Watching and being watched effects on human interaction: Evidence from a trust game

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Abstract

Although face-to-face communication amplifies human trust, one of the crucial factors for important decisions with others, human interaction have made online instead of in person through the technological breakthrough and pandemic. To investigate two situations arise from online human interaction where you cannot see other peoples' faces, but you are being watched, and vice versa, in this paper, I measure the effects of both watching and being watched separately on human interaction using a trust game. Firstly, I theoretically identify the two effects and derive the optimal behavior for a trust game. Secondly, I empirically validate the it through a randomized controlled trials. In my experiment, more than half the participants follows the optimal behavior, and both watching and being watched enhance human trust and reciprocity. I additionally observe that trust gets large when participants are paired with opposite gender and watch their partner, and women become more reciprocate when they are watched by their partner. These results propose a framework, which watching and being watched affect human trust and reciprocity separately, and the importance of face-to-face communication in online human interaction.

JEL classification: C72, C91, D63, D91

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1 Introduction

Trust is one of the keys for important decisions with others and affects human purchase actions (Gefen, 2000). We do not lend money to unknown people; companies do not purchase from untrusted sales persons. Trust is more likely to succeed under face-to-face communication than under electronic contexts (Rocco, 1998), and it depends on who you are interacting with (Glaeser et al., 2000; Wilson and Eckel, 2006). As the technological breakthrough and pandemic, however, our decisions have made online in stead of face-to-face. In the COVID-19 situation, for example, since many companies have been forced to introduce working from home, their important decision-making meetings have held online instead of in person. Through online human interaction, two situations arise where you cannot see other peoples' faces, but you are being watched, and vice versa. Although a large number of papers have discussed the importance of face-to-face communication, the effect of being watched by others are not paid attention in the context of trust even though we often care about what we are seen as.

In this paper, I measure the effects of both watching and being watched separately on human interaction using a trust game. I firstly introduce a theoretical framework to capture watching and being watched effects on trust and reciprocity, and secondly derive optimal behaviors for the trust game. As for trust games, over 150 trust games have been conducted around the world (Johnson and Mislin, 2011), but there is no established theoretical framework to interpret prevailing patterns of deviation from Nash equilibrium where players send/return nothing each other. Therefore, this paper also contributes to introducing a theoretical framework and deriving optimal behaviors for trust games. Finally, I empirically validate the two effects through a randomized controlled experiment.

2 Theory

To capture watching and being watched effects on trust games, I introduce a theoretical framework for a trust game which are started from Berg et al. (1995) as follows. Let x_1 be a sender's amount sent and x_2 be a receiver's amount returned. Assuming that the first endowment is w, the profit of the sender, v_1, is $w - x_1 + x_2$. Similarly, the profit of the receiver, v_2, is $3x_1 - x_2$. According to Fehr & Schmidt (1999) and Bursztyn & Jensen (2017), the utility function with social pressure term is represented by

$$U_i(x_i, x_{-i}) = v_i - \alpha_i \max\{v_{-i} - v_i, 0\} - (\beta_i + \lambda_i) \max\{v_{-i} - v_i, 0\}$$

where α_i and β_i are i's envy aversion parameter and guilt aversion parameter respectively ($\alpha_i \geq \beta_i \geq 0$). $\lambda_i (\geq 0)$ is i's social pressure parameter and it represents how he or she cares about what he or she is seen as. For simplicity, we assume that both the sender and the receiver choose higher amount if their utilities are same, i.e., $\forall i \in \{1, 2\}$ $x_i^* = x_i'$ if $U_i(x_i', x_{-i}) = U_i(x_i'', x_{-i})$ s.t. $x_i' \geq x_i''$. Let $\gamma_i = \beta_i + \lambda_i$.

From the backward induction, the optimal behavior of the receiver is as bellow

$$x_2^*(x_1) = \begin{cases} 0 & \text{if } 0 \leq x_1 < \frac{w}{4} \vee \gamma_2 < \frac{1}{2} \\ 2x_1 - \frac{w}{2} & \text{if } \frac{w}{4} \leq x_1 \leq w \wedge \gamma_2 \geq \frac{1}{2} \end{cases}$$

It means that the receiver returns nothing in two cases: he gets low values from his partner, or he is not a

reciprocator. If he is a reciprocator and gets high values from his partner, on the other hand, he equalizes the profits with his partner.

As for the sender, she decides her behavior depending on her partner's guilt aversion parameter and social pressure parameter from the above discussion. We consider the case that the sender does not know her partner's γ_2. Let p be the sender's belief that her partner is a reciprocator ($\gamma_2 \geq \frac{1}{2}$), the optimal behavior of the sender in which she does not know her partner's γ_2 is as bellow

$$x_1^* = \begin{cases} w & \text{if } \alpha_1 \leq p^* \wedge \gamma_1 \geq f(\alpha_1, p) \\ \frac{w}{4} & \text{if } \alpha_1 > p^* \wedge \gamma_1 \geq \frac{1}{4} \\ 0 & o.w. \end{cases}$$

where $p^* = \frac{2p-1}{4(1-p)}$ and $f(\alpha_1, p) = 1 - \frac{3}{2}p + 3\alpha_1(1-p)$
Since $\frac{\partial p^*}{\partial p} > 0$, $\frac{\partial f(\alpha_1,p)}{\partial \alpha_1} > 0$, and $\frac{\partial f(\alpha_1,p)}{\partial p} < 0$, the optimal behavior indicates that the sender gives all her first endowment to her partner if she is not so envious and believes that her partner is a reciprocator. If she is an envious woman or thinks that her partner returns nothing, on the other hand, she gives only one forth of the first endowment. She sends nothing if she is not altruistic nor worried about what she is seen as.

3 Experimental design

3.1 Procedure

Experiments[1] were conducted nine times from January 8th to January 16th of 2019 at the University of Tokyo. We recruited participants via Social Networking Services, mainly LINE and Twitter, and, as a result, 249[2] students took part in our experiment. Approximately 70% of the students were from the University of Tokyo, and the rest were from other universities around Tokyo. In this experiment, participants played a trust game on computer devices. First endowment, w, was set to 1000 yen and sender's choice set was $X_1 = \{0, \cdots, 1000\}$. Receiver's choice set was $X_2(x_1) = \{0, \cdots, 3x_1\}$.

Participants played the trust game two times. In each game, computer program randomly made 14 pairs out of 28 participants. At the same time, one was assigned to a sender and the other was assigned to a receiver in each pair. The role was displayed on participants' computer screens at the beginning of each game. Participants played the trust game with their partner in real time. During the experiment, the microphone of all computer devices were turned off, and communication among participants including gestures was not allowed.

3.2 Treatment

In this experiment, to capture watching and being watched effects, participants were randomly assigned to four groups: Control group, Treatment 1 group, Treatment 2 group, and Treatment 3 group. The differences among the four groups were made by a video chat tool, Appear.in. If individual i belongs to Control group, the camera of the computer devices are turned off for both i and i's partner so that i knows nothing about i's partner and vice versa (See Figure 1). If i belongs to Treatment 1 group, the camera of i's computer device is turned off,

[1] I used oTree (Chen et al., 2016) in the experiments

[2] Capacity of each time was 28 people. To fill up vacancies, experimenters complementarily took part in experiments. Their data were omitted from the dataset.

but that of i's partner is turned on so that only i can watch his or her partner. If i belongs to Treatment 2 group, on the contrary to Treatment 1 group, i's camera is turned on and his or her partner's camera is turned off. i has no way to watch his or her partner, but i is watched by his or her partner. In Treatment 3 group, both cameras are turned on so that i and i's partner can watch each other (See Figure 2).

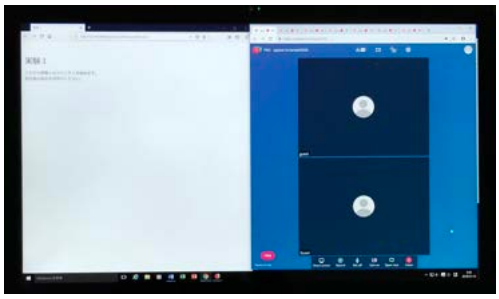

Figure 1: Screen of Control group

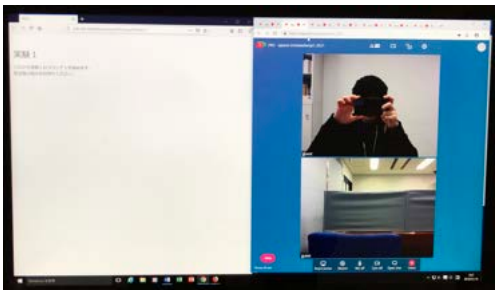

Figure 2: Screen of Treatment 3 group

4 Result

4.1 Optimal behavior

Figure 3 plots senders' amount sent and receivers' amount returned on a bubble chart. x axis shows senders' amount sent, and y axis shows receivers' amount returned. Size of circle indicates the frequency of each combination. 52.6% of senders followed the optimal behavior and over 70% of them sent all their first endowment to their partners. As for receivers, 62.4% of receivers followed the optimal behaviors discussed in Section 2, and almost all bubbles lies on red line, which is optimal behavior for reciprocators. It shows that majority of receivers equalize their profits with their partners if they got high trust and return nothing if they got low trust. Let (x_1, x_2) be the combination of senders' amount sent and receivers' amount returned, $(1000, 1500)$ was most occurred in this experiment and this result is Pareto optimal for senders and receivers.

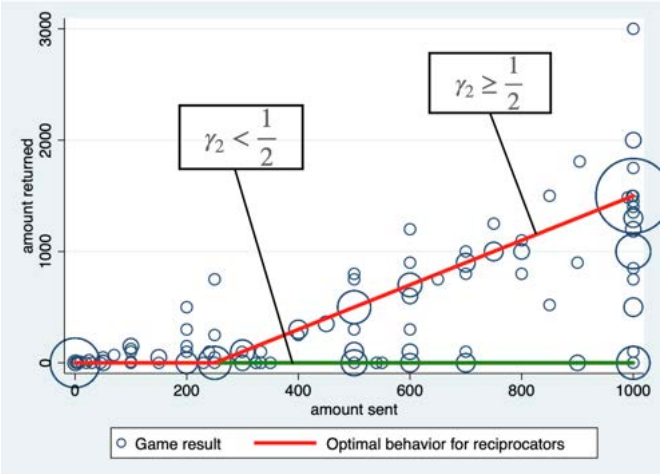

Figure 3: Bubble chart of senders' and receivers' behavior

4.2 Treatment effect

Figure 4 shows histograms of $v_1 - v_2$ for each treatment group for interpreting treatment effects towards receivers because they finally decide the values of $v_1 - v_2$, while senders could not. Focusing on treatment effects on γ_2, I consider only the case $x_1 \in (\frac{w}{4}, w]$ because all receivers return nothing regardless of their own γ_2 when their partner chooses their amount sent from $[0, \frac{w}{4}]$. If receivers follows the optimal behavior, as they choose $x_2^*(x_1) = 2x_1 - \frac{w}{2}$ in this case, it achieves $v_1 = v_2$. From the figures, all treatment groups decrease the proportion of $v_1 - v_2 < 0$ and increase that of $v_1 = v_2$. This result supports that there are positive effects on γ_2 in treatment groups. Especially in Treatment group 3, the treatment effect is the largest among treatment groups. More than 60% of receivers equalize their profits with their partners, while 35% in Control group. Treatment 3 group is significantly higher than Control group in Mann-Whitney U test (p-value is .0038).

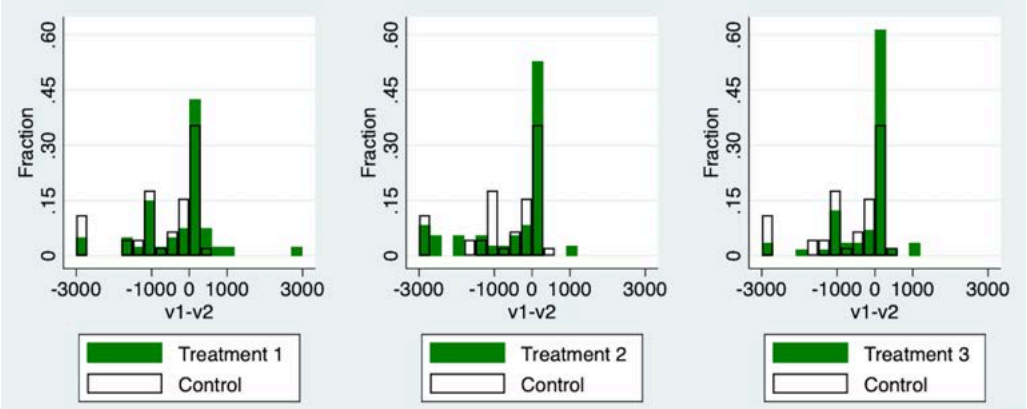

Figure 4: Treatment effects on receivers

Figure 5 shows histograms of x_1 for each treatment group. All treatments decrease the proportion of sending nothing to receivers and increase that of sending all their first endowment. In particular, Treatment 3 nearly quarters the proportion of $x_1 = 0$ and doubles that of $x_1 = 1000$ when we compare with Control group. Treatment 3 group is significantly higher than Control group in Mann-Whitney U test (p-value is .0140).

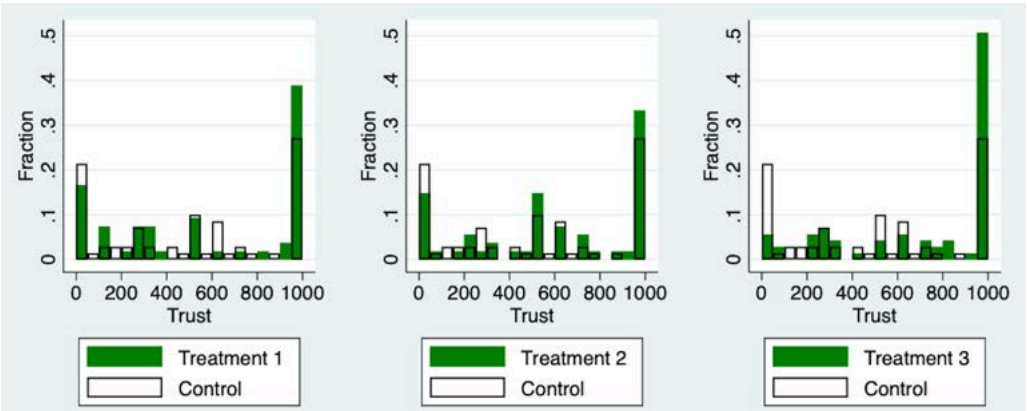

Figure 5: Treatment effects on senders

In more detail about being watched effect, Treatment 2 and 3, Figure 6 describes being watched effect on $Pr(v_1 - v_2 \geq 0)$ conditional on receivers' own gender. Being watched effect gets larger towards women than men, and the difference is significantly greater than zero (p-value is .0510). This difference is not founded for senders nor for watching effect. Therefore, as women would care more about what they are seen as than

men do, women are more likely to equalize the profits with their partner in order to let their partner thinks that she is reciprocator. When it comes to watching effect, Treatment 1 and 3, Figure 7 shows watching effect on $Pr(x_1 > 250)$ conditional on partner's gender. The proportion of senders who send more than 250 increases when they are paired with opposite gender participant, and the change, comparing the case with same gender partner, is significantly different from zero (p-value is .0598). This difference is not founded for receivers nor for being watched effect. From this result, watching opposite gender's partner would increase not only senders' guilt aversion parameter β_2 but also senders' beliefs, p, that their partner is a reciprocator.

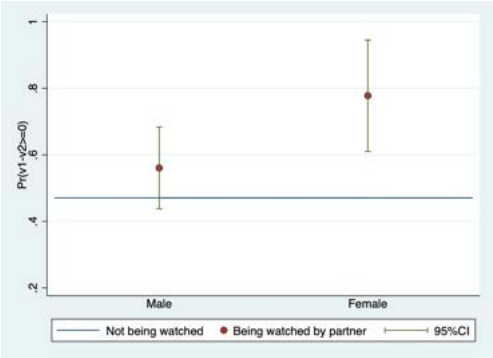

Figure 6: Watched effect towards receivers

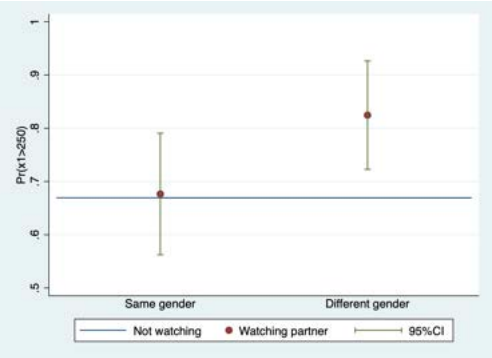

Figure 7: Watching effect towards senders

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