investment. The other three were a dictator game and two lottery-choice experiments to estimate subjects' psychological characteristics. We set a preparatory exercise for the choice experiments to ensure that subjects fully understood what to do and how to answer. The experimenters had randomly selected in advance two experiments out of four to determine participants' rewards; the subjects, however, did not know which two had been selected until all experiments were completed.

The choice experiment aims at investigating people's preference over a set of alternatives expressed as a bundle of attributes, called a choice set (Lancaster 1966; Rosen 1974; McFadden 1974); an example is shown in Table 2. Each attribute has levels (presented in Table 3), so this makes a profile different over alternatives. Subjects faced three alternatives and were asked to choose the one they preferred the most. Through seeing their choices, we note how changes in the attribute levels affect their choices, thus enabling us to estimate their utility functions.

Each respondent was asked to invest 100 points in one of the first two options (Stock A, Stock B); or, if they choose the third option ("I invest in neither Stock A nor Stock B"), they would be saving 100 points. They were to make such a choice 12 times. In our study, we calculated the rewards such that one point was equivalent to one Japanese yen. The amount of money that subjects earned or lost by investment in each choice could not carry over to the next choice.

**Table 1: Descriptive Statistics**

|  |  | December Session (n = 25) | | January Session (n = 21) | |
| --- | --- | --- | --- | --- | --- |
|  |  | Number of Subjects | Percentage | Number of Subjects | Percentage |
| Gender | Male | 20 | 80 | 14 | 67 |
|  | Female | 5 | 20 | 7 | 33 |
| Total |  | 25 | 100 | 21 | 100 |
|  |  |  |  |  |  |
| School | Economics | 12 | 48 | 4 | 19 |
|  | Others | 13 | 52 | 17 | 81 |
| Total |  | 25 | 100 | 21 | 100 |

We have three attributes: Possible Return on Investment, Variance, and Corporate Social Responsibility. Possible return on investment is the measure of the profit earned from each investment, and it has four patterns as shown in Table 4. Its expected return is highest in Pattern A and lowest in Pattern D. The profit earned from each investment is calculated by adding the expected return from a given choice to the initial holdings (100 points).

Variance is a measure of risk, in that it looks at which return will be forthcoming with how much likelihood. Although it was not shown explicitly as an attribute in a choice set (see Table 2), an experimenter explained to the subjects the event possibility for each possible return as follows. If there are two possible returns appearing in a choice set (see Stock A in Table 2), each of the two appears with a 50 per cent chance, which we regard as low risk. On the other hand, four possible returns shown in a choice set (Stock B in Table 2) means a high risk, since each of the four returns appears with a 25 per cent chance.[5] The Corporate Social Responsibility attribute shows the amount of money that a firm donated to a non-governmental organisation. We specified the non-governmental organisations in this experiment to be WWF Japan, UNESCO Japan, and Plan Japan. A higher amount of donation by a company can be interpreted as a greater effort directed toward environmental or social issues. With the settings such that the experimenters actually paid those amounts of donations to those organisations, subjects obtained utility from investing in such firms. The point we should note here is that even though a subject chooses to invest in a firm with a donation, his or her possible return is not reduced by the amount of donation. This reduces cognitive burden of respondents, since they do not have to calculate the net possible return of each choice. It also reflects the reality: investment return is not usually deducted even though people invest in firms implementing CSR activities (see "Instruction for Experiment A" in supplemental material). We used all combinations of the attribute levels (4 * 2 * 3 = 24 combinations) as a profile and two of them were randomly selected, which became a choice set by adding the third option, which is "I invest in neither Stock A nor Stock B".

**Table 2: An Example of a Choice Set in the Choice Experiment**

|  | Stock A | Stock B |  |
|---|---|---|---|
| Possible Return on Investment | 0 points<br>20 points | -10 points<br>0 points<br>20 points<br>30 points | I invest in neither Stock A nor Stock B. |
| Corporate Social Responsibility | 10 points | 0 points |  |
| Choose one |  |  |  |

## Table 3: Attributes, Their Definitions, and Levels

| Attribute | Definition | Level |
|---|---|---|
| Possible Return on Investment | The measure of the profit earned from each investment | 4 patterns (see Table 4) |
| Variance | The variance of possible return on investment | None = 0<br>Low = 100<br>High = 250 |
| Corporate Social Responsibility | The amount of money that a firm donated to WWF Japan, UNESCO Japan, or Plan Japan (return for a subject is NOT lowered due to a contribution) | 0 points<br>1 points<br>10 points |

## Table 4: Possible Return on Investment

| Pattern | Possible Return on Investment | | | |
|---|---|---|---|---|
| A | 10 points | 20 points | 40 points | 50 points |
| B | 0 points | 10 points | 30 points | 40 points |
| C | -10 points | 0 points | 20 points | 30 points |
| D | -20 points | -10 points | 10 points | 20 points |

3.2 Estimation Model

The theoretical framework of a conditional logit model is as follows. We assume that respondent $n$ has a random utility function for choosing alternative $i$ as shown in Eq. (1). The indirect utility consists of the observable utility $V_{ni}$ and the stochastic component of utility $\varepsilon_{ni}$ that is identically independently distributed, and follows a type-I extreme value distribution.

$$U_{ni} = V_{ni} + \varepsilon_{ni} \quad (1)$$

The probability of alternative $i$ chosen out of alternatives in choice set $C = \{1,2,...,J\}$ can be shown as follows:

$$P_{ni}\left(U_{ni} > U_{nj}, \forall\, i \neq j\right) = \frac{exp(\mu V_{ni})}{\sum_{j \in C} exp(\mu V_{nj})}, \quad (2)$$

where $\mu$ is a scale parameter. We assume a linear model for $V_{ni}$ as in Eq. (3).

$$V_{ni} = \beta_0 + \beta_1 Return + \beta_2 Variance + \beta_3 CSR + \beta_4 CSR * Altruism + \beta_5 CSR * Risk\ Aversion + \beta_6 CSR * Time\ Discount + \beta_7 CSR * d\_Economics\ Student + \beta_8 CSR * d\_Female. \quad (3)$$

The observable utility consists of *Return*, *Variance*, and *CSR* as well as interaction terms of *CSR\*Altruism*, *CSR\*Risk Aversion*, *CSR\*Time Discount*, *CSR\*d_Economics Student*, and *CSR\*d_Female*. To test hypotheses, we need to look at estimation results of interaction terms. If $\beta_4$ is positive and statistically significant, it can be interpreted that people who are more altruistic obtain higher utility from CSR activities. Since we regard people obtaining a positive utility from CSR as SRI investors, this result supports the first hypothesis. We can interpret $\beta_5$ and $\beta_6$ in the same manner. In order to control variables that could affect the utility of investment, we added interaction terms of *CSR\*d_Economics Student* dummy ($\beta_7$) and *CSR\*d_Female* dummy ($\beta_8$) into our estimation model.

However, conditional logit models have several limitations such as the assumption of preferences' homogeneity in the sample. Hence, recent studies often employ advanced tools such as mixed logit or latent class models. To check for the robustness of our results, we estimated the mixed logit model by Revelt and Train (1998), which relaxes the assumptions of homogeneity associated with respondents' preferences and independence of irrelevant alternatives (IIA). The probability that respondent $n$ chooses alternative $i$ can be

expressed as in Eq. (4):

$$P_{ni}\left(U_{ni} > U_{nj}, \forall i \neq j\right) = \int \frac{exp\left(V_{ni}(\beta_n)\right)}{\sum_{j \in C} exp\left(V_{nj}(\beta_n)\right)} f(\beta) d\beta \qquad (4)$$

where $f(\beta)$ is the density function of $\beta$. Note that observable utility comprises the same variables included in Eq. (3).

We used altruism, risk aversion, and time discount rate to examine the motivations for SRI. We followed Forsythe et al. (1994) and used a dictator game to measure altruism by asking subjects to answer how much out of 500 Japanese yen they would give their partners (see "Instruction for Experiment B" in supplemental material). They did not know who their partners were, even after the experiment. We used the amount of money they gave their partners as the measure of their altruism: the more money they gave, the more altruistic they were.

To measure their attitude toward risk, we presented subjects with ten paired lottery-choice decisions (shown in Table 5) and asked them to choose Lottery A or Lottery B in each of the ten options (Holt and Laury 2002; see "Instruction for Experiment C" in supplemental material). In both Lottery A and B, greater rewards were possible in the later options. Lottery A was defined as a safe choice, so people with more Lottery A choices can be considered to be more risk averse. See Table 6 to better understand the relationship between the number of safe choices and the classification of risk preference. We announced to subjects that after the lottery-choice experiment we were going to randomly choose a number to decide which numbered option was going to be used to determine their rewards, and then choose another number to determine how much the prize would be; by doing this, we gave subjects an incentive to choose all options carefully.

**Table 5: Ten Paid Lottery-Choice Decisions**

| Option | Lottery A | Lottery B | Your Choice |
|:---:|:---:|:---:|:---:|
| 1 | 1/10 of 200 yen, 9/10 of 160 yen | 1/10 of 385 yen, 9/10 of 10 yen | |
| 2 | 2/10 of 200 yen, 8/10 of 160 yen | 2/10 of 385 yen, 8/10 of 10 yen | |
| 3 | 3/10 of 200 yen, 7/10 of 160 yen | 3/10 of 385 yen, 7/10 of 10 yen | |
| 4 | 4/10 of 200 yen, 6/10 of 160 yen | 4/10 of 385 yen, 6/10 of 10 yen | |
| 5 | 5/10 of 200 yen, 5/10 of 160 yen | 5/10 of 385 yen, 5/10 of 10 yen | |
| 6 | 6/10 of 200 yen, 4/10 of 160 yen | 6/10 of 385 yen, 4/10 of 10 yen | |
| 7 | 7/10 of 200 yen, 3/10 of 160 yen | 7/10 of 385 yen, 3/10 of 10 yen | |
| 8 | 8/10 of 200 yen, 2/10 of 160 yen | 8/10 of 385 yen, 2/10 of 10 yen | |
| 9 | 9/10 of 200 yen, 1/10 of 160 yen | 9/10 of 385 yen, 1/10 of 10 yen | |
| 10 | 10/10 of 200 yen, 0/10 of 160 yen | 10/10 of 385 yen, 0/10 of 10 yen | |

We conducted another lottery experiment suggested by Coller and Williams (1999) to measure the time preference of subjects (see further details in "Instruction for Experiment D" in supplemental material). Subjects were given the opportunity to obtain either 5,000 yen in one month or somewhat more in three months. They needed to choose which payment they preferred in each of a total of 15 options (Table 7). The amount given in three months varied but would always be greater than 5,000 yen. Again we told subjects that a random number would be chosen to decide which option would determine their rewards, and another number would be randomly chosen to determine who the winner was. This setting follows Coller and Williams (1999). Table 8 shows the relationship between the option at which subjects switch from payment option A to payment option B and their rate of time preference. The less money that people are willing to give up by obtaining payment in one month, the lower the time preference they have.

## Table 6: Risk Aversion Classifications Based on Lottery Choices

| Number of Safe Choices | Range of Relative Risk Aversion for $U(x) = x^{1-r}/(1-r)$ | Risk Preference Classification |
|---|---|---|
| 0-1 | $r < -0.95$ | Highly Risk Loving |
| 2 | $-0.95 < r < -0.49$ | Very Risk Loving |
| 3 | $-0.49 < r < -0.15$ | Risk Loving |
| 4 | $-0.15 < r < 0.15$ | Risk Neutral |
| 5 | $0.15 < r < 0.41$ | Slightly Risk Averse |
| 6 | $0.41 < r < 0.68$ | Risk Averse |
| 7 | $0.68 < r < 0.97$ | Very Risk Averse |
| 8 | $0.97 < r < 1.37$ | Highly Risk Averse |
| 9-10 | $1.37 < r$ | Stay in Bed |

## Table 7: Fifteen Payment-Option-Choice Decisions

| Option | Payment Option A (pays amount below in one month) | Payment Option B (pays amount below in three months) | Your Choice |
|---|---|---|---|
| 1 | 5,000 yen | 5,016 yen | |
| 2 | 5,000 yen | 5,025 yen | |
| 3 | 5,000 yen | 5,033 yen | |
| 4 | 5,000 yen | 5,041 yen | |
| 5 | 5,000 yen | 5,062 yen | |
| 6 | 5,000 yen | 5,082 yen | |
| 7 | 5,000 yen | 5,103 yen | |
| 8 | 5,000 yen | 5,125 yen | |
| 9 | 5,000 yen | 5,144 yen | |
| 10 | 5,000 yen | 5,164 yen | |
| 11 | 5,000 yen | 5,205 yen | |
| 12 | 5,000 yen | 5,288 yen | |
| 13 | 5,000 yen | 5,411 yen | |
| 14 | 5,000 yen | 5,616 yen | |
| 15 | 5,000 yen | 5,822 yen | |

**Table 8: Time Preference Classification based on the Experiment**

| Option Where Switch Occurs | Rate of Time Preference (Annual Interest Rate) |
| --- | --- |
| 1 | 2.0% |
| 2 | 3.0% |
| 3 | 4.0% |
| 4 | 5.0% |
| 5 | 7.5% |
| 6 | 10.0% |
| 7 | 12.5% |
| 8 | 15.0% |
| 9 | 17.5% |
| 10 | 20.0% |
| 11 | 25.0% |
| 12 | 35.0% |
| 13 | 50.0% |
| 14 | 75.0% |
| 15 | 100.0% |

## 4. Estimation Results

Table 9 shows the descriptive statistics for three psychological variables: *Altruism*, *Risk Aversion*, and *Time Discount Rate.* As is mostly observed in earlier studies, more than half of the subjects gave their peer more than zero yen in a dictator game. In our experiment, about 40 per cent of subjects gave their peers nothing, another 40 per cent of them paid less than 150 yen to their peers. With regard to risk aversion, our subjects on average were very risk averse. Estimated risk aversion is 0.71 on average, which is slightly lower than those found in earlier studies (Andersen et al. 2006; Andersen et al. 2008). Mean discount rate is 0.51 with standard deviation of 0.41. We found that participants on average exhibit a higher time discount rate. However, it is distributed on the two sides, which means that there is a split in our subjects between those who have a lower and higher time discount rate.

**Table 9: Distribution of Psychological Variables**

| Variable | Observation | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| *Altruism* | 46 | 66.17 | 89.93 | 0 | 250 |
| *Risk Aversion* | 46 | 0.71 | 0.43 | -0.32 | 1.37 |
| *Time Discount Rate* | 46 | 0.51 | 0.41 | 0.02 | 1.00 |

The estimation results by conditional logit model are given in Table 10. Firstly, it can be seen that subjects significantly obtain positive utility from *Return* and negative utility from *Variance* as expected from the modern portfolio theory, even though we obtain statistical significance only for *Return*. The coefficient of *CSR* shows up as negative value, but statistical significance is not found. As regards the estimation results of interaction terms, we obtain statistical significance for coefficients of *CSR\*Altruism* and *CSR\*Time Discount*, which are positive values. As regards other interaction terms, we obtain positive coefficients for *CSR\*Risk Aversion* and *CSR\*d_Economics Student*, while that of *CSR\*d_Female* is negative, but they are not statistically significant.

We now turn to test our three hypotheses. As we obtain a positive and significant result for *CSR\*Altruism*, we take as confirmed our first hypothesis. However, we cannot observe the statistical significance for *CSR\*Altruism* anymore estimated with mixed logit model. Hence, the robustness of this result cannot be confirmed. Regarding the heterogeneity, the standard deviations of random parameters that are "*CSR\*Altruism*" and "*CSR\*Risk Aversion*" are statistically significant. Hence, the degrees of altruism and risk aversion of potential SRI investors are heterogeneous.

As for the second hypothesis, the estimation results with conditional logit model show that SRI investors are indeed more risk averse, but the second hypothesis is not supported as the results are not statistically significant. Overall, from some studies it emerges that people in Germany (Wins & Zwergel, 2016), Sweden (Nilsson, 2008), and the UK (Lewis & Mackenzie, 2000) believe that SRI funds are associated with similar or less risk than conventional ones. Indeed, the percentage of respondents who think that ethical funds are less risky than conventional ones is higher than the percentage of those who consider ethical funds as risker than conventional ones. While results with mixed logit model estimated the positive coefficient, it was not statistically significant.

Regarding the third hypothesis, we obtain a result that shows, contrary to our expectation, that people who have a higher time discount rate tend to be SRI investors. This

estimation result is robust between conditional logit model and mixed logit model. From these results, we suggest that motivations for SRI could include as follows. First, the result of first hypothesis testing shows that the motivation for SRI could be a desire to contribute to the society through their investment activities. Second, findings from the third hypothesis testing reveal that SRI investors are not patient in contrast to our expectation. Instead, they would be interested in urgent issues in the real world that could include immediate gains or CSR activities engaging in something they need to deal with in the shorter period of time. In fact, the most selected donation project in our experiment were "The UNESCO Association Scholarship for 3.11 Disaster-Stricken Children and Students" in the UNESCO Japan and one of the priority projects in Plan Japan "Improvement accesses to safe drinking water and basic sanitation in Cambodia", which are obviously the project that especially needs the immediate actions for.

**Table 10: Estimation Results with Conditional Logit Model and Mixed Logit Model**

| Variable | Conditional Logit Model | | Mixed Logit Model | | | |
| | Coeff. | S.E. | Coeff. | S.E. | S.D. | S.E. |
|---|---|---|---|---|---|---|
| *Return* | 0.221*** | 0.015 | 0.294*** | 0.025 | - | - |
| *Variance* | -0.001 | 0.001 | -0.001 | 0.001 | 0.005*** | 0.002 |
| *CSR* | -0.041 | 0.050 | 0.042 | 0.075 | 0.002 | 0.100 |
| *CSR*Altruism* | 0.001*** | 0.000 | 0.001 | 0.001 | 0.003*** | 0.001 |
| *CSR*Risk Aversion* | 0.005 | 0.043 | -0.110 | 0.086 | 0.112** | 0.054 |
| *CSR*Time Discount* | 0.125** | 0.049 | 0.135* | 0.077 | 0.082 | 0.124 |
| *CSR*d_Economics Student* | 0.003 | 0.040 | 0.010 | 0.064 | 0.095 | 0.108 |
| *CSR*d_Female* | -0.011 | 0.043 | 0.026 | 0.067 | 0.046 | 0.237 |
| *Number of responses* | 552 | | 552 | | | |
| *Log likelihood function* | -221.097 | | -204.171 | | | |

We assumed normal distributions for the random parameters.
*** Statistically significant at the 1% level
** Statistically significant at the 5% level
* Statistically significant at the 10% level

We also included gender and student dummy variables to control for those effects on choice of investment. The estimation results show that they do not significantly affect investment decisions. While some studies (Frank et al. 1993; Simmons and Emanuele 2007) revealed that females are more altruistic than males, Andreoni and Vesterlund (2001), Cox

and Deck (2006), and Rigdon and Levine (2011) asserted that females are not always more altruistic than males. Depending on the cost of altruistic behaviour, gender difference in such behaviour disappears or even reverses. Also, there are studies that conclude that females are less generous than males. Bauman and Rose (2009) is such an example. Other studies (Frank et al. 1993; Haucap and Muller 2014[6]; Bauman and Rose 2009) hold that economics students are less generous than other students on the grounds that economics students are intrinsically more self-interested than non-economics students, and this tendency is strengthened through taking economics courses. For this reason we need to control for subjects' attributes in order to clarify the effect of altruism on decision making for SRI.

## 5. Option to Choose a Project

In our experiment, when subjects decided to invest some money in a stock involving CSR, the experimenters actually made that amount of donation to one of the environmental or social projects carried out by WWF, UNESCO, or Plan. [7] We select these three particular organisations because this enabled subjects to choose from a variety of social activities. WWF is especially known for their environmental activities, UNESCO has engaged in activities for further development and promotion of culture, and Plan has been involved in social activities aimed at encouraging children's rights and extending children's potential. Plan has also recently been active in programmes to help girls in developing countries receive a proper education so that they can obtain stable employment. These organisations engage in different kinds of social issues.

To investigate whether the possibility of choosing the destination of a donation affects the investor utility, we designed different donation settings in our experiment. In the first session conducted on 22 December 2012, subjects were able to choose which project in which organisation their donation would go to if they invested in stocks containing donations. We provided them with a list of projects in an appendix attached to their instructions. When the experiment on investment choice was over, subjects were asked to indicate on the sheet, with a check mark, their choice of one project to which they would like their donations to be made. In the January session, however, we did not allow subjects to choose a project, although they knew that their donations would go to one of the three organisations. In order to examine whether the different setting for donations led to greater or lower utility from CSR, we used the following equation:

$$V_{ni} = \beta_0 + \beta_1 Return + \beta_2 Variance + \beta_3 CSR + \beta_4(CSR * Choice) + \beta_5(CSR * d\_Economics\ Student) + \beta_6(CSR * d\_Female)\ ,\ (5)$$

<p style="text-align: center">where Choice = 1 if the respondent has an option to choose a project</p>

<p style="text-align: center">Choice = 0 otherwise</p>

where *Choice* is equal to one if the subjects participated in the December session, and zero otherwise. We pooled all data from the December and January sessions and estimated with a conditional logit model. The coefficient of CSR shows the utility obtained directly from CSR, since the interaction term *CSR\*Choice* controls possible distinctions caused by the difference in option to choose the destination. We also included the interaction terms of *CSR\*d_Economics Student* and *CSR\*d_Female* to control for possible impacts on treatment effects due to demographic differences.

The coefficient of *CSR\*Choice* tells us whether the design allowing subjects to choose their donation destination changes their utility; since *CSR\*Choice* has a positive coefficient with statistical significance, the design that enables people to choose the donation projects actually increases their utility, as we see in Table 11. This suggests that reflecting investors' preferences in CSR activities would lead to a higher evaluation of CSR efforts.

**Table 11: Estimation Results with a Dummy Variable Distinguishing Between the December Session and the January Session**

| Variable | Coefficient | Standard Error |
|---|---|---|
| *Return* | 0.219*** | 0.014 |
| *Variance* | -0.000 | 0.001 |
| *CSR* | 0.026 | 0.031 |
| *CSR\*Choice* | 0.086** | 0.037 |
| *CSR\*d_Economics Student* | -0.042 | 0.040 |
| *CSR\*d_Female* | -0.025 | 0.042 |
| *Number of responses* | 552 | |
| *Log-likelihood function* | -224.310 | |

*** Statistically significant at the 1% level
** Statistically significant at the 5% level

## 6. Conclusion

The aim of this paper was to reveal the psychological characteristics of potential SRI investors in Japan to explain its motivation, by using economic experiments. Although earlier studies found that SRI investors are different from that of rational investors in terms of their demographic characteristics and their investment behaviour, how different has yet to be

identified. Since behavioural finance asserted that psychological features might play an important role in investor behaviour (Barberis and Thaler 2003), we focused on psychological aspects of investors to uncover the motivations behind SRI and how they differ from those in conventional investments by using laboratory experiments. We conducted an investment experiment with undergraduate students to estimate their utility function and also conducted three experiments to measure three psychological factors: altruism, risk aversion, and time preference. We used these psychological factors to apply a conditional logit model, as well as a mixed logit model, and examined whether these factors affect motivations for investing in the stock of companies that are actively promoting CSR.

The findings of this paper can be summarised as follows. Firstly, we found that people who are more altruistic are more likely to be SRI investors, but that effect is only significant in a conditional logit model. Secondly, people who are more risk averse tend to be SRI investors, but that effect is not statistically significant. Thirdly, people who have a higher time discount rate significantly incline to be SRI investors, which was contrary to our expectation. From these findings, we suggest that motivations for SRI could include a desire to contribute to society through investment activities and also interests in urgent issues that could include immediate gains or CSR activities engaging in something they need to deal with in the short time. Furthermore, when subjects were allowed to choose the project for their donation, they obtained significantly higher utility from the CSR attribute. This suggests that reflecting investors' preferences in CSR activities would lead to a higher evaluation of CSR efforts, hence, higher demand for investing such firms.

We can point out some limitations of our study and important tasks for further research. First of all, our experiments were conducted with undergraduate students who might have less experience in investment activities. Their decision-making might not entirely reflect the reality of active investors, while we still believe that our result is important for understanding the behaviour of potential SRI investors. Second, the number of subjects in our experiments may have been insufficient to have robust estimation results. Third, we tried to identify fundamental psychological mechanisms behind SRI investment; while we believe that this attempt partially succeeded, statistical support for our psychological variables is not strong. Further investigation on psychological underpinnings of SRI investors remains to be done.

**Notes**

[1] Financial literacy might be another reason why there are seemingly irrational investment. Borgers and Pownall (2014) used stated preference survey and compared attitudes of Dutch household members in 2011 towards socially responsible investment practice. They found that over one third reported at least one financial choice inconsistent with rational behaviour.

[2] Fréchette (2012) discovered that, although there are situations where focusing on students is too specific, in general the conclusions reached by using student subjects generalizes to professionals.

[3] Pikulina et al. (2017) demonstrated that their experimental results do not depend on whether the investment choices are made on paper or based on computerized information.

[4] SurveyMonkey is the world's most popular online survey tool; it enables its users to send free surveys, polls, questionnaires, customer feedback, and market research. (https://www.surveymonkey.com)

[5] We calculated variance in a general manner as follows:

$$V(X) = E\left[\left(X - E[X]\right)^2\right] = E\left[\left(X - \mu\right)^2\right] = \sum_{i=1}^{n}\left(x_i - \mu\right)^2 f\left(x_i\right).$$

Variance of a choice with two possible returns is 100, and variance of one with four possible returns is 250. Therefore, we regard the former as low risk and the latter as high risk. If someone chooses "I invest in neither Stock A nor Stock B", he/she knows that he/she is going to save 100 points, which can be considered as no risk.

[6] When the authors control for gender and progress of study in their trust game, the economics student dummy does not itself show statistical significance. In their estimation results, female economics students are less trustworthy, and their trust level falls even lower over the course of their economics studies relative to their counterparts.

[7] The list of projects to which we chose to make a donation is available upon request.

**Supplemental Material**

**Instruction for the Experiment**

Thank you very much for your participation in this economic experiment. You are kindly requested to note the following important reminders:

1. You are not permitted to use your mobile phone during the experiment.

2. You are not to speak to any other participants in this room. If you have any questions, please raise your hand and one of the experimenters will come to your desk to answer the question.

3. You will find a letter of consent on your desk. Please read and sign it if you accept the terms and conditions. If you cannot accept them, you are asked to leave the room now.

4. You are not permitted to have anything on your desk except materials provided by the experimenters.

5. You are not to leave the room until the experiment is over. But please raise your hand if you need a restroom break.

Your personal data, including the results of your experiment, will be kept completely confidential and aggregated only for research purposes. They will not be used for any other purpose than this experiment. Your name will not be linked with your decisions when the results of the experiment are published. You will be personally informed of the amount of your earnings and paid at the end of the experiment. The reward consists of two parts: a 1,000-yen show-up bonus and an additional sum of money that is dependent on your choices during the experiments. The experimenters have randomly selected in advance two experiments out of the four (Experiment A, Experiment B, Experiment C, and Experiment D), as the basis for calculating participants' rewards. Which two experiments were selected will not be disclosed until the end of all experiments. The whole session will take two hours at most.

**Instruction for Experiment A（Investment Choice）**

In Experiment A you are to make decisions on stock investment. As the diagram below indicates, you can choose between "Stock A" and "Stock B", or, if you prefer, you can choose "I invest in neither Stock A nor Stock B."

**Sample Question**

|  | Stock A | Stock B |  |
|---|---|---|---|
| Possible Return on Investment | -20 points with 25%<br>-10 points with 25%<br>+10 points with 25%<br>+20 points with 25% | ±0 points with 50%<br>+20 points with 50% | I invest in neither Stock A nor Stock B. |
| Corporate Social Responsibility | 10 points | 1 point |  |

Choose one and tick box ☐            ☐            ☐

You will be presented with twelve such choices to make. Here we introduce "point" as a hypothetical currency, as you can see in the sample question. In each question, you are provided with 100 points for your decision making. If you choose "I invest in neither Stock A nor Stock B", 100 points will be given to you for certain, but you cannot carry over those points to the next investment choice. Also, when you invest in either Stock A or Stock B, all 100 points will be invested (that is, you cannot invest partially in Stock A and the rest in Stock B). All stocks differ in terms of "Possible Return on Investment" and "Corporate Social Responsibility". Everything else is identical in Stock A and Stock B.

"Possible Return on Investment" is the expected return from your investment of 100 points. If two returns are shown, as under Stock B in the sample question, one of the two appears with a 50 per cent chance. On the other hand, if four possible returns are shown, as under Stock A in the sample, each return appears with a 25 per cent chance.

"Corporate Social Responsibility" shows the amount of points that the firm you would invest

in donates to one of the following organisations: WWF Japan, UNESCO Japan, or Plan Japan. Even though you decide to invest in a firm with CSR activities, your investment return will not be deducted. A stock with zero points for CSR indicates that the firm does not implement any CSR activities, and so does not donate to any of the above three organisations.

Once we make sure that all participants have finished making all twelve choices, the actual investment returns are decided on the basis of random selection using a bingo cage containing balls. Your profits from Experiment A will be translated into real rewards using a translation rate of 1 point = 1 yen. If you choose any stocks involving one point or more for the attribute "Corporate Social Responsibility", the firm you invested in would donate that sum of money. In this experiment, however, instead of the firm it will be the experimenters who will make donations in accordance with your investment after translating points into real money using a translation rate of 1 point = 1 yen. You can decide which organisation/project the donation will go to. Please choose ONE of the projects listed in the appendix to these instructions. If you are unable to select which project the donations should go to, select "Leave entirely up to experimenters". You can make sure that the experimenters have indeed donated money to the project/organisation you choose by visiting our homepage, whose URL is enclosed in the envelope containing the rewards you will be given at the end of the experiment.

You have a practice session for Experiment A. While you will face twelve choices in the real experiment, you have three investment choices in this practice exercise. If you have any questions about Experiment A, please raise your hand before the experiment begins.

**Instruction for Experiment B (Decision Making)**

You're paired with a partner whose identity you will not know, neither during nor after the experiment. 500 yen is provided to each of you, and you can give your partner none, some, or this entire sum. Decide how much of the 500 yen you will keep for yourself, and give your partner the rest.
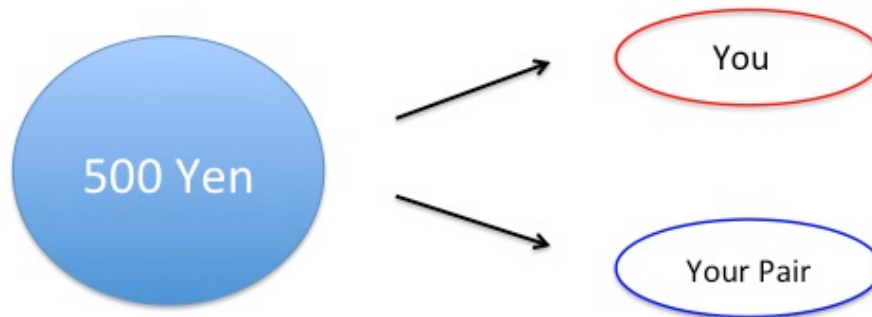


**Sample Question**

|  | The Amount of Money |
|---|---|
| (1) The amount of money you keep for yourself | yen |
| (2) The amount of money you give your partner | yen |
| (3) Total | yen |

Please write down the amount of money that you would like to keep for yourself on line (1) in the table, and the amount of money that you will give your partner on line (2). Make sure the sums add up to 500 yen. In Experiment B, your reward will be (1) plus the amount of money that your partner gives you. If you have any questions about this experiment, please raise your hand now.

**Instruction for Experiment C (Lottery-Choice Decisions 1)**

You are required to choose either Lottery A or Lottery B in each of the ten options given. Depending on your choices, the amount of the reward that you are going to obtain will differ.

**Sample Question**

| Option | Lottery A | Lottery B | Your Choice |
|--------|-----------|-----------|-------------|
| 1 | 1/10 of 200 yen, 9/10 of 160 yen | 1/10 of 385 yen, 9/10 of 10 yen | ○Lottery A<br>○Lottery B |
| 2 | 2/10 of 200 yen, 8/10 of 160 yen | 2/10 of 385 yen, 8/10 of 10 yen | ○Lottery A<br>○Lottery B |
| 3 | 3/10 of 200 yen, 7/10 of 160 yen | 3/10 of 385 yen, 7/10 of 10 yen | ○Lottery A<br>○Lottery B |
| 4 | 4/10 of 200 yen, 6/10 of 160 yen | 4/10 of 385 yen, 6/10 of 10 yen | ○Lottery A<br>○Lottery B |

Choose either Lottery A or Lottery B in options 1 to 10. Note that the reward increases in the later options of both Lottery A and Lottery B; that is, the later options will give you more possibilities to obtain 200 yen in Lottery A and 385 yen in Lottery B. Once we are sure that all participants have completed making choices for the ten questions, an experimenter will randomly produce a number from a bingo cage to decide which option is going to be used for your reward, and produce a second number to determine how much the prize will be. Raise your hand now if you have any questions.

**Instruction for Experiment C (Lottery-Choice Decisions 2)**

All of you have an opportunity to obtain 5,000 yen in Experiment D. Depending on whether you are paid in one month (Option A) or in three months (Option B), the amount you are going to receive will differ.

**Sample Question**

| Option | Payment Option A (pays amount below in one month) | Payment Option B (pays amount below in three months) | Your Choice |
|---|---|---|---|
| 1 | 5,000 yen | 5,016 yen | |
| 2 | 5,000 yen | 5,025 yen | |
| 3 | 5,000 yen | 5,033 yen | |
| 4 | 5,000 yen | 5,041 yen | |

Choose Option A or Option B according to your preference. You are required to make such a decision 15 times. Please note that you will receive the Option B payment two months later than if you choose the Option A payment, and that the amount of payment for Option A is always smaller than the one for Option B. When all participants finish all 15 options, an experimenter will randomly produce a number from a bingo cage to decide which option is going to be used for the reward, and produce a second number to determine who the winner will be (in this experiment only one participant will be chosen to be rewarded). Each of you has the same possibility to be the winner, so select each option carefully. Also, the reward for Experiment D will not be given to the winner at the end of the experiment today. Rather, he/she will be paid in either one month or in three months, in accordance with the winner's actual choice in this experiment. If you have any questions, please raise your hand now.

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