

Voluntary vs. mandated sustainable disclosure:  
An experimental study on the real effects of  
disclosure that enhances future-oriented  
management and investor behavior

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文部科学大臣認定 共同利用・共同研究拠点

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**Voluntary vs. mandated sustainable disclosure:  
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future-oriented management and investor behavior**

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**Abstract**

As the global environment undergoes significant transformations, the landscape of sustainable reporting information disclosure, once at the discretion of companies, is experiencing a notable shift towards mandatory disclosure. The purpose of this study is to examine which condition fosters future-oriented perspectives among managers and investors: Voluntary or mandated disclosure. I conducted a pre-registered experiment (N =140) employing a modified trust game with disclosure options. The results unveiled an unexpected consequence: managers operating under the voluntary condition tended to employ a strategy that enticed investors into selfish exchanges by intentionally disclosing low sustainable investments. Conversely, managers under the random condition demonstrated a greater inclination towards adopting highly sustainable investments and cultivating sustainable exchange relationships with investors. The unintended consequence of the manager's behavior is explained by the two mediating variables, Selfish and Future-oriented. Our research sheds new light on the positive dimensions of mandatory sustainable disclosure, which have remained unclear until now.

Keywords: sustainable reporting, real effect, trust game, voluntary disclosure, random disclosure

JEL classification: M41, D82, D90

Acknowledgment: This research was partly supported by the Joint Usage and Research Center, Research Institute for Socionetwork Strategies, Kansai University. This work was also supported by JSPS KAKENHI Grant Number JP 22K1854.

## 1. Introduction

The global environment is undergoing drastic changes, forcing a review of securities markets and corporate activities, which are particularly affected. For example, sustainable investment centered on ESG (Environment, Social, Governance) and sustainable management aimed at achieving the sustainability of corporate SDGs (Sustainable Development Goals) activities are required. Regarding corporate information disclosure, the G7 has requested the disclosure of climate change risk information based on the ‘Task Force on Climate-related Financial Disclosures (TCFD)’, and the information disclosure of sustainable reporting that has been left to the discretion of companies is significantly changing to mandatory disclosure. In the research field as well, along with the reconstruction of capitalism, the way of new information disclosure is being discussed, and further deepening of research is being demanded.

Much of the research on sustainable disclosure premised on the securities market is empirical research using archival data, investigating the correlation between corporate size, industry, governance form and disclosure, and the impact of information disclosure on stock prices (Barth et al. 2017; Christensen et al. 2021). In the field of management control, the impact of tools such as the Sustainability Balanced Scorecard on employee productivity and motivation has been investigated (Hansen et al. 2016). However, to achieve a sustainable society, research should be needed from the perspective of how mandatory corporate sustainability reporting draws out the future orientation of managers and investors. However, such perspective research has not yet been conducted.

The purpose of this study to experimentally examine the real effect of the sustainable reporting, especially, how disclosure system enhances managers’ and investors’ future oriented. This study employed a modified trust game with a disclosure option to compare voluntary disclosure and random disclosure conditions, and tested which condition brings out the future-oriented of managers and investors in a pre-registered economic experiment (N = 140). In the game, first, it is decided whether the management investment chosen by the manager will be disclosed. Under voluntary disclosure conditions, the manager decides this, while under mandatory disclosure conditions, the computer randomly decides this. Second, the manager (receiver) chooses one of the management investments, either environmentally considerate (high sustainable investment) or environmentally destructive low sustainable investment). This choice determines the multiplier  $e$ . Third, the investor (sender) decides the amount of investment in the manager from 0 to 100. Finally, the profits determined by the investment amount and multiplier  $e$  are split equally between both parties. In addition, before the game, the time travel exercise was applied to all of the participants, referencing future design research (Hara et al. 2019; Saijo 2020).

I extend the gift exchange hypothesis from previous research (Berg et al. 1995) and

propose the sustainable exchange and selfish exchange hypotheses through disclosure (see Figure 1). Specifically, under voluntary disclosure condition, I assume that the disclosure itself becomes a gift, establishing a sustainable exchange, where managers choose high sustainable investment and voluntarily disclose it, investors perceive it as a gift, and in response to the gift, they invest more (the sustainable exchange hypothesis. Panel A of figure 1). On the other hand, under the random disclosure condition, there is no room for such reciprocity to be established, so they are simply expected to make economically rational choices (the selfish exchange hypothesis. Panel B of figure 1).

The results of the experiment revealed four key findings. First, managers under voluntary conditions chose low sustainable investment more often than managers under random conditions. In particular, managers under the voluntary condition adopted a strategy to lure investors into the selfish exchange by choosing and voluntarily disclosing low sustainable investment, compared to managers under the random condition. This is an unintended consequence. Second, under both conditions, investors invested more when disclosed. Third, under the subsample restricted to with disclosure, investors invested more in managers' high sustainable investment under both conditions. In light of the first and third results, under the random disclosure condition, managers were more likely to adopt sustainable management investments, and they have established a 'sustainable exchange relationship' where investors invest more in response to this. Fourth, the unintended consequence especially on the management behavior are explained by the two mediating variables, Selfish and Future-oriented.

My contributions are threefold, primarily related to the real effects of information disclosure, both academically and practically. The first is a contribution to the study of the real effects of non-financial information. There are many prior studies on how information disclosure can change a company's investment behavior and actual activities (e.g., Kanodia and Sapat 2016; Leuz and Wysocki 2016; Roychowdhury et al. 2019). For non-financial information disclosure, for example, Birt et al. (2017) show that when the quality of integrated reporting is high, improvements are made in corporate internal investment decisions. However, there is still little research focusing on differences in disclosure systems, the pathways through which real effects occur, and especially on interactions between players. My research provides a new perspective to existing studies by approaching these issues by comparing voluntary and mandatory disclosure of non-financial information and focusing on strategic interactions that occur between managers and investors.

The second is a contribution to information disclosure research. Many prior studies focus on the goodness of voluntary disclosure (Lunawatt 2013; Tsang et al. 2022), while others suggest that careful analysis is necessary for mandatory disclosure as it may lead to unintended

results (see, e.g., Dranove and Jin 2010; Chen et al. 2018; Christensen et al. 2021). My research provides a new perspective to existing studies by revealing the negative strategic interactions inherent in voluntary disclosure and suggesting that mandatory disclosure may mitigate such negative effects.

The third is a practical contribution to standard setting and institutional design. Currently, countries are exploring how to regulate sustainable information, and are steering heavily from voluntary disclosure to mandatory disclosure regulations. My research sheds light on the positive aspects of mandatory sustainable disclosure that have not been clarified until now, supports this current trend, and provides a new perspective on future-oriented institutional design.

The remainder of this paper is organized as follows. Section 2 proposes the hypotheses. Section 3 shows the experimental design, Section 4 describes the empirical results. Section 5 concludes the paper. The instructions for the experiments are provided in the Supplementary File.

## **2. Hypotheses**

In comparing voluntary disclosure and random disclosure conditions, I focus on the intention behind the voluntary information disclosure, which will play the role of a “gift” that directly promotes strategic and sustainable gift exchange relationship. Especially, I extend the gift exchange hypothesis from previous research (Berg et al. 1995) and propose the sustainable exchange and selfish exchange hypotheses through disclosure (see Figure 1).

Specifically, under the voluntary disclosure condition, I assume that the disclosure itself becomes a “gift.” This is because the intentions of managers is embedded in the execution of voluntary disclosure (Taguchi and Kamijo 2022). Therefore, voluntary disclosure would establish a sustainable exchange, where managers choose high sustainable investment and voluntarily disclose it, investors perceive it as a “gift,” and in response to the gift, they invest more (the sustainable exchange hypothesis. Panel A of figure 1).<sup>1</sup> The gift exchange paradigm posits that people reward kind behavior and punish unkind behavior even in situations where standard economic theory predicts they would not (Akerlof, 1982; Fehr et al., 1993; Rabin, 1993). Applying the gift exchange paradigm to the voluntary disclosure condition, I derive the

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<sup>1</sup> Prior research also finds that individuals’ behavior often depends on the presumed intentions of others (e.g., Bartling et al., 2014; Falk et al., 2003; Ferreira et al., 2020; Rabin, 1993). Rabin (1993), for example, incorporates a “kindness” function in participants’ utility to capture the following behavior: as one’s counterpart increases his or her “kindness,” the utility maximizing response is to be kinder in return. Rabin (1993) points out that individuals consider the intentions and motives of others. Bartling et al. (2014) and Ferreira et al. (2020) also provide evidence that individuals intrinsically value decision rights.

hypothesis of strategic gift exchange behavior of sustainability between managers' voluntary disclosure with high sustainable decisions and investors' investment.

On the other hand, under the random disclosure condition, there is no room for such strategic exchange to be established, so they are simply expected to make economically rational choices (the selfish exchange hypothesis. Panel B of figure 1). Therefore, the following hypothesis can be derived.

***H1 Sustainable exchange and selfish exchange hypotheses through disclosure (1): Receiver's behavior.*** *If information disclosure is made, the proportion of receivers choosing high sustainable investment under the voluntary condition is greater than the proportion of receivers choosing high sustainable investment under the random condition.*

***H2 Sustainable exchange and selfish exchange hypotheses through disclosure (2): Sender's behavior.*** *If information disclosure is made and high sustainable investment is chosen by the receiver, the amount of investment by the sender under the voluntary condition is greater than the amount of investment by the sender under the random condition.*

Furthermore, I examine the mediating effect to explain the managerial behavior related to H1. Here, I refer to the manager's self-interested psychological state as "Selfish", and conversely, I call the manager's environmentally considerate and future-oriented psychological state "Future-oriented". Based on the sustainable and selfish exchange hypotheses, I propose the following hypothesis about the mediating effect:

***H3 Mediating effect of managerial behavior:*** *Managerial behavior that chooses high sustainable investment under voluntary conditions is mediated by either decreasing of Selfish and increasing of Future-oriented.*

### **3. Method**

#### **3-1. Task**

This study modifies the traditional trust game by focusing on the multiplier  $e$ . We introduce information asymmetry and the disclosure regime in the traditional trust game. Furthermore, I incorporate the manager's (receiver's) choice of business investment and linked it with the multiplier  $e$ . Specifically, the manager chooses one from one environmentally considerate management investment (High sustainable investment,  $e = 2$ ) and two environmentally destructive management investments (Low and certainty sustainable investment,  $e = 3$ . Low and uncertainty sustainable investment,  $e = 1$  or 5).<sup>2</sup> As for the labeling of whether it is environmentally considerate or not, I assigned "CSR scores" to each investment, referring to

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<sup>2</sup> We chose three options because we would like to capture not just differences in sustainable behavior, but also behavior in response to those risks.

Hoang and Phang (2023). In Hoang and Phang's (2023) experiment, participants were presented with these CSR scores to manipulate the strength of the company's CSR efforts. These labels are only notations on the vignette that do not affect the payoff structure of the game.<sup>3</sup> Figure 2 shows the timeline.

### 3-2. Experimental design and procedures

I used a  $2 \times 1$  between-participants design: I manipulated the type of disclosure (the random disclosure condition, in which a computer randomly determines whether to disclose, and the voluntary disclosure condition, in which the receiver make a decision whether to disclose).

The experimental protocol was approved with unanimity by the institutional review board where the experiment was conducted (Review No. 2022-7), and all experimental conditions were conducted in accordance with relevant regulations and guidelines, which met the requirements of the Declaration of Helsinki. Informed consent was obtained from all participants in the experiments. After approval by the institutional review board, I pre-registered the experiment in *AsPredicted* (<https://aspredicted.org/>, Pre-registered No.118647). All experiments were performed in accordance with relevant named guidelines and regulations. We performed a power analysis beforehand and calculated the sample size.

I conducted experiments in January 2023. All conditions were programmed using o-Tree software (Chen et al. 2016), and participants were recruited from the campus through the Sona system. In total, 140 participants joined our experiment (70 for the random, 70 for the voluntary condition). Participants were business students at a large university's students and 21.02 years old on average (SD = 1.45, The max and min ages were 28 and 18 years, respectively). 48.59 percent of them were female.

The experiment consisted of one practice round and ten actual rounds. Before the game started, the time travel lecture was applied to all of the participants with referencing future design research (Cuhls 2017; Hara et al. 2019; Saijo 2020).<sup>4</sup> It aimed to help participants assume the perspective of future generations during the game and to make participants feel more realistic about the high and low sustainable investment settings in the experiment.

For the disclosure rate under the random condition, I set it as follows for comparison between conditions. First, I conducted an experiment under the voluntary condition. As a result, the average disclosure rate in the voluntary condition was 81.71%. Therefore, I adopted this

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<sup>3</sup> In detail, I set CSR scores as follows: CSR score of High sustainable investment = 96, that of Low and certainty sustainable investment = 28, and that of Low and uncertainty sustainable investment = 26.

<sup>4</sup> Future design exercises specifically stress the importance of incorporating the perspectives of imaginary future-generation groups (Hara et al., 2019).

value as the information disclosure rate in the random condition and programmed it.<sup>5</sup>

The payment for the experiment was based on the points earned in two randomly selected rounds out of the ten rounds. Due to the adoption of performance-based pay using points earned in the game, participants' behavior was sufficiently incentivized. Each session lasted approximately 60 minutes on average, and the average payment to participants was JPN 3687.8.<sup>6</sup>

I confirmed participants' understanding of the experiment through post-questionnaire. The result indicated that it was sufficiently high (mean levels = 6.22 points out of 7 points).

## 4. Results

### 4.1. Test of H1: Main results about managers' behavior

Panel A of Table 1 shows the manager's behavior. The proportion of managers' choosing the high sustainable investment under the random condition (40.00%) was statistically higher than the proportion under the voluntary condition (32.85%) at 5% levels (Fisher's Exact Test (One-tailed),  $p = 0.029$ , Odds ratio = 0.734). Moreover, even when limited to situations where there is disclosure, the proportion under the random condition (44.22%) was statistically higher than the proportion under the voluntary condition (33.21%) at 1% level (Fisher's Exact Test (One-tailed),  $p = 0.004$ , Odds ratio = 0.627). These results were contrary to H1, which predicts the proportion under the voluntary condition is higher than that under the random condition.

Furthermore, figure 3 shows that, within the conditions, under the random condition, the proportion choosing the high sustainable investment when disclosure is present (44.22%) was statistically higher than the proportion when disclosure is not present (17.86%) (Fisher's Exact Test (One-tailed),  $p = 0.000$ , Odds ratio = 3.634). However, under the voluntary condition, there was no statistical significance between these proportions (33.21%, 31.25%. Fisher's Exact Test (One-tailed),  $p = 0.442$ , Odds ratio = 1.093). This result is also contrary to our predictions.

To test the robustness of this result, in particular, to deal with the repetition of the game, I conducted the random-effects and population-averaged probit models for the manager's choosing the high sustainable investment. The dependent variable is High sustainable dummy, which is a dummy variable that is 1 if the manager chooses a high sustainable investment. Table 2 shows that in Models (3) and (4), the intersection term between the disclosure dummy and the voluntary condition dummy is negatively significant. This indicates that when disclosure is made under the voluntary conditions, managers were less selective about the high Sustainable investments. This result reinforces the unintended consequences.

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<sup>5</sup> See the frequency of disclosure by conditions in Table S5-1 in Supplementary file S5.

<sup>6</sup> This was approximately 30 dollars when converted to USD. The amount also meets the minimum wage in the test area.



In summary, H1 expects that under voluntary conditions, the sustainable exchange hypothesis would hold, and conversely, under random conditions, the selfish exchange hypothesis would hold. However, the experimental results suggest the opposite for the management behavior. This suggests that, especially under the voluntary disclosure condition, managers adopted a strategy to use voluntary disclosure to rather lure investors into a selfish exchange.

#### **4.2. Test of H2: Main results about investors' behavior**

Panel B of Table 1 shows the descriptive statistics for the levels of the investors' investment behavior by conditions. Figure 4 shows that, in both conditions, investors invested more when disclosure was made (Mann-Whitney U test. The voluntary condition:  $p = 0.000$ ,  $U = 12,498$ . The random condition:  $p = 0.000$ ,  $U = 11,412$ ), which is consistent with previous research (Taguchi and Kamijo 2020).

Panel B of Table 1 shows that, when narrowed down to the sample with disclosure and managers' adoption of high sustainable investment, the investment amount under voluntary conditions (72.03) was not statistically significantly larger than the investment amount under random conditions (73.54) (Mann-Whitney U test.  $p = 0.806$ ,  $U = 6,323$ ). This result did not support H2.

To test the robustness of the result, in particular, to deal with the repetition of the game, I limited the analysis to a subsample with disclosures and conducted the random-effect tobit analysis for investors' investment behavior. The dependent variable is sent amount, which is a variable that represents the amount of investment made by the sender (values between 0 and 100). Table 3 shows that in all models, the High sustainable dummy, a dummy variable where it takes 1 if managers take the high sustainable investment, is positively significant. This result shows that investors make larger investments when managers choose high sustainable investments. Table 3 also shows that the voluntary dummy variable is not significant, indicating that no differences between conditions are observed.

In summary of managers' and investors' behaviors, under the random disclosure condition, managers were more likely to adopt high sustainable investment and investors invested more, indicating that it is easier to build a sustainable exchange relationship between managers and investors. However, under the voluntary disclosure condition, despite the tendency of investors to invest more in high sustainable investments, managers have adopted a strategy of adopting more low sustainable investments and enticing investors into selfish exchanges by disclosing them. These results were unintended consequences.

#### **4.3. Test of H3: An analysis on mediated variables**

In this subsection, I conduct an analysis on the mediating variables. Table 4 presents the descriptive statistics of the mediating variables. I focus particularly on the selfish and future-oriented aspects of the manager (receiver) in relation to H3. Under the voluntary condition, Selfish (5.85) was statistically significantly higher at the 10% level compared to that under the random condition (5.05) (Mann-Whitney U test,  $W = 762$ ,  $p = 0.070$ ). Although no statistically significant difference was observed, Future-oriented under the voluntary condition (4.38) was lower than that under the random condition (4.71) (Mann-Whitney U test,  $W = 533$ ,  $p = 0.350$ ).

Next, Figure 5 shows the results of the mediation analysis regarding managerial behaviors. Panel A of Figure 5 indicates that under the voluntary condition, the future-oriented significantly decreases, and this mediates a significant decrease in the adoption of high sustainable investments, showing a significant indirect effect (-0.060, 95%CI [-0.098, -0.024]). Panel B of Figure 5 indicates that under the voluntary condition, the selfish significantly increases, and this mediates a significant decrease in the adoption of high sustainable investments, showing a significant indirect effect (-0.081, 95%CI [-0.112, -0.054]). These results contradict H3. However, they are consistent with the results in Section 4-1. In other words, the unintended consequences of managers' behavior confirmed in the verification of H1 are explained by the two mediating variables, Selfish and Future-oriented.

## **5. Discussion and conclusion**

This study employed a modified trust game experiment featuring a disclosure option to compare conditions of voluntary and random disclosure to examine which condition fosters future-oriented perspectives among managers and investors. The results unveiled an unexpected consequence: managers operating under the voluntary condition tended to employ a strategy that enticed investors into selfish exchanges by intentionally disclosing low sustainable investments. Conversely, managers under the random disclosure condition demonstrated a greater inclination towards adopting high sustainable investments and cultivating sustainable exchange relationships with investors. The unintended consequences of managers are explained by the two mediating variables, Selfish and Future-oriented. Our research sheds new light on the positive dimensions of mandatory sustainable disclosure, which have remained unclear until now.

Despite its contributions, this study is naturally subject to several limitations. Some limitations are inherent to the use of a controlled laboratory experiment with student participants and relate to the generalizability of our findings to real-world settings. The cautious approach is recommended when extrapolating laboratory results to the real world since our experimental settings were highly controlled. In particular, in the setting of the experiment, companies and investors have a one-to-one relationship. If there are multiple firms and they are competitive, the

peer effect may cause the results to have other consequences.

### Supplementary file S1. Instructions used for the experiment

The following are the instructions that were presented to the participants in our experiments. Participants are randomly assigned to only one of the conditions and read only one scenario. The different parts of each scenario are underlined and italicized according to the conditions of the experiment. Footnotes are also underlined and italicized.

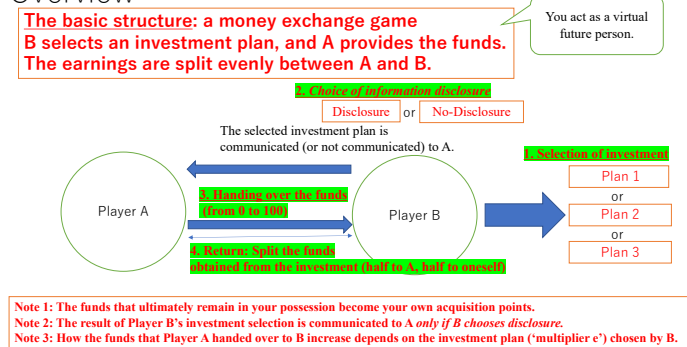
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Thank you for agreeing to participate in this task. In today's task, you will be playing the role of Player A or Player B. You will read the following scenario. Following figure shows the overview.

**Figure S1 Overview**

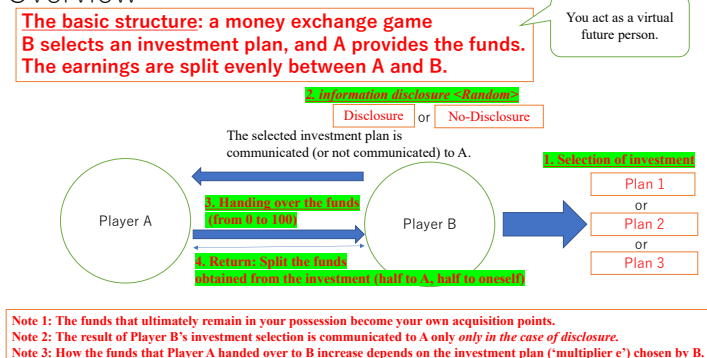
<for the voluntary disclosure condition>

Overview



<for the random disclosure condition>

Overview



### 1. Each Round in the Experiment

You will participate in the game as a pair with someone else. Each round consists of four steps, as shown in the following figure, and this is repeated for a total of 10 rounds. Each round is independent (and you will pair up with a different person each time to play the game). Within the game, the time limit for each step is 40 seconds. Please make sure to make your decision within the time limit.

<b>Step 1.</b> Disclosure or not of B's choice	<b>Step 2.</b> B's choice: High or low sustainable investment (This choice determines the multiplier $e$ )	<b>Step 3.</b> A's choice: A's investment behavior (from 0 to 100) in B	<b>Step 4.</b> The profits determined by the A's investment amount and multiplier $e$ are split equally between both players
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## 2. Your Role in the Experiment

-Your role in the experiment is either Player A or Player B. Your role is randomly determined by the computer at the beginning and does not change until the end.

-Player B decides which of the investment plans (Option 1, 2, 3) to choose. Player B also decides whether to disclose an investment plan of his/her own choosing to player A.<sup>7</sup>

-After that, player A decides how much of their available funds (100) to give to Player B.

## 3. Rules for decision-making

At the start of the game, pairs consisting of Player A and Player B are formed. Decisions are made by each pair. The timeline of the game is as follows.

The timeline

<p><u>Step 1. B's decision 2: Disclosure or not an investment plan to A</u><sup>8</sup></p> <p><u>Step 1. Computer's decision: Disclosure or not an investment plan to A</u><sup>9</sup></p> <p>Step 2. B's decision: Sustainable investment (This choice determines the multiplier <math>e</math>)</p> <p>Step 3. A's decision</p> <p>Step 4. The determination of the profit</p>
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### 3-1. Step 1: B's decision 2: Disclosure or not an investment plan to A<sup>10</sup>

#### Computer's decision: Disclosure or not an investment plan to A<sup>11</sup>

-Player B decides whether to disclose B's chosen investment proposal to Player A.<sup>12</sup>

-Computer randomly decides whether to disclose B's chosen investment proposal to Player A.<sup>13</sup>

- When the information is disclosed, player A will learn B's chosen investment and the value of  $e$  in that round.

- When the information is not disclosed, player A will not know B's chosen investment and the value of  $e$  in that round.

<sup>7</sup> This sentence was provided for the voluntary disclosure condition only.

<sup>8</sup> This sentence was provided for the voluntary disclosure condition only.

<sup>9</sup> This sentence was provided for the random disclosure condition only.

<sup>10</sup> This sentence was provided for the voluntary disclosure condition only.

<sup>11</sup> This sentence was provided for the random disclosure condition only.

<sup>12</sup> This sentence was provided for the voluntary disclosure condition only.

<sup>13</sup> This sentence was provided for the random disclosure condition only.

**3-2. Step 2: B's decision: Sustainable investment (This choice determines the multiplier  $e$ )**

- At the same time as step 1, Player B makes investment choices.

-The investment options are following three:

Option1: an environmentally friendly investment with multiplier  $e$  of 2.  
 CSR score = 96 points.

Option 2: an investment with a high environmental impact and multiplier  $e$  of 3.  
 CSR score = 28 points.

Option 3: an investment with a high environmental impact and multiplier  $e$  of either 1 or 5  
 (Note that the computer determines whether the final multiplier  $e$  with a 1/2 chance after the investment is made).  
 CSR score = 26 points.

-The CSR score is an index provided by a credit institution that indicates the degree to which a business investment responds to CSR.

-The higher the score, the greener the investment for future generations.

-The lower the score, the more environmentally damaging the investment, which will benefit the modern generation.

-The industry's average CSR score = 65.

-Reports issued by a credit institution are as follows:

Option1: CSR score = 96 points [High]

<b>Option 1</b>	<b>CSR score: 96 [high]</b>	<b>96</b>
Overall corporate social responsibility Score (industry average is 65)		
Industry rank (out of 56 companies)		<b>3</b>

<b>EMPLOYEES AND SUPPLY CHAIN</b>		<b>Score 97.0</b>
How the company compares with industry: all employee and supply chain policies, initiatives, and controversies. Individual scores range from 1 to 5, with 5 being the best.	<ul style="list-style-type: none"> <li>Labor-management relations: 5 out of 5</li> <li>Employee safety: 5 out of 5</li> <li>Workforce diversity: 5 out of 5</li> <li>Supply chain: 5 out of 5</li> </ul>	
<b>CUSTOMERS</b>		<b>Score 99.6</b>
How the company compares with industry: all customer-related policies, initiatives, and controversies. Individual scores range from 1 to 5, with 5 being the best.	<ul style="list-style-type: none"> <li>Marketing and advertising: 5 out of 5</li> <li>Product quality and safety: 5 out of 5</li> <li>Anticompetitive policies: 5 out of 5</li> <li>Customer relations: 5 out of 5</li> </ul>	
<b>COMMUNITY AND SOCIETY</b>		<b>Score 91.4</b>
How the company compares with industry: a measure of firm impact on community and social issues. Individual scores range from 1 to 5, with 5 being the best.	<ul style="list-style-type: none"> <li>Philanthropy: 3 out of 5</li> <li>Impact on community: 3 out of 5</li> <li>Human rights, civil and political: 3 out of 5</li> </ul>	
<b>ENVIRONMENTAL IMPACT</b>		<b>Score 96.0</b>
How the company compares with industry: a measure of environmental impact from global operations. Individual scores range from 1 to 5, with 5 being the best.	<ul style="list-style-type: none"> <li>Greenhouse gas emission/revenues: 3 out of 5</li> <li>Water use/revenues: 3 out of 5</li> <li>Waste/revenues: 3 out of 5</li> </ul>	

Option2: CSR score = 28 points [Low]

<b>Option 2</b>	<b>CSR score: 28 [Low]</b>	<b>28</b>
Overall corporate social responsibility Score (industry average is 65)		
Industry rank (out of 56 companies)		<b>54</b>

<b>EMPLOYEES AND SUPPLY CHAIN</b>		<b>Score 26.7</b>
How the company compares with industry: all employee and supply chain policies, initiatives, and controversies. Individual scores range from 1 to 5, with 5 being the best.	<ul style="list-style-type: none"> <li>Labor-management relations: 1 out of 5</li> <li>Employee safety: 1 out of 5</li> <li>Workforce diversity: 1 out of 5</li> <li>Supply chain: 1 out of 5</li> </ul>	
<b>CUSTOMERS</b>		<b>Score 30.3</b>
How the company compares with industry: all customer-related policies, initiatives, and controversies. Individual scores range from 1 to 5, with 5 being the best.	<ul style="list-style-type: none"> <li>Marketing and advertising: 1 out of 5</li> <li>Product quality and safety: 1 out of 5</li> <li>Anticompetitive policies: 1 out of 5</li> <li>Customer relations: 1 out of 5</li> </ul>	
<b>COMMUNITY AND SOCIETY</b>		<b>Score 29.5</b>
How the company compares with industry: a measure of firm impact on community and social issues. Individual scores range from 1 to 5, with 5 being the best.	<ul style="list-style-type: none"> <li>Philanthropy: 3 out of 5</li> <li>Impact on community: 3 out of 5</li> <li>Human rights, civil and political: 3 out of 5</li> </ul>	
<b>ENVIRONMENTAL IMPACT</b>		<b>Score 25.5</b>
How the company compares with industry: a measure of environmental impact from global operations. Individual scores range from 1 to 5, with 5 being the best.	<ul style="list-style-type: none"> <li>Greenhouse gas emission/revenues: 3 out of 5</li> <li>Water use/revenues: 3 out of 5</li> <li>Waste/revenues: 3 out of 5</li> </ul>	

Option3: CSR score = 26 points [Low]

Option 3	CSR score: 26 [Low]	26
Overall corporate social responsibility Score (industry average is 65)		
Industry rank (out of 56 companies)		55

<b>EMPLOYEES AND SUPPLY CHAIN</b>		<b>Score 25.2</b>
How the company compares with industry: all employee and supply chain policies, initiatives, and controversies. Individual scores range from 1 to 5, with 5 being the best.	<ul style="list-style-type: none"> <li>• Labor-management relations: 1 out of 5</li> <li>• Employee safety: 1 out of 5</li> <li>• Workforce diversity: 1 out of 5</li> <li>• Supply chain: 1 out of 5</li> </ul>	
<b>CUSTOMERS</b>		<b>Score 25.5</b>
How the company compares with industry: all customer-related policies, initiatives, and controversies. Individual scores range from 1 to 5, with 5 being the best.	<ul style="list-style-type: none"> <li>• Marketing and advertising: 1 out of 5</li> <li>• Product quality and safety: 1 out of 5</li> <li>• Anticompetitive policies: 1 out of 5</li> <li>• Customer relations: 1 out of 5</li> </ul>	
<b>COMMUNITY AND SOCIETY</b>		<b>Score 27.5</b>
How the company compares with industry: a measure of firm impact on community and social issues. Individual scores range from 1 to 5, with 5 being the best.	<ul style="list-style-type: none"> <li>• Philanthropy: 3 out of 5</li> <li>• Impact on community: 3 out of 5</li> <li>• Human rights, civil and political: 3 out of 5</li> </ul>	
<b>ENVIRONMENTAL IMPACT</b>		<b>Score 25.8</b>
How the company compares with industry: a measure of environmental impact from global operations. Individual scores range from 1 to 5, with 5 being the best.	<ul style="list-style-type: none"> <li>• Greenhouse gas emission/revenues: 3 out of 5</li> <li>• Water use/revenues: 3 out of 5</li> <li>• Waste/revenues: 3 out of 5</li> </ul>	

### 3-3. Step 3. A's decision

Player A is given 100 points. Player A decides how many of these points to send to Player B.

The amount to send is an integer between 0 and 100.

### 3-4. Step 4. The determination of the profit

Based on the above, the B's investment plan (option 1, 2 or 3) is executed, and the multiplier  $e$  is finalized. Multiplier  $e$  determines the funds to be acquired.

- Option 1: The multiple  $e$  would be 2.
- Option 2: Multiplier  $e$  would be 3.
- Option 3: There is a 1/2 chance that the multiplier  $e$  will be fixed at either 1 or 5.

Note that only Player B can know the fixed value of multiplier  $e$ .

Player A cannot know the fixed value even after the game is over.

Player B earns a return of funds received from A  $\times$  multiplier  $e$  from the investment made.

Player B then splits this return with A. That is, half of the return goes to A and the other half stays with B.

### 4. Points earned in each round

Your points earned in each round will be the sum of the funds you had on hand after the round.

The points are calculated in the following way:

**Points earned by Player A** = [Initial points on hand 100] – [funds given to B] + [funds returned from B]

**Points earned by Player B** =  $[[\text{Funds received from A}] \times [\text{multiplier } e]]/2$

### **5. Matching**

The sequence of decision-making described above is repeated 10 times. Pairs of Player A and B are determined randomly in each round by the computer. Thus, the decision-making process is not conducted repeatedly between the same participants.

### **6. Feedback information**

The feedback information at the end of each round was as follows:

Player A: your own action, B's action (only when disclosed), and your own payoff.

Player B: your own action, A's action, option 3's fixed value of multiplier  $e$  (only when choosing option 3) and your own payoff.

### **7. The rewards you will receive**

-The rewards you will receive for this experiment are:

Fixed compensation 2000 JPY + Performance pay (from 0 to 2000 JPY)

-Performance pay (from 0 to 2000 JPY) depends on the points you earn. In other words, the greater the points earned in the game, the greater the amount of performance pay you receive.

-Your points earned in the experiment are determined by extracting 2 of the 10 rounds (This round is determined by roulette after the experiment).

- Conversion rate between in-game points earned and your performance pay: performance pay of 100 JPY per 10 points.

(For example: 0 points in a game -> 0 JPY for performance pay

50 points in a game -> 500 JPY for performance pay)

### **Supplementary file S2. Time travel lecture**

Before the presenting experimental instructions, I gave all participants a lecture on how to time travel with referencing future design research (e.g., Cuhls 2017; Hara et al. 2019; Saijo 2020). It aimed to help participants assume the perspective of future generations during the game and to make participants feel more realistic about the high and low sustainable investment settings in the experiment. The following are the instructions that were presented to the participants.

\*\*\*\*\*

- In today's game, everyone will make decisions as a "virtual future person".
- First, let me explain the problems that the current Earth is facing. Do you know the concept of the Planetary Boundary (Earth's limit)? This is a discussion that we have already exceeded the "Earth's limit" in several areas such as climate change and biodiversity. Your own activities and the economic activities of the companies you know may be factors that exceed this Earth's limit.
- In response to this, guidelines for creating a sustainable society, such as SDGs, have been presented, and efforts towards a sustainable society are progressing. However, it is also true that various anxieties and problems related to politics and economics are currently occurring. What will happen to society in the future?
- With this problem awareness, here is a hint for making decisions in today's game. I will tell you the concept of virtual future person.
- You are a virtual future person who lives in 2050 about 30 years ahead at your current age. And let's assume that you, as a virtual future person, have time slipped to the present and are participating in today's game. Make decisions from such a perspective.
- The trick to gaining such a perspective is back casting. For example, let's look at the past from now. If you were to time slip to the past (1990) about 30 years ago, what message would you convey to the people of 1990?
- Just like this, let's look at the present from the future as a virtual future person. Let's assume that you are a virtual future person who lives in 2050 at your current age and has time slipped to the present and is participating in today's game. Please think about the decision of today's game from this back casting.

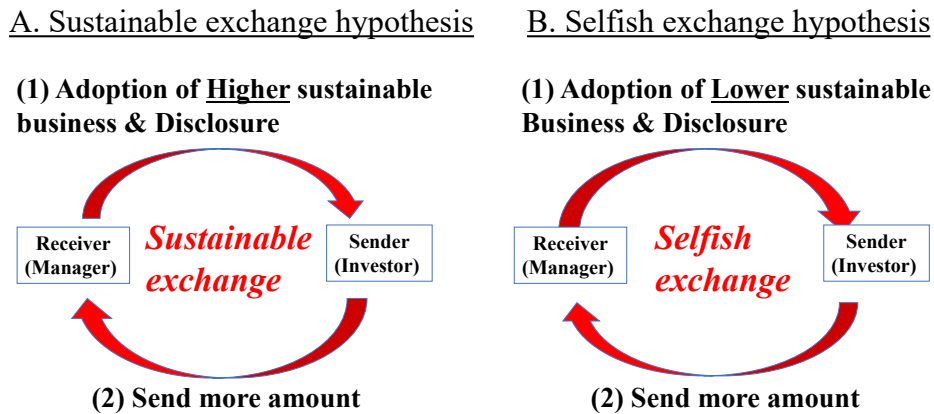


## Reference

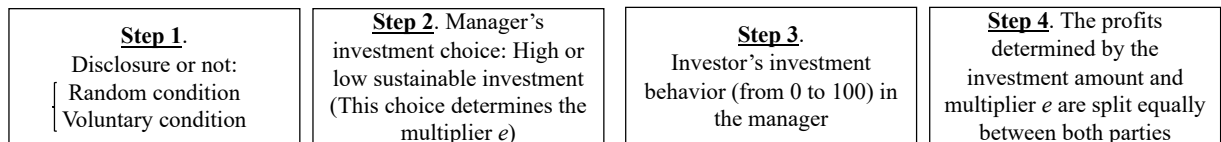
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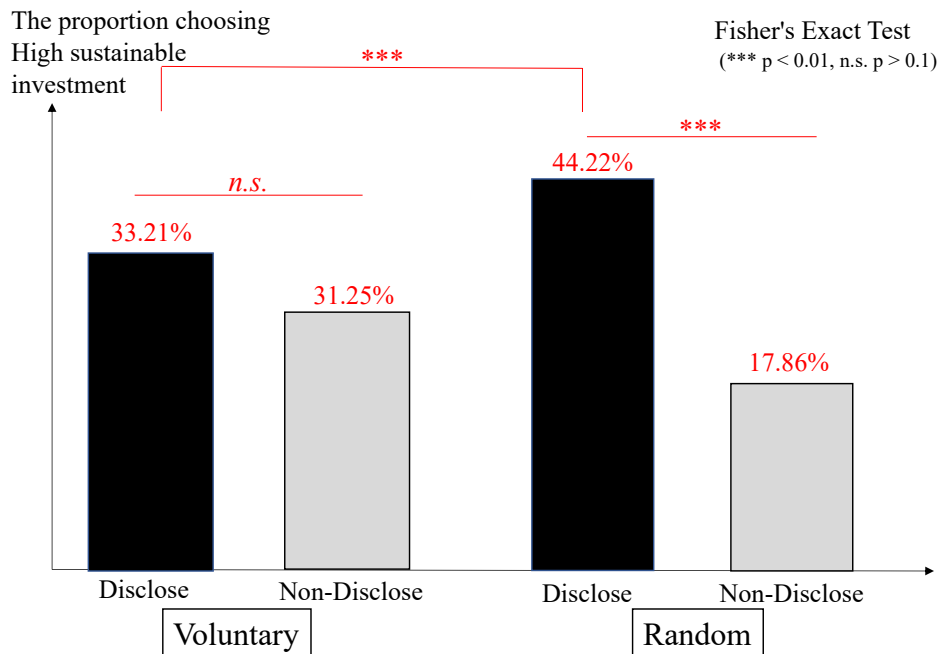
**Figure 1. Sustainable/ Selfish exchange hypotheses**



**Figure 2. Timeline of the game**

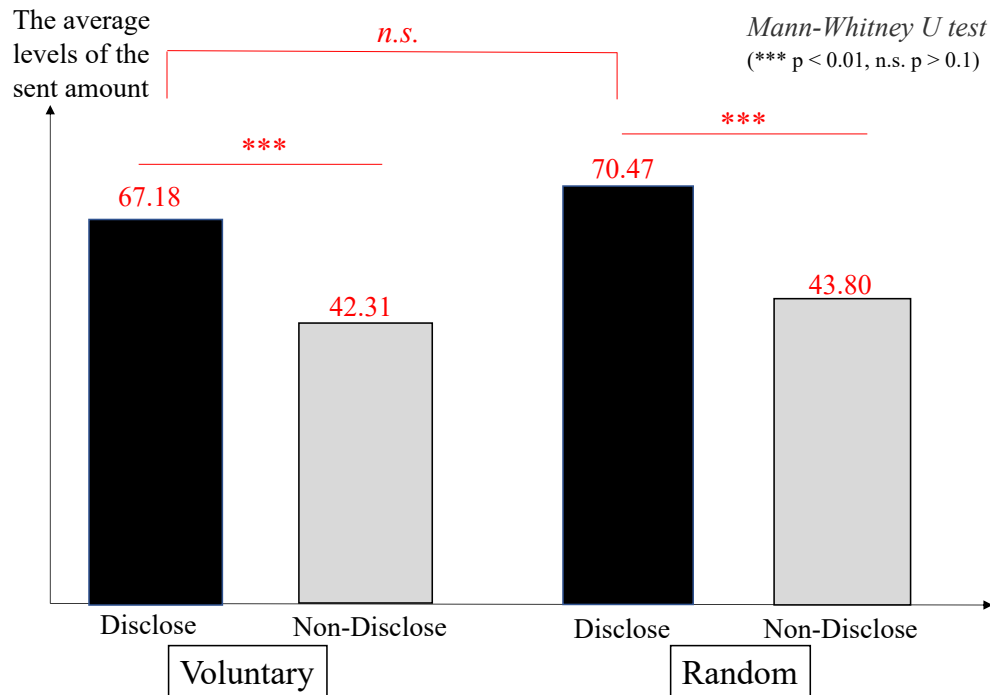


**Figure 3. Main results for H1: The manager's behavior**



Note: This figure shows the proportion choosing the high sustainable investment by the manager. "Disclosure" indicates cases where disclosure was made, and "Non-Disclosure" indicates cases where no disclosure was made.

**Figure 4. Main results for H2: The investor’s behavior**

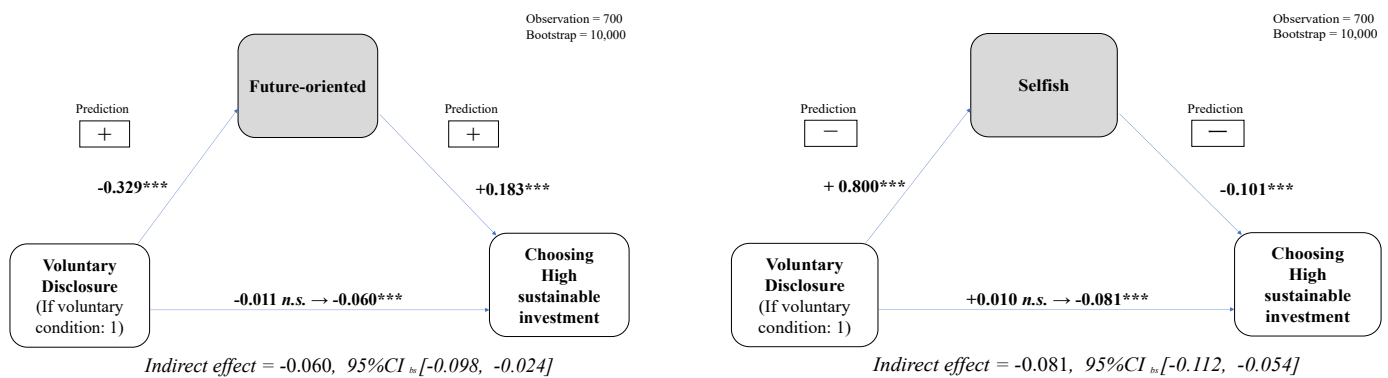


Note: This figure shows the average levels of the sent amount by the investor. “Disclosure” indicates cases where disclosure was made, and “Non-Disclosure” indicates cases where no disclosure was made.

**Figure 5. Main results for H3: The mediating effect of the manager’s behavior**

**Panel A. Mediating effect by Future-oriented**

**Panel B. Mediating effect by Selfish**



Note: These figures show the mediating effect of managers’ behavior: Panel A shows that by future-oriented, and Panel B, by Selfish. The explanations of the mediated variables are shown in the supplementary file S4.

**Table 1. Descriptive statistics**

**Panel A. Frequency of the manager's investment by condition**

	Voluntary			Random		
	Total	Disclosure	Non-Disclosure	Total	Disclosure	Non-Disclosure
High sustainable	32.85%	33.21%	31.25%	40.00%	44.22%	17.86%
	(115/350)	(95/286)	(20/64)	(140/350)	(130/294)	(10/56)
Low and certainty sustainable	49.71%	53.14%	34.37%	42.00%	42.52%	39.29%
	(174/350)	(152/286)	(22/64)	(147/350)	(125/294)	(22/56)
Low and uncertainty sustainable	17.42%	13.63%	34.37%	18.00%	13.27%	42.86%
	(61/350)	(39/286)	(22/64)	(63/350)	(39/294)	(24/56)

**Panel B. The levels of the investors' investment behavior by conditions**

		Voluntary	Random
Total	Mean	62.64	66.21
	Median	70.00	80.00
	S.D.	38.22	37.17
	N	350	350
Disclosure Total		Mean	67.18
		Median	70.47
		S.D.	81.50
		N	37.06
Disclosure & High sustainable		Mean	70.47
		Median	71.74
		S.D.	73.54
		N	100.00
Disclosure & Low, Certainty		Mean	37.35
		Median	36.33
		S.D.	37.35
		N	95
		Mean	130
		Median	75.12
		S.D.	100
		N	30.71

	N	152	125
Disclosure	Mean	41.21	45.38
& Low, Uncertainty	Median	30	40
	S.D.	35.16	39.85
	N	39	39
<hr/>			
Non-Disclosure	Mean	42.31	43.80
Total	Median	45.00	40.00
	S.D.	36.94	36.34
	N	64	56

Note: Panel A shows the frequency of management investments chosen by the manager for each condition. The numbers in parentheses indicate frequency, and the numerical values represent proportions. “Disclosure” indicates cases where disclosure was made, and “Non-Disclosure” indicates cases where no disclosure was made. Panel B represents the levels of the investors’ investment behavior by conditions.

**Table 2. The result of the random-effects and population-averaged probit models for the manager's choosing the high sustainable investment**

VARIABLES	Model (1)	Model (2)	Model (3)	Model (4)
	High sustainable dummy			
<i>Voluntary Dummy</i>	-0.276	-0.325	0.435	0.322
(Voluntary: 1)	(-0.782)	(-0.987)	(0.928)	(0.709)
<i>Disclose Dummy</i>	0.475***	0.500***	0.859***	0.853***
(Disclose: 1)	(2.603)	(2.746)	(3.386)	(3.358)
<i>Voluntary × Disclose</i>			-0.850**	-0.772**
			(-2.310)	(-2.099)
<i>Rec_period</i>	0.362	0.358	0.371*	0.368
	(1.627)	(1.602)	(1.657)	(1.639)
<i>Risk</i>		0.078		0.081
		(0.474)		(0.485)
<i>Prosocial dummy</i>		-0.399		-0.382
(Prosocial: 1)		(-1.175)		(-1.110)
<i>Gender (female: 1)</i>		1.379***		1.351***
		(3.901)		(3.774)
Constant	-0.950***	-1.544***	-1.283***	-1.846***
	(-3.147)	(-3.971)	(-3.757)	(-4.362)
Observations	700	700	700	700
Number of Participants	70	70	70	70

Note: This table shows the result of the random-effects and population-averaged probit models. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. “*Voluntary Dummy*” is a dummy variable that is 1 if it is the voluntary condition. “*Disclose Dummy*” is a dummy variable that is 1 if the disclosure option is exercised. “*Risk*” represents participants’ risk score (see supplementary file S4). This scale is standardized. “*RecPeriod*” represents the reciprocal of the number of rounds. “*Prosocial\_Dummy*” is a dummy variable that is 1 if the participant has a prosocial tendency. We used the Van Lange’s et al. (1997) SVO scale. “*Gender*” is a dummy variable that is 1 if the participant is female.

**Table 3. The results of the random-effect tobit models for investors' investment behavior with subsample restricted to the with-disclosure case**

VARIABLES	Model (1)	Model (2)	Model (3)	Model (4)
	Sent amount			
Voluntary Dummy	-1.667 (-0.129)	-2.702 (-0.198)	0.033 (0.003)	-1.101 (-0.084)
High sustainable Dummy	19.024*** (3.120)	17.689** (2.132)	19.134*** (3.142)	17.660** (2.131)
VoluntaryDummy × High sustainable Dummy		2.872 (0.237)		3.168 (0.262)
Rec_period	-24.977** (-2.439)	-24.995** (-2.441)	-25.056** (-2.446)	-25.071** (-2.448)
Risk			8.083 (1.270)	8.099 (1.273)
Prosocial Dummy			17.165 (1.370)	17.217 (1.374)
Gender			-9.241 (-0.705)	-9.195 (-0.701)
Constant	94.213*** (9.452)	94.753*** (9.262)	88.873*** (7.052)	89.425*** (6.997)
Observations	580	580	580	580
Number of participants	70	70	70	70

Note: This table shows the results of the random-effect tobit models for investors' investment behavior with subsample restricted to the with-disclosure case. "High sustainable Dummy" is a dummy variable that is 1 if the manager chooses a high sustainable investment. See note in table 2 for other variables. z-statistics in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.



**Table 4. Descriptive statistics of mediated variables**

		Total	Voluntary			Random		
			Total	Sender	Receiver	Total	Sender	Receiver
<b>Future-oriented</b>	Mean	4.61	4.63	4.88	4.38	4.60	4.48	4.71
	S.D.	1.35	1.34	1.38	1.26	1.38	1.29	1.48
<b>Selfish</b>	Mean	5.42	5.51	5.17	5.85	5.32	5.60	5.05
	S.D.	1.59	1.47	1.61	1.24	1.70	1.51	1.86
<b>Sender-Disclosure</b>	Mean		-	5.48	-	-	5.62	-
	S.D.		-	1.78	-	-	1.66	-
<b>receiver-Disclosure</b>	Mean		-	-	6.14	-	-	5.71
	S.D.		-	-	1.47	-	-	1.75
Observation		140	70	35	35	70	35	35

Note: This table shows the descriptive statistics of mediated variables. For explanations of each variable, please refer to Supplementary S4.