Trust, Lies, and Inequality

Ninghua Du[1]

Shanghai University of Finance and Economics

Shan Gui[2]

George Mason University

Daniel Houser[3]

George Mason University

Abstract

The effect of endowment equality on trust may stem from outcome inequality aversion or changes in expected trustworthiness. Here, we measure trust as the expectation of honesty in a sender-receiver game (Gneezy, 2005) where participants must make trust decisions without knowing the outcome. Our design enables us to isolate the effect of initial endowment inequality on trust. Our results show that endowment inequality reduces trust regardless of whether it favors the sender or the receiver. We further find that the frequency of lies is insensitive to endowment inequality. Our results amplify the importance of equal starting positions on promoting trust.

Keywords: Inequality, Endowment, Lie, Trust

1. Introduction

Wealth inequality can hamper economic growth (Knack and Keefer, 1997; Zak and Knack, 2001). Institutional inequality is associated with low trust (Alesina and La Ferrara, 2002; Haile et al., 2008b), which is known to reduce state level investment (Gustavsson and Jordahl, 2008). Cross-sectional studies provide empirical insights on the impact of inequality at the macro-level; however, micro-level evidence focused on unequal initial positions is still needed (Durlauf, 2002).

Experiments provide mixed evidence on how initial endowment inequality affects specific trust. Few studies have focused on manipulating initial endowment distributions between investors and trustees in a trust game (Berg et al., 1995). One of them, Anderson et al. (2006), found greater trust levels among investors in advantageous inequality when the inequality on the initial payment was public knowledge. Another, Xiao and Bicchieri (2010), found indifferent trust choices, as well as the fact that trustees had lower expectations of trustworthiness when investors were in advantageous inequality. Brülhart and Usunier (2012) found that initial endowment did not affect trust level, and Greiner et al. (2012) found that both advantageous and disadvantageous inequality could reduce trust levels.

Trust can be challenging to define and measure (Glaeser et al., 2000). In the aforementioned experiments, trust is measured as the amount investors send in the trust game (Berg et al., 1995). However, the interplay between outcome inequality aversion and anticipated trustworthiness (reciprocity) makes the effect of initial endowment on trust unclear. The reason is that investors can anticipate outcomes, given the public initial endowment and the common rule that any transfer to a trustee is tripled. For example, in Greiner et al. (2012), investors' low transfer rate when facing poor trustees cannot be explained by outcome inequality aversion. This indicates that investors expect trustees to be less trustworthy under inequality. It is difficult to distinguish whether lower expectations of trustworthiness stem from observed initial endowment inequality or anticipated outcome inequality (investors may anticipate trustees returning less under inequality). For the same reason, trust measured as willingness to pay to avoid being vulnerable to the target of trust in the distrust game

(McEvily et al., 2012) cannot exclude the effect of outcome inequality aversion on trust.

To eliminate the effect of anticipated outcome inequality and isolate the effect of initial endowment inequality on trust, we measure trust as the expectation of honesty in a sender-receiver game Gneezy (2005). In the sender-receiver game, only the sender is informed of the monetary consequences of the two options. The sender may lie to their receiver when sending the message. If the receiver follows the message sent by their sender, they are considered trusting. Based on this setting, we vary public initial endowments of the senders and receivers among three treatments. In Control, both senders and receivers receive an equal initial endowment. In the Sender Better treatment, receivers receive the same endowment as in Control, while senders receive relatively more. In the Receiver Better treatment, receivers receive relatively more. Given that receivers cannot know the consequences of their actions, any treatment differences on the rate of following messages indicate the pure effect of initial endowment inequality on trust, i.e., the receiver's expectation of honesty.

We find the highest trust rate when the initial endowment is equal. We further find that both advantageous and disadvantageous initial endowment inequality reduces receivers' trust. This finding is consistent with the results in Xiao and Bicchieri (2010) and in McEvily et al. (2012), all of which used trust games (Berg et al., 1995). However, our design further indicates that the effect of initial endowment inequality on trust does not necessarily derive from outcome inequality aversion or reciprocity. While receivers expect senders to lie more in inequality treatments, the percentage of actual lies in our experiment is similar across all treatments.

We further collect senders' motives using the method provided by Sutter (2009). While senders under disadvantaged initial endowment inequality are more likely to expect favorable outcomes for themselves, their inequality-sensitive motives are masked by a significant amount of strategic honesty. As a result, there is inconsistency between the receiver's expectation about lies and the actual lying behavior of the sender.

Our experiment based on the sender-receiver game (Gneezy, 2005) is a complementary design to literature investigating the effect of initial endowment inequality on trust. Our findings provide micro-level evidence on the pure negative effect of initial endowment in-

equality on trust. This finding helps explain heterogeneous trust levels among societies or countries and provides insights on reducing lies and improving trust. We further emphasize the importance of equality principles in social preference and economic behaviors.

The remainder of the paper is organized as follows: Section 2 introduces the experimental design; Section 3 discusses our experimental results; and Section 4 concludes.

2. Design and Hypothesis

2.1. Experimental Design

Sender-receiver game (Gneezy, 2005) with public initial endowments

Our experiment is a variant of the sender-receiver game (Gneezy, 2005) with public initial endowments. Participants learn that their payoff has two components: the initial endowment, and the experimental payoff. The initial endowment drawn by the computer is either ¥8 or ¥ 0, while the experimental payoff depends on the participants' choices in the experiment.

Participants play the role of sender or receiver, with equal probability. When a sender and receiver are paired, their initial endowments are public information within the group. There are two options, A or B, with different monetary consequences for group members: in option A, the sender earns ¥15 and the receiver earns ¥10; in option B, the sender earns ¥10 and the receiver earns ¥15.

Only the sender is informed about the monetary consequences. The sender sends one of the following two messages to the receiver:

Message A: "Option A will earn you more money."
Message B: "Option B will earn you more money."

After receiving the message sent by their sender, the receiver chooses either option A or option B to be implemented for the group.

Considering potential strategic lies (Sutter, 2009), after choosing the message sent to the Receiver, the sender is required to answer question Q:

"Which option do you expect the receiver to choose?". [4]

In our experiment, the sender sending Message A is considered to be lying, and the receiver choosing the option consistent with the message sent by their sender is considered trusting. We use the sender's answer to question Q to represent their true motive.

Treatments

To investigate the role initial endowment inequality plays in trusting and lying behavior, we design three treatments that vary in initial endowment distribution between the sender and the receiver. As shown in Table 1, in Control, both the sender and the receiver receive a ¥0 initial endowment. In the Receiver Better treatment, the initial endowment is ¥0 for the sender and ¥8 for the receiver. In the Sender Better treatment, the initial endowment is ¥8 for the sender and ¥0 for the receiver. Our experiment uses a between-subject design.

	Initial Endowment	
Treatment	Sender	Receiver
Control	0	0
Receiver Better	0	8
Sender Better	0	8

Table 1: Initial Endowment Distribution (¥) in each Treatment

2.2. Hypotheses

Given that senders know the monetary consequences of the two options, we extend the outcome inequality aversion (Fehr and Schmidt, 1999) to initial endowment inequality aversion for our first hypothesis on the lying behavior of the sender. Senders in the Receiver Better Treatment may observe the initial group endowment distribution and decide to lie to reduce inequality and extract a better experimental payoff for themselves. Indeed, their disadvantageous position makes them more likely than senders in the Control treatment to

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[4]Following Sutter (2009), we do not incentivize the answer with money.

lie. For the same reason, senders in the Sender Better treatment may lie less due to their position of advantageous initial endowment inequality. We have our Hypothesis 1.

Hypothesis 1. *The faction of lies is greatest in treatment Receiver Better, then in Control, and lowest in Sender Better.*

The second hypothesis is on the receiver's choice of trust. In contrast to the sender, the receiver only knows the message sent by their sender. The receiver has no information about monetary consequences. This setting excludes the effect of outcome inequality aversion on trust behavior, allowing us to study the pure effect of initial endowment inequality on trust. Given that current experiments provide mixed evidence on the relationship between inequality and trust[5], we make no hypothesis on the direction of the pure effect of initial endowment inequality on trust. Our second hypothesis is stated below.

Hypothesis 2. *The choice to trust is the same among Control, Receiver Better treatment, and Sender Better treatment.*

Our final hypothesis about the sender's expectation is in the same vein as Hypothesis 1. After observing the initial endowment distribution within the group, outcome inequality aversion (Fehr and Schmidt, 1999) predicts that more senders in the Receiver Better treatment expect receivers to choose option A, as compared with Control. Similarly, to reduce outcome inequality, more senders in the Sender Better treatment should expect Option B, which favors receivers. We have our Hypothesis 3.

Hypothesis 3. *The percentage of Senders expecting option A is greatest in Receiver Better, then in Control, and lowest in Sender Better.*

Experiment Procedure

Participants from Shanghai University of Finance and Economics (SUFE) were recruited. We recruited subjects from the Wenjuanxing platform (`https://www.wjx.cn/`) and preselected subjects over 18-year-old. The experiment was programmed in zTree3.6.7 and conducted from November 2016 to January 2017 at the Experimental Economics Laboratory

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[5]See Section 1; positive effect (Anderson et al., 2006), no effect (Brülhart and Usunier, 2012) and negative effect (Xiao and Bicchieri, 2010; Greiner et al., 2012) are found in literature.

in SUFE. 258 undergraduate students in SUFE were randomly assigned to one of the 3 treatments. Participants were paid in cash privately after completing the demographic questionnaire following the Sender-Receiver game. See Appendix A for instructions.

3. Results

Among 258 participants, there were 84 participants in Control, 88 in the Receiver Better treatment, and 86 in the Sender Better treatment. In each treatment, half of the participants were senders and the other half were receivers. While we did not explicitly control for this, we realized balanced gender across treatments.[6] The average payoff was ¥15.20. In Section 3.1, we report the lying behavior of senders. In Section 3.2, we present treatment differences in the trust choices of receivers. Section 3.3 discusses senders' expectations.

3.1. Inequality-Insensitive Lies

We first test Hypothesis 1 by comparing the percentage of lies (sending wrong Message A) among treatments. The outcome inequality aversion predicts the greatest rate of lying in Receiver Better, then in Control, and then in Sender Better. However, experimental results show no difference among treatments (p=0.25, Jonckheere trend test).

Figure 1 reports the percentage of senders sending Message A to their Receivers in each treatment.[7] In Control, 33.33% of senders in Control lied by sending the wrong message A to their Receiver. In Receiver Better, 38.64% of senders (slightly more than in Control) lied. The increasing deception rate is not statistically significant (p=0.31, one-sided t-test). This shows that the initial endowment inequality favoring receivers did not drive more lying behavior of senders. Similarly, in Sender better, 30.23% of senders (slightly less than in Control) lied. The decreasing deception rate is not statistically significant (p=0.38,

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[6]Consistent with the gender distribution in SUFE, 33.74% of participants were male. There was no gender difference among treatments (p=0.64) between experimental roles (p=0.15), or their interaction (p=0.73, ANOVA). We do not observe gender differences in later analysis.

[7]Whisker bars represent one standard error of the mean.

one-sided t-test), indicating that the initial endowment inequality favoring senders did not reduce their lies.
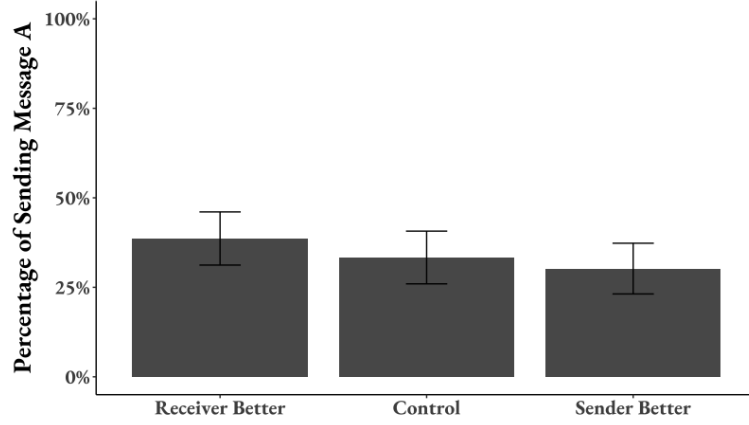

Figure 1: Percentage of Lies in each Treatment

We conclude our first result as below:

Result 1. *Hypothesis 1 is not supported. The percentage of lies does not significantly differ among treatments. Lying behavior is insensitive to initial endowment.*

3.2. Negative Effect of Initial Endowment Inequality on Trust

We test Hypothesis 2 by comparing the percentage of receivers who followed messages sent by their senders among treatments. While we do not predict any treatment difference in trust choice, our experimental results show significantly lower trust rates in the two treatments with initial endowment inequality. Given that receivers are not informed of the monetary consequences of the two options, this finding indicates the pure negative effect of initial endowment inequality on trust.

Figure 2 reports the percentage of senders following messages sent by their senders.[8] In Control, 95.24% of receivers followed their senders' messages. In Receiver Better, only 70.45% of receivers followed their senders' messages. The decrease in trust is statistically significant (p=0.02, one-sided t-test). This indicates that the initial endowment inequality

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[8]Whisker bars represent one standard error of the mean.

favoring receivers tends to make receivers perceive their senders as less trustworthy. Similarly, in Sender Better, 81.40% of receivers trusted senders and followed their messages. The decreasing trust rate is statistically significant (p=0.01, one-sided t-test). There is no significant difference between the trust rate in Receiver Better and in Sender Better, indicating that the initial endowment inequality favoring either side has the same effect in reducing the trust rate of receivers. Measuring the initial endowment inequality as the difference between initial endowment of senders and that of receivers, the relationship between initial endowment inequality with trust exhibits an inverted "U-shape". As suggested by Glaeser et al. (2000) and Fershtman and Gneezy (2001), wealth differences among economic agents may create greater social distance, and thus hamper trust. Our experimental results suggest that endowment differences may create distance between the receiver and the sender. The receiver may thus view their sender as less trustworthy.
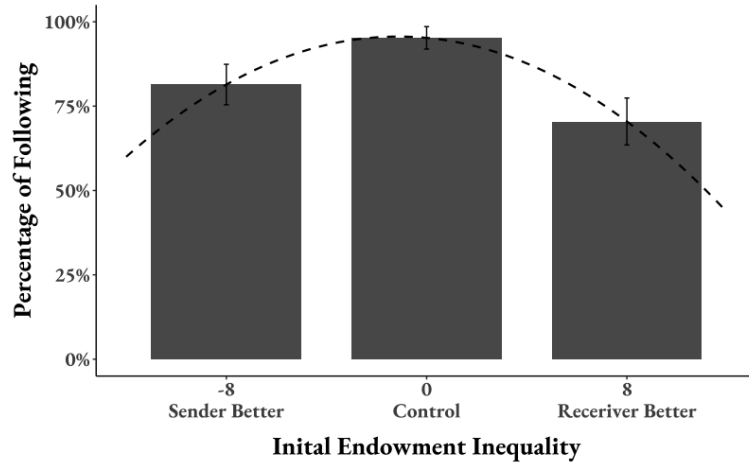

Figure 2: Trust rate in each Treatment

We use OLS regression to further investigate the effect of initial endowment inequality on lies and trust. As shown in Table 2, we regress whether the sender lies on the message in Regressions (1) and (2), and regress whether the receiver follows the message sent by their sender in Regressions (3) and (4). Independent variables are treatment conditions, gender and partisanship. Considering lying behaviors first, insignificant β_1 and β_2 in Regression (1) show that initial endowment inequality does not affect lying behavior of senders. Regression

(2) confirms this finding when control variables are included. These findings further support our Result 1.

On the trust side, the significant negative β_1 in Regression (3) shows that the initial endowment inequality favoring senders reduces trust. The significant negative β_2 exhibits a similar effect of the initial endowment inequality favoring senders on trust. Regression (4) including control variables further supports these findings. There is no significant difference in the reduced trust rate in the two treatments ($H_O : \beta_1 = \beta_2$, p=0.12 in Regression (3) and (4)). These findings further confirm that initial endowment inequality can help account for the reduced trust rate.

	Deception		Trust	
	(1)	(2)	(3)	(4)
β_1: Receiver Better	0.05	0.05	-0.25^{***}	-0.27^{***}
	(0.10)	(0.11)	(0.08)	(0.08)
β_2: Sender Better	-0.03	-0.03	-0.14^*	-0.15^*
	(0.10)	(0.11)	(0.08)	(0.08)
β_3: Male(=1)		0.09		0.02
		(0.10)		(0.07)
β_4: Econ/Fiance (=1)		0.01		-0.10
		(0.11)		(0.08)
β_5: Party Membership (=1)		0.02		0.27
		(0.21)		(0.23)
Constant	0.33^{***}	0.10	0.95^{***}	1.06^{***}
	(0.07)	(0.32)	(0.06)	(0.24)
Controls	No	Yes	No	Yes
R^2	0.01	0.03	0.07	0.10
Adj. R^2	-0.01	-0.05	0.06	0.03
Num. obs.	129	129	129	129

Note: For Regressions (2) and (4), 7-point Likert scales on happiness, fairness, trust, and family income are introduced as controls. We do not find significant controls. Coefficients of OLS regressions are reported. We find consistent coefficients from Probit models.

$^{***}p < 0.01$; $^{**}p < 0.05$; $^*p < 0.1$.

Table 2: Regressions of Lying and Trusting

We now have our second result:

Result 2. *Hypothesis 2 is not supported. Compared with Control, Receivers trust less both in the Receiver Better treatment and in the Sender Better treatment. Initial endowment inequality has negative effect on trust.*

3.3. Strategical Honesty

In this Section, we discuss the motive of the sender. Recall that after choosing the message to send to the Receiver, the sender must answer question Q: *"Which option do you expect the Receiver to choose?"*. Figure 3 reports the percentage of senders expecting receivers to choose option A (favouring senders) by treatment and by senders' chosen message. Black bars represent the percentage of senders expecting to implement option A when they send the wrong message A; grey bars represent the fraction of senders expecting option A when they send the true message B; and whisker bars represent one standard error of the mean.

As shown in Figure 3, senders sending wrong message A to their receivers expect option A the most in Receiver Better (94.12%), then in Control (92.86%), and then in Sender Better (76.92%). These high expectation rates indicate that senders tend not to lie strategically. It is striking that nearly 50% of honest senders sending true message B to their receivers expect option A[9]: 55.56% in Receiver Better; 53.57% in Control, and 43.67% in Sender Better. This indicates a significant amount of strategic honesty among Senders. In general, 70.45% of senders in Receiver Better expect option A to be implemented, significantly more than 55.91% of senders in Sender Better (p=0.08, one-sided t-test).[10] While lying behavior is insensitive to initial endowment inequality, we find senders are more likely to hold selfish expectations when the initial endowment inequality favors receivers versus themselves.

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[9]For the Binomial test with 0.5 probability of success, p=0.85 in Control, p=0.70 in Receiver Better, and p=0.86 in Sender Better.

[10]However, there is no significant difference in the expectation of senders sending message A among treatments (p=0.5, Jonckheere trend test).
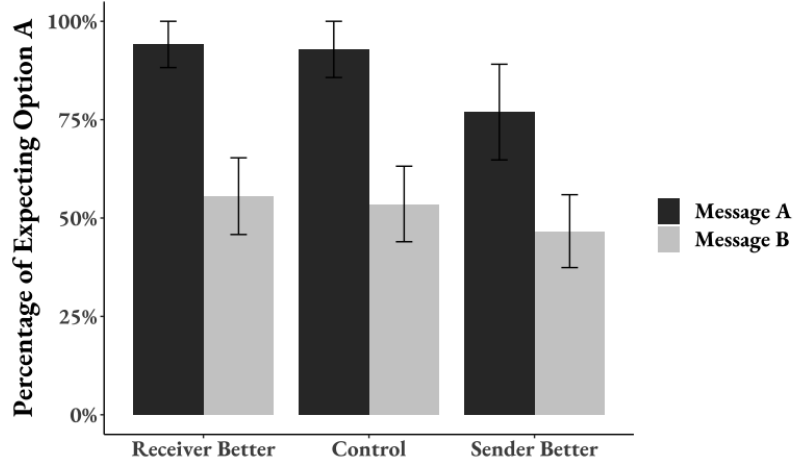
Figure 3: Percentage of Senders expecting the option A

Following Sutter (2009), we further divide Senders into 4 categories according to their sent messages and their expectations: Senders who send message A and expect option A are "Liars"; senders who send message A and expect option B are "benevolent liars"; senders who send message B and expect option B are "benevolent truth-tellers"; and senders who send message B and expect option A are "sophisticated truth-tellers". The percentage of senders in each category and in each treatment are reported in Table 3. Consistent with findings in Sutter (2009), benevolent liars are rare, and the percentage is not significantly different from 5% (p=0.72 in Control, p=0.72 in Receiver Better, and p=0.47 in Sender Better, Binomial test). We find a significant amount (nearly 30%) of sophisticated truth-tellers: 35.71% in Control, 34.09% in Receiver Better, and 2.56% in Sender Better. Compared with Receiver Better, there are significantly less liars in Sender Better (23.26% vs. 36.36%, p=0.09, one-sided t-test). However, there is no significant difference in the percentage of sophisticated truth-tellers between those two treatments (32.56% vs. 34.09%, p=0.44, one-sided t-test). This helps explain our Result 1, i.e., that initial endowment inequality has no effect on general lying behaviors.

We now have our last result:

Result 3. *Hypothesis 3 is supported. Senders expect more option A in treatment Receiver Better than in treatment Sender Better. And there are a considerable number of sophisticated*

	Receive Better	Control	Sender Better
Number of Senders	42	44	43
Senders choose Message A (Deception)	38.64%	33.33%	30.23%
Senders expect Receivers to choose Option A	70.45%	66.67%	55.81%
Message A and Option A (Liar)	36.36%	30.95%	23.26%
Message A and Option B (Benevolent liar)	2.27%	2.38%	6.98%
Message B and Option B (Benevolent truth-teller)	27.27%	30.95%	37.21%
Message B and Option A (Sophisticated truth-teller)	34.09%	35.71%	32.56%

Table 3: Type of Senders

truth-tellers.

4. Discussion and Concluding remarks

This paper presents a complementary design to investigate how initial endowment inequality affects trust. We view trust as the expectation of honesty, and we measure trust rate as the percentage of receivers following their sender's message in a sender-receiver game (Gneezy, 2005). In our design, the sender and the receiver begin with equal or unequal initial endowments. Results show that receivers trust senders most when initial endowments are equal, and that inequality favoring either side reduces trust. This finding is consistent with the results in Xiao and Bicchieri (2010) and in McEvily et al. (2012) using a trust game (Berg et al., 1995).

Given that receivers cannot know the consequences of their choices, we are the first to show that the negative effect of inequality on trust does not necessarily derive from outcome inequality aversion or reciprocity. We provide micro-level evidence on the pure negative effect of inequality on trust. Our study can help supplement macro-level empirical literature suggesting inequality within a society may systematically affect trust (Alesina and La Ferrara, 2002; Haile et al., 2008b). As suggested by Glaeser et al. (2000), and Fershtman and Gneezy (2001), wealth differences between economic agents may create greater social distance and thus hamper trust. In our experiments, endowment differences may create dis-

tance between the receiver and the sender. Likewise, this distance may cause the receiver to view their sender as less trustworthy. Future research could help to provide neural evidence to confirm this social distance hypothesis.

While receivers expect more lies in inequality treatments, the percentage of lies is statistically identical across all treatments. The inequality-sensitive motives of senders are hidden under a significant amount of strategic honesty. Receivers appear to overreact when initial endowments are unequal. Finding approaches to align receivers' expectations and senders' choices is an important topic left for future research.

One limitation of our study is that it considers only a one-shot sender-receiver game (Gneezy, 2005). We do not address the question of how trust and lies would evolve over time in a repeated setting. Nor do we investigate the differences between merit-based endowment inequality and luck-determined endowment inequality. As suggested by Bolton et al. (2005) and Haile et al. (2008a), people tolerate inequality more when it is the result of a procedurally fair allocation mechanism or randomization. Future studies could also investigate whether different origins of inequality play a role in trust. Additionally, exploring how to reduce deception and promote trust provides a promising avenue for future research.

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16

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Appendix A. Instructions

Welcome

Welcome to this experiment! If you have any questions, an experimenter will answer them privately. Please do not communicate with other participants. This is an experiment on individual decision-making. The experiment will last about 15 minutes.

There are two roles in this experiment, Jia and Yi. Half of you will be selected at random to have role Jia, the other half of you will have role Yi. One Jia and one Yi will be randomly paired in the experiment.

You will start with some initial endowments. The computer will decide whether the initial endowment is 8 or O. You will observe both your initial endowment and the initial endowment of the person paired with you.

There are two options, A and B, in the experiment. Both Jia and Yi will earn extra experimental payoff from those two options, while only Jia is informed of the monetary consequences of them. Jia will send one of those two messages to the Yi:

Message A: "Option A will earn you more money."
Message B: "Option B will earn you more money."

After receiving the message sent by Jia, Yi will choose either option A or option B to be implemented for both Jia and Yi.

Your payment is the sum of your initial endowment and the experimental payoff. If you follow the instruction carefully and make thoughtful decisions, you may earn a considerable amount of money. This experiment will only be conducted once.

Role Jia (the Sender)

Your role is Jia.

In Control it reads

Your initial endowment is ¥0.

Yi's initial endowment is ¥0.

In treatment Receiver Better it reads

Your initial endowment is ¥0.

Yi's initial endowment is ¥8.

In treatment Sender Better it reads

Your initial endowment is ¥8.

Yi's initial endowment is ¥0.

There are two options, A or B, that can be chosen in the experiment. Both options yield different payoff for you and your paired Yi. The options are as follows:

Option A: Jia earns ¥15, Yi earns ¥10.

Option B: Jia earns ¥10, Yi earns ¥15.

Only you are informed about those payoffs. You have to send one of the following two messages to Yi:

Message A: "Option A will earn you more money."

Message B: "Option B will earn you more money."

After receiving your message, Yi will make the choice which option to implement. Yi's decision determines the experimental payoff for both of you.

After Jia sent the message

Please answer this following question:

"Which option do you expect Yi to choose?"

Role Yi (the Receiver)

Your role is Yi.

In Control it reads

Your initial endowment is ¥0.

Jia's initial endowment is ¥0.

In treatment Receiver Better it reads

Your initial endowment is ¥8.

Jia's initial endowment is ¥0.

In treatment Sender Better it reads

Your initial endowment is ¥0.

Jia's initial endowment is ¥8.

There are two options, A or B, that can be chosen in the experiment. Both options yield different payoffs for you and your paired Jia. Only Jia is informed about those payoffs.

Jia has sent this following message to you:

Message A: "Option A will earn you more money."

Or Message B: "Option B will earn you more money."

You have to make the choice which option to implement. Your decision determines the experimental payoff for both you and Jia.