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The Measurement of Changes in Distributional Preferences

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Abstract

This study explores the way in which social information about giving impacts the stability of distributional preferences. We designed a two-stage treatment which varied the information participants received about the maximum amounts given to recipients. Information on maximum giving can significantly increase giving share compared to the control group, especially when the relative price of giving is low. However, with a rise in the relative price, the giving decreases significantly. Applying measures of consistency with the Generalized Axiom of Revealed Preference (GARP) and non-linear Tobit estimates of preferences, we observe changes in distributional preferences indicating that more fairness and efficiency are considered in distributions when social information is provided. Type changes in distributional preferences at an individual level provide evidence that there is one substitution relationship with context to fairness-selfishness and efficiency-equality tradeoffs. People's preferences can change due to environmental factors, which are less equality-focused and more efficiency-oriented. It provides evidence for heterogeneity in preference stability by studying distribution stability causal effect.

Keywords: Distributional Preferences; GARP; Dictator Game; Maximum Information

JEL Classifications: A12; C13; D31

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1 Introduction

Social information is one of the most important environmental factors impacting people's decision making and behavior related to generosity, trust, cooperation and other behaviors (Schultz, 2002; Goldstein et al., 2008; Shang and Croson, 2009; Duffy and Kornieko, 2010; Murphy et al., 2015). In dictator game research has shown that giving is increased when social information is introduced. Examples include, the recipient's identity (Eckel and Grossman, 1996), names (Charness and Gneezy, 2008), poverty (Branas-Garza, 2006), moral framing (Branas-Garza, 2007), and endowments (Frohlich et al., 2004). Apart from focusing on recipients' information, some studies investigate how information or actions of dictators impacts dictators' giving behaviors or fairness consideration (Potters and Xu, 2020). More importantly, the giving behaviors of participants are also impacted (shaped) by dictators' distributional preferences (Andreoni and Miller, 2002; Fisman et al., 2007, 2015a, 2015b, 2023).

Andreoni and Miller (2002) introduced variability in the cost of giving in the dictator game to examine the heterogeneity of distributional preferences, and to explore whether the preference structures associated with consumption had explanatory power. They investigated the heterogeneity in distributional preferences within a static framework in which the generalized axiom of revealed preferences (GARP) was relevant. We extend and explore how changes in the environment associated with the introduction of social information, impacts ditributional preferences at an individual level and whether this change leads to a "jump" between types of preferences. There is little evidence on whether social information changes the types of distributional preferences. In this paper, we used a within-subject design to examine whether the provision of social information of dictators impacts selfishness-fairness and efficiency-equality tradeoffs and further investigate how information changes the dictator's type of the distributional preference. In the first stage which consists of 10 rounds of decisions with various budget lines (Andreoni and Miller, 2002), the dictator will not see any other information but only choose allocations between himself/herself and the recipient on the budget line, while in the second stage with 10 rounds budget line identical to the first stage,[1] the dictator can see the information of maximum giving by dictators in the last round before making distributions in this round. To identify the causal effect, we implement a baseline group (no information in both stages) and the treatment group (receiving information in Stage II). How does the dictator give response to social information of dictators' maximum giving to recipients? What will social information bring to the dictator's tradeoffs in selfishness-fairness or efficiency-equality of distributions? Will information make the dictator "jump" (switch) from the specific type of the distributional preference to another one?

A great number of studies have opted to provide individuals with social information about the behavior of other participants (Cason and Mui, 1998; Croson and Shang, 2008; Murphy et al., 2015; Iriberri and Rey-Biel, 2013; Chiang and Wu,

[1] The budget lines showing up in Stage II are identical to those lines of Stage I, but the budget line's order of showing up in Stage II is re-edited, which is different from the order of shwoing up in Stage I.

2015). An individual's actions can be influenced by the behavior that others are inclined to adopt, potentially impacting their own decision-making. An illustrative example is the work of Schultz (2002), who discovered that families receiving information about the average amount of waste utilization by their neighbors heightened their frequency of roadside recycling activities. This phenomenon may be attributed to the social comparisons induced by the neighbors' information. Similar outcomes were observed in a hotel experiment, wherein the provision of social descriptive normative information raised towel reuse rates by over 28 percent (Goldstein et al., 2008).

With respect to dictator games: Duffy and Kornieko (2010) organized the contributions of all participants within the dictator game and presented this sorting information to all dictators. The findings indicates that dictators are more charitable with altruistic information than those with selfish information, yet their contributions dwindled over time. Recipients' facial expression impacts dictators' giving (Weiß et al., 2021). Before the allocation decision, the dictator was presented with the facial expression of the recipient (angry, disgusted, sad, smiling, or neutral). They found that dictators sent more money to recipients with sad or smiling facial expressions and less to recipients with angry or disgusted facial expressions compared with a neutral facial expression. In essence, economists' endeavor to shed light on the interplay between information, individual preferences, and social influence through experiments, exploring the dynamic relationships underlying decision-making and behavior.

The general finding is that on average, people positively condition the amount they give to the amounts given by others. However, there is heterogeneity in how individuals respond to social information, with some people positively conditioning their choices to those of others, some negatively conditioning their choices and others unaffected (Gachter et al., 2017; Panchanathan et al., 2011; O'Garra et al., 2019; O'Garra and Sisco, 2020). The information influence observed by participants increased pro-social behaviors (Krupka and Weber, 2009), which predicts that people will get more prosocial when they are observing others' prosocial behaviors. In our experiment, the social information is provided in Stage II but not Stage I, so the appearance of the information is similar to an intervention or shock to the dictators. This causes a change in behaviors with respect to tradeoff between equality and efficiency (selfishness and fairness). Fisman et al. (2015b) used experiments to investigate how macroeconomic shocks impact Americans' distributional preference during the "Great Recession". The results capture subjects' selfishness (the weight on one's own payoff) and equality-efficiency tradeoffs (concerns for reducing differences in payoffs versus increasing total payoffs). More importantly, they found that subjects exposed to recession exhibit greater selfishness and higher emphasis on efficiency relative to equality.

The research of Fisman et al. (2015b) is the most closely related paper to our experiment, but our experiment is different from their design and focuses on the effects of micro social information (dictators' maximum donation) on the dictator's giving and how the distributional preference changes in the lab. Their design focuses on how the economic recession in 2008 impacts Americans' distributional preferences, in which they only used a pre- and post-measurement, but they did not have a control group (no any economic shock). Our experiment uses a within-subject design between treatments for eliciting the pure effect of the social information on giving behaviors with regards to one control group (no social information for neither Stage I nor Stage II) and the treated group (social information for Stage II but Stage I). Another related paper is that of Potters and Xu (2020) who studied the effect of social information on selfishness (as measured by dictator game giving) in a twice-repeated setting. They varied whether or not dictators receive information about the allocation decisions of other dictators and found that dictators act more generously in the first round with than without social information. They focused on whether social information impacted dictator's selfishness. We go further by examining two dimensions of changes, that include the selfishness-fairness tradeoff and the efficiency-equality tradeoff.

Our contributions to previous literature are as follows: First, this paper enriches the field of social information impacting behaviors. Our work considers environmental factors in decision making, and extends the static framework of Andreoni and Miller (2002). Social information in the role of a shock yields a dynamic framework. We observe the response in the context of changes to the CES utility function. When the dictator receives the social information, she improves the efficiency in distributions which means that she increases the giving when the relative price of giving is low but decreases it with higher prices, but it totally increases her giving to the recipient (more generous). We further find changes in types of distributional preference at an individual level, for example, the distributional preference of some dictators are categorized as the Selfishness in Stage I, but it is changed to be Perfect Substitutes. Second, our paper reveals how dictators' distributional preferences react to receiving information of the maximum given across all dictators. Informaton on the maximum giving by dictators increased dictators' giving in aggregate. More importantly, our results indicate that the price of giving (cost of helping) has an important effect on dictators' giving behaviors. First, consistent with other research (Andreoni and Miller, 2002; Fisman et al., 2007, 2015b, 2023; Inukai et al., 2022), the price of giving is negatively correlated with dictators' giving. Second, the effect of social information on improving dictators' giving works when the price of giving is relatively low or higher, indicating that dictators give more when facing relatively most low prices, but less with the relatively high price. More importantly, previous dictator game studies incorporating social cues focus only on the tradeoff in selfishness-fairness (Cason and Mui, 1998; Potters and Xu, 2020). Our design allows consideration of both the selfishness-fairness and efficiency-equality tradeoffs by setting budget lines with various prices.[2] Thus, our results demonstrate that participants become more efficiency-focused (less equality-focused) in distributions in the treatment in which they receive social infromation. Third, the change in distributional preferences from one type to another was found to be happening at an individual level. Although many papers show that social information can impact dic-

[2] With choices on various budget lines (Andreoni and Miller, 2002; Fisman et al., 2007; Fisman et al., 2015a, 2015b; Fisman et al., 2023), the dictator is tasked with making allocations between herself and the other participant when facing high or low prices. On the one hand, the dictator chooses how many tokens allocated to the recipient and keep the rest for herslf, which reveals how selfish (fair) she is. On the other hand, that the dictator makes allocations with varying prices reveals her efficiency-equality tradeoff.

tators' giving behaviors, they can only answer how less selfish the dictator gets but cannot make it clear that how one subject's distributional preferences change with social information at an individual level. Our paper uses a two-stage experimental design to identify the specific type of switch in preferences at an individual level by comparing choices in Stage I and II. For exmaple, our evidence shows that the preference for selfishness can change to Leontief (fixed-proportion) or Cobb-Douglas as two parameters in a CES utility function vary across stages. Variation in these parameters indicates whether distributional preferences are getting more fairness or efficiency-focused. Ths structure of the paper is organized as follows: Section II outlines the experimental design, Section III presents the experimental results, and Section IV offers concluding remarks and discussion.

2 Experimental Design

This experiment is influenced by the experimental framework developed by Andreoni and Miller (2002) and Fisman et al. (2007) and extends upon it by introducing a modified dictator game. In this enhanced variation, subjects partake in a sequence of 20 rounds, where they are assigned the responsibility of making allocation decisions between themselves and a paried recipient. Subjects were students at Northeast Normal University in Changchun, China. The whole exeperiment was coded with zTree (Fischbacher, 2007).

Experimenters provide instructions for subjects at the beginning of the experiment, allowing them a 15-munite window to thoroughly read them and complete some exercise which helps them deeply understand how to play the experiment. Furthermore, experimenters verbally articulated the instructions to ensure a comprehensive understanding of the experimental procedures and how to make decisions during the course of the experiment. Subjects are clearly told that one experimental token is exchanged with 0.3 RMB. Once the experiment is initiated, all subjects were randomly assigned into groups of two, and the assignment was fixed and not changed again across stages.Each subject makes decisions for 20 rounds in which she makes allocations between herself and the other participant on the budegt lines. At the end of the experiment, participants complete a questionanire of demographics. After the whole experiment completed, the computer randomly selected one side as *Red* (dictator) from the group, while the other one is made the role of *Blue* (recipient). Finally, one decision was randomly selected from *Red*'s 20 rounds' decisions as the profits relevant to the final payment plus one show-up fee (10 RMB) for her and the recipient.

In Figure 1, each decision problem is presented as a choice from a two-dimensional budget set whose mathematic expression is $p_s\pi_s + p_o\pi_o = 1$, so the relative price is $p = \frac{p_s}{p_o}$. Dictators are willing to give one more token to recipients at the cost p tokens. Participants use the mouse to click on the budget line or move the slider on the right side of the screen to determine the allocation (π_s, π_o), in which π_s is kept for $Self$, and π_o is given to $Other$. When all participants finish a round allocation, click the "Confirm Selection" button to entering the next round of allocation until all rounds are completed. Participants face the same lines in Stage I and Stage II (see Table 1). The cost (relative price) is ranging from $[0.33, 4]$ and the intercept varies much, which can help us get a rich amount of observations. For example, the 1st budget line is same as the 20th line, and the 2nd budget line is same as the 17th, and so on.[3]

Table 1: The standard budget lines

Rounds	X-intercept	Y-intercept	Relative Price	Budget Functions
1	38	76	2	$1{=}x/38 + y/76$
2	20	60	3	$1{=}x/20 + y/60$
3	20	60	3	$1{=}x/20 + y/60$
4	30	60	2	$1{=}x/30 + y/60$
5	60	60	1	$1{=}x/60 + y/60$
6	80	20	0.25	$1{=}x/80 + y/20$
7	30	30	1	$1{=}x/30 + y/30$
8	20	80	4	$1{=}x/20 + y/80$
9	30	60	2	$1{=}x/30 + y/60$
10	76	38	0.5	$1{=}x/76 + y/38$
11	30	30	1	$1{=}x/30 + y/30$
12	60	30	0.5	$1{=}x/60 + y/30$
13	60	60	1	$1{=}x/60 + y/60$
14	30	60	2	$1{=}x/30 + y/60$
15	80	20	0.25	$1{=}x/80 + y/20$
16	76	38	0.5	$1{=}x/76 + y/38$
17	20	60	3	$1{=}x/20 + y/60$
18	20	80	4	$1{=}x/20 + y/80$
19	60	20	0.333	$1{=}x/60 + y/20$
20	38	76	2	$1{=}x/38 + y/76$

Note: The X-intercept and Y-intercept represents the maximum number of tokens given to recipients and kept for himself or herself respectively. The relative price indicates how much it costs dictators for giving one token to recipients.

[3] There are two budget lines appearing only once in Stage II, like 12th and 19th budget lines. To encourage attentiveness with repeated decisions, the budget lines were modified by added ±5% moving to the X and Y-intercepts relative to the standard budget lines.

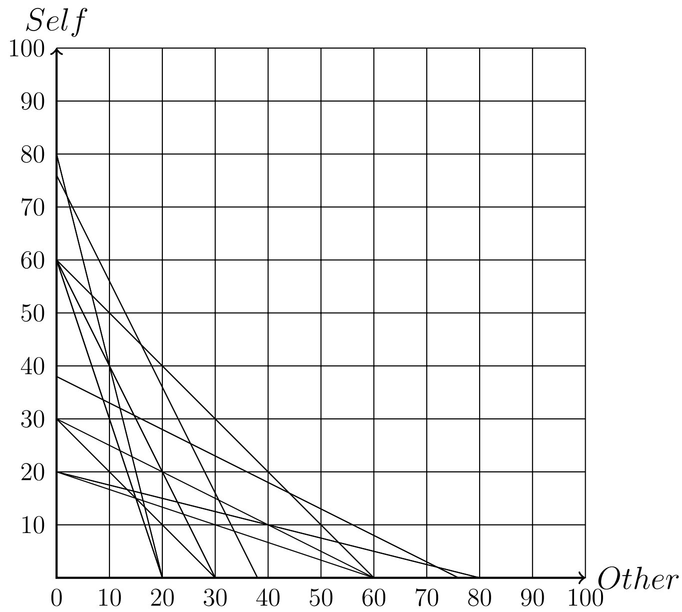

Figure 1: Budget lines

The experiment consists of two treatments as follows: the Baseline Treatment (BT) and the Maximum Information Treatment (MIT) (see Figure 2). BT consists of a 20-round dictator game, and participants will be faced with different decision situations during the whole experiment. The budget lines for MIT are identical to thoes of BT, but MIT is divided into two stages: the first 10-round decisions (Stage I: no information) and the second 10-round decisions (Stage II: the information of the maximum giving). [4] In contrast to BT, participants in MIT will see the maximum number of tokens given from the last round before the next round decision in Stage II. Specifcally, when the participant completes the $decision_{10}$, she will start to play Stage II ($decision_i, i = 11, 12, ..., 20$) and see the $decision_{10}$'s information of the maximum giving before she start doing $decision_{11}$. As Figure 2 shows, the light blue rectangles and light orange (green) rectangles represent Stage I and Stage II, respectively. In Stage I, the participant makes a decision ($decision_i$, $i = 1, 2, ..., 10$) when she is faced with the budge line in the Round i. After completing $decision_i$, she will only read her own profit in the Round i for both BT and MIT. Once entering Stage II, the participant firstly read the information of the maximum giving of the session in the Round $j - 1$ ($j = 11, 12, ..., 20$). After reading the $information_{j-1}$ of the maximum giving, the participant will do $decision_j$ with the budget line in the Round j.

[4] Although BT is not divided into two stages for participants, we will still do data analysis via dividing it into Stage I and Stage II which is identical to that of MIT, for doing purely casual effects of the social information.

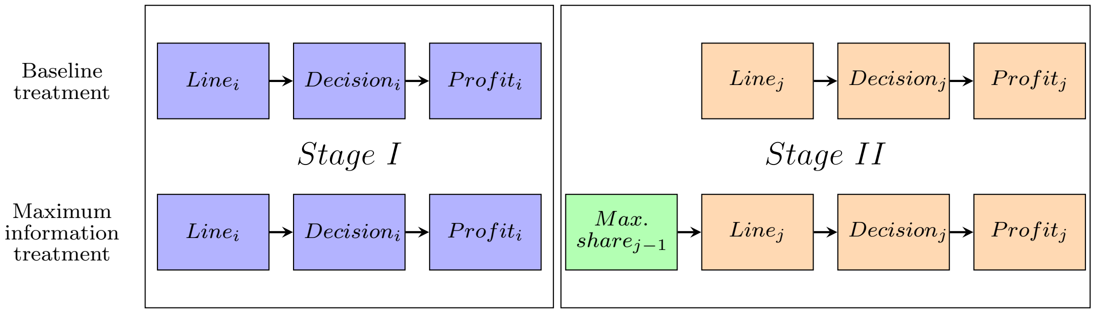

Figure 2: Treatments and expeirmental process

3 Results

3.1 Overview Statistics

The experiment was conducted in the Laboratory of Economics and Management at Northeast Normal University and the Key Laboratory for Applied Statistics of MOE at Northeast Normal University during the 2017 Winter Semester, the 2018 Summer Semester and Winter Semester, the 2023 Summer Semester and the 2024 Spring Semester.[5] We have 218 participants as the dictators to attend the experiment and are randomly selected from the big subject pool at Northeast Normal University and Jilin University. As Table 2 shows, there is no significant difference in demographic characteristics between BT and MIT, indicating that we have a good assignement between treatments. Specifically, the proportion of males for BT and MIT accounts for 40.8% and 34.2%, respectively, but there is no significant difference with Pearson's χ^2 test ($\chi^2\,(1)$=1.022, p=0.312). Han Chinese accounts for the majority in both treatments, and there is no significant difference in the proportion of Han Chinese between treatments (BT v.s. MIT: 86.7% v.s. 87.5%; Pearson's χ^2 test: $\chi^2\,(1)$=0.028, p=0.867).[6] With regards to education, the percentage of undergraduates is 86.7% in BT, while the graduates (master students and Ph.D. students) only account for 13.3%. MIT has a similar distribution in education to BT, with a figure of 87.5% for undergraduates and 12.5% for graduates. Thus, there is no significant difference in education between BT and MIT (Pearson's χ^2 test: $\chi^2\,(1)$=0.943, p=0.331). In BT, 37.8% of participants are the only child in her family, 41.8% of them has one sibling, and 20.4% has at least two siblings. As for MIT, it has the similar distributions for the amount of the participant's siblings in her family, in which 39.2% of participants is the only child for her family, 45% of participants has one sibling, and 15.8% of participants have at least two siblings,

[5] The experiment has a long gap and takes so much time because the Covid-19 pandemics was lasting for three years in China, during which we could not complete data collection. In Section 4.3.1, we are examining whether the pandemics brings impacts on dictators' preferences in giving for eliciting the pure effect of the social information on their giving behaviors and distributional preferences.

[6] Han Chinese accounts for 91.11% in the population and the figure of the other minorities is 8.89%, which was released by the Seventh National Population Census Bulletin in China (Further and detailed references see https://www.gov.cn). The figure of Han Chinese in our sample is close to the that of the population in China.

but there is no significant difference in the number of siblings between treatments (Wilcoxon-Mann-Whitey test: z=0.619, p=0.536).

Table 2: Overview statistics

Treatments	BT		MIT		p value
	Mean	S.D.	Mean	S.D.	
Female	0.592	0.494	0.658	0.476	0.312
Han Chinese	0.867	0.341	0.875	0.332	0.867
Undergraduate	0.857	0.352	0.9	0.301	0.331
Siblings	0.949	1.019	0.817	0.829	0.536

Note: Significance level indicates that * 10%, ** 5%, and *** 1%.

3.2 Rationality Test

We use the Generalized Axiom of Revealed Preferences (GARP) to examine whether an individual's decision making is consistent with the rationality, which can remove data with mistakes made by participants (Samuelson, 1938; Varian, 1982). The definition of GARP by Samuelson is as follows: "*If π_i is indirectly revealed preferred to π_j, then π_j is not strictly directly revealed preferred to π_i, that is, π_i is not strictly within the budget set when π_j is chosen.*" The critical cost efficiency index (CCEI) is used to measure the consistency of individuals with the GARP (Afriat, 1967, 1972). By the definition of CCEI, it has a value ranging from 0 to 1, in which the index is closer to 1 when the individual is more consistent with the GARP; otherwise, more deviations from the GARP. The simple process of CCEI calculation is taken from Murphy and Banerjee (2015) as follows:

For two bundles x_i and x_j,

$$D_{ij} = \frac{p_i x_j}{p_j x_i} - 1$$

where p_i is the price when the bundle x_i is chosen. Let $d_{ij} = \max\{D_{ij}, D_{ji}\}$, the cross cost efficiency index is defined as follows:

$$e_{ij} = 1 - \max\{0, -d_{ij}\}$$

Then, we have the critical cost efficency index as follows:

$$e^* = \min_{i \neq j} \{e_{ij}\}$$

In our experiment, the mean CCEIs are 0.933, 0.953, and 0.897 for Stage I, Stage II and Stage I + Stage II of BT, respectively. Similarly, in MIT, the mean CCEIs are 0.936, 0.943, and 0.892 for Stage I, Stage II, and Stage I + Stage II (see Table 3). There is no signifciant difference in CCEIs between treatments for Stage I (Wilcoxon-Mann-Whitney test: z=-0.046, p=0.963) and Stage II (Wilcoxon-Mann-Whitney test: z=0.311, p=0.756). We categorize a participant as consistent with the GARP and rational only if their CCEIs are greater than 0.8. Of our 87 participants (88.8%) in BT and 109 participants (90.8%) in MIT have values above 0.8. We make sure that these participant choices are generally consistent with the utility maximization. To do rigrious analysis, we are doing data analysis with the all-observations sample and the only-rational-observations sample (CCEI≥0.8).[7]

Table 3: Mean CCEIs

Treatments	All subjects			CCEI≥0.8		
	Stage I	Stage II	Stage I+Stage II	Stage I	Stage II	Stage I+Stage II
BT	0.933	0.953	0.897	0.956	0.977	0.937
	(0.091)	(0.111)	(0.132)	(0.027)	(0.031)	(0.034)
MIT	0.936	0.943	0.892	0.952	0.976	0.923
	(0.083)	(0.128)	(0.126)	(0.029)	(0.036)	(0.052)

Note: Stage I and Stage II represent the Round 1—10 and Round 11—20, respectively.

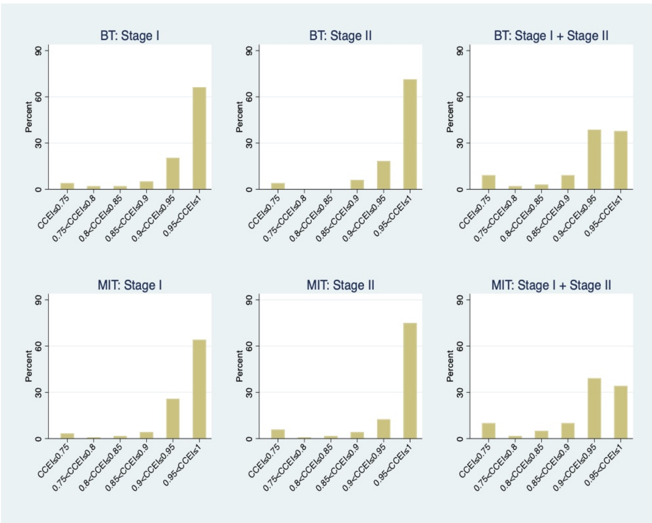

Figure 3: The distribution of CCEIs in Stage I, Stage II, and Stage I + Stage II

3.3 Treatment Effect of the Social Information

3.3.1 Parameter test

In this section, we are examining whether the social information of the maximum giving will impact dictators' giving behaviors between subjects (within subjects). We use one two-sided t test to (1) test giving share for Stage I (Stage II) between BT and MIT; (2) test giving share for BT (MIT) between Stage I and Stage II; and

[7] The all-observations sample contains 98 and 120 observations for BT and MIT, respectively, but the figures of only-rational-observations sample that excludes the deviations from the GARP (CCEI<0.8) are 87 and 109 for BT and MIT, respectively.

(3) test the difference in giving share between stages between treatments.[8] On the other hand, there are some participants incosnistent with GARP, and, sepcifically, their CCEIs are less than 0.8. How do these deviations from rationality react to the social information? To answer the question, we need to compare giving share for Stage I and Stage II with two samples. One sample includes all observations (all-observations sample) while the other one only includes these observations consistent with rationality (CCEI≥0.8, the only-rational-observations sample). Finally, we also exmaine whether the social information impacts the giving behavior with the only irrational observations between stage.

Figure 4 depicts the mean giving share $\frac{\pi_o}{\pi_o+\pi_s}$ in Stage I and Stage II for two conditions (BT and MIT). With the all-observations sample, we take one two-sided t test on $\frac{\pi_o}{\pi_o+\pi_s}$ of Stage I (Stage II) between BT and MIT. There is no signifciant difference in $\frac{\pi_o}{\pi_o+\pi_s}$ of Stage I between BT and MIT (BT v.s. MIT: 0.301 v.s. 0.283; One two-sided t test: t=0.869, p=0.193), whereas the mean giving share in Stage II MIT is signifciantly different from that of BT (MIT v.s. BT: 0.361 v.s. 0.323; One two-sided t test: t=1.632, p=0.052), indicating that the social information increases the generosity in the dictator game. Overall, dictators give more in Stage II to recipients than Stage I when seeing the social information. With the only-rational-observations sample, we take one two-sided t test on $\frac{\pi_o}{\pi_o+\pi_s}$ of Stage I (Stage II) between BT and MIT. Similarly, we also get the results that there is no signifciant difference in $\frac{\pi_o}{\pi_o+\pi_s}$ of Stage I between BT and MIT (0.288 v.s. 0.276; One two-sided t test: t=1.059, p=0.145), while there is a significant difference in Stage II between BT and MIT (0.315 v.s. 0.353; One two-sided t test: t=-2.870, p=0.002). Similar results of both samples indicate that the social information improves dictators' giving shares with recieving the information, and excluding irrational observations does not impact the robustness of the results.

As for the within-subject test, we compare giving share of the all-observation sample between stages and find that there are significant differences in the giving share for BT (One two-sided t test: t=-2.504, p=0.007) and MIT (One two-sided t test: t=-8.753, p=0.000), respectively. The significant difference in the giving share of BT between stages indicates that dictators give more to recipients in Stage I than Stage II, which may be because the learning effect impacts the giving share with periods. With the rational-observations sample (CCEI≥0.8), as for BT, the giving share of Stage II is greater than that of Stage I, and there is one significant difference in the giving share between stages (One two-sided t test: t=-3.239, p=0.001), which is similar to the above test result with the all-observations sample. More importantly, for MIT, the mean giving share of Stage I and Stage II is 0.276 and 0.353, respectively. Obviously, the giving share for Stage II is signifciant greater than that of Stage I (One two-sided t test: t=-8.142, p=0.000). The difference between Stage II and Stage I is 0.022 and 0.077 for BT and MIT (all observations), respectively, and the difference of MIT is significantly greater than that of BT (One two-sided t

[8] The test (1) is between-subject, which is aimed at eliciting the causal effect of the information of the maximum giving. The test (2) is the within-subject test, and we use it to examine whether and how pariticipants change their behaviors over rounds with information (without information). The test (3) is aimed at eliciting the purely causal effect via excluding the learning effect between stages.

test: t=-4.447, p=0.000), indicating that the casual effect of the social information improves dictators' giving to recipients. With the only-rational-observations sample, we get the similar results in the differences between stages (BT v.s. MIT: 0.028 v.s. 0.076; One two-sided t=-3.575, p=0.000).

On the other hand, we also exmaine whether the social information impacts dictators' giving behvaiors with the only-irrational-observations sample (CCEI<0.8). We are here examaning the social information works on both the only-irrational-observations sample with regards to giving behaviors (see Figure 5). First of all, we use one two-sided t test to examine the causal effect of the social information with the only-irrational-observations sample between treatments. We find that there is no signifciant difference in the giving share of Stage I (Stage II) between treatments (Stage I: t=0.995, p=0.166; Stage II: t=-1.049, p=0.153) with the standard errors clustered at the subject level. That the results with the only-irrational-observations sample are different from the above results with the all-observations (only-rational-observations) sample is due to the statistically small observations.[9] Now, we are doing within-subject examination in the giving share with the irrational observations. As for BT, these participants with deviations from the rationality assumption give averagely 0.408 to recipients in Stage I while the figure of Stage II is 0.381, but there is no significant difference between stages (One two-sided t test: t=0.784, p=0.226). For MIT, the mean giving share in Stage I and Stage II is averagely 0.359 and 0.442, respectively, so we find that there is one significant difference between stages (One two-sided t test: t=-3.345, p=0.004), indicating that the information improves the dictators' giving share with the only-irrational-observations sample (only 11 observations for each stage).

Figures 6 and 7 present the distributions of giving share by dictators in Stage I, Stage II, BT, and MIT with the all-observations sample and the rational-observations sample. The majority of the giving share is less than 0.55 which accounts for over 75% of the observations. The mainly distributional patterns are associated with selfish behaviors and the 50%-50% split which equalizes the dictator and recipient's tokens. As for the selfish pattern, dictators allocate less than 5% to recipients and keep most tokens for herself. Over 20% of giving share is less than 5%, while it has at least 15% of giving share is the equal pattern of 50%-50% distribution. The results suggest that norms may be motive distributions in some environments, particularly, as discussed below, when the cost of giving is relatively low.

[9] The amount of dictators breaking the GARP (CCEI<0.8) is 11 and 11 for BT and MIT, respectively. The insignificance in the test results may be caused by the statistically small observations.

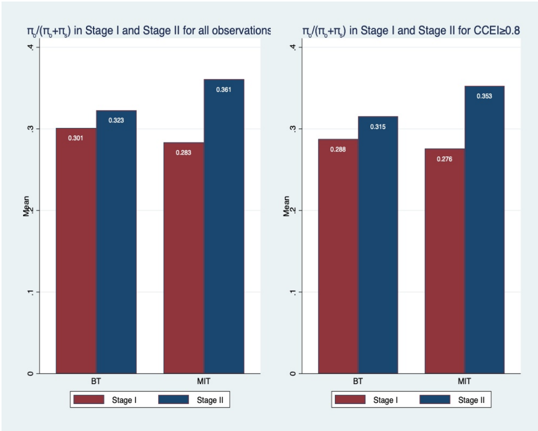

Figure 4: Mean giving share for the all-observations sample and the only-rational-observations sample

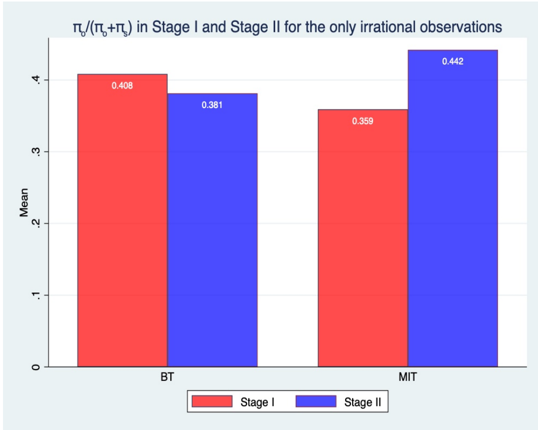

Figure 5: Mean giving share for the only-irrational-observations sample

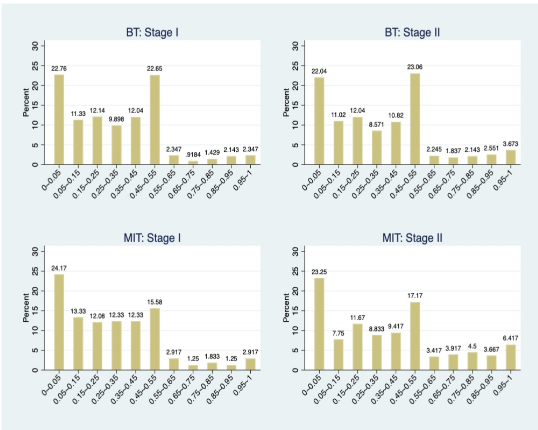

Figure 6: The distribution of giving share for all observations

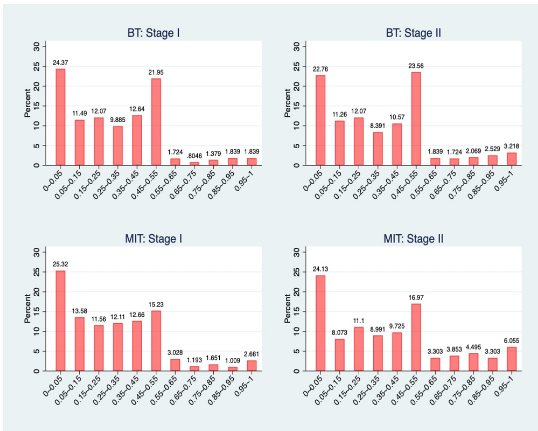

Figure 7: The distribution of giving share for CCEI≥ 0.8

3.3.2 Panel estimates on the giving share

Table 4 reports the panel regression on the giving share $\frac{\pi_o}{\pi_o+\pi_s}$, the fraction of tokens given to recipients. Due to each subject having 20 rounds decisions, we report the panel estimates on the giving share clustered by subject. As for all subjects, Column (1) indicates that Stage II has a greater giving share than Stage I in both BT and MIT (b=0.052, p=0.000), indicating that participants are more generous in Stage II than Stage I, which is consistent with the test mentioned earlier in Section 4.3.1. In Column (2), Stage II of BT is significantly greater than Stage I (b=0.022, p=0.012), indicating that giving share is impacted by learning or experience. Furthermore, the coefficient for an interaction of MIT and Stage II is significant and positive indicates that the difference between stages in MIT is greater than that of BT and the social information indeed improves the giving behaviors (b=0.056, p=0.000). With the only-rational-observations sample (CCEI≥0.8), the signifciant and positive coefficient is 0.055 (p=0.000) which is close to that of Column (1) with the all-observations sample. In Column (5), the signifciant coefficient for Stage II is 0.028 (p=0.001) close to that of Column (2), which means that the learning effect still works here. Additionally, the interaction of Stage II and MIT, in Column (5), is significant and positive with the coefficient of 0.049 (p=0.000) which is consistent with the estimates with the all-observations sample. The above results mean that the casual effect of the social information is made clear with our analysis here with the all-observations sample and the only-rational-observations sample although considering the situation where existing deviations from the rationality.

Table 4: Panel regression on giving share ($\frac{\pi_o}{\pi_o+\pi_s}$)

Specifications	Dependent variable: Giving Share					
	All subjects			CCEI≥0.8		
	(1)	(2)	(3)	(4)	(5)	(6)
MIT	0.010	-0.018	-0.017	0.013	-0.012	-0.010
	(0.021)	(0.020)	(0.020)	(0.023)	(0.022)	(0.021)
Stage II	0.052***	0.022**	0.022**	0.055***	0.028***	0.027***
	(0.007)	(0.009)	(0.009)	(0.007)	(0.009)	(0.009)
MIT × Stage II		0.056***	0.056***		0.049***	0.049***
		(0.012)	(0.012)		(0.013)	(0.013)
Constants	0.286***	0.301***	0.259***	0.274***	0.288***	0.251***
	(0.016)	(0.016)	(0.040)	(0.017)	(0.017)	(0.043)
Controls	No	No	Yes	No	No	Yes
$Sigma_u$	0.145	0.145	0.145	0.147	0.147	0.148
$Sigma_e$	0.227	0.227	0.227	0.222	0.221	0.221
Rho	0.290	0.291	0.291	0.307	0.307	0.309
Observations	4360	4360	4360	3920	3920	3920
Participants	218	218	218	196	196	196

Note: Standard errors clustered at the subject level. Significance level at * 10%, ** 5%, *** 1%.

Due to data collection in both pre- and post-pandemics, we are here examining whether the pandemics brings some effects on the giving share. As mentioned earlier, we find the causal effects on the giving share in Stage II but it should be identified clearly where the effect comes from. The improvement in the giving share may be caused by the social information or the pandemics. If the effect of the social information is dominant, the effect of the pandemics is not significantly correlated with the giving share or it only impacts the giving share sligltly; otherwise, both effects work on the giving share or the pandemics effect is mainly impacting the giving share.

To make it clear, we are using indicators of MIT, Stage II, and Cov19 in the panel estimates on the giving share (see Table 5). Similarly to the above analysis, we are considering two conditions for "All subjects" (Column (1), (2), and (3)) and "CCEI≥0.8" (Column (4), (5), and (6)) in the table, in which the results of both conditions are close, indicating that the results are robust for the all-observations sample and the only-rational-observations sample. For Column (1) and (2), we report that the pure effect of the social information on dictators' giving share, in which the difference between stages in difference between treatments is significant and positive before the pandemics (b=0.040, p=0.016), indcating that the effect of social information, which we exclude the learning effect from, increases the giving share.[10]

Similarly, as for the post-pandemics, we find that the signifciant and positive coefficient for the effect is 0.069 (p=0.000) of which the size is greater than that of the pre-pandemics, but we need to test whether the size is significantly different between the pre-pandemics and the post-pandemics. If the effect of the social information in the post-pandemics estimates is significantly greater than that of the pre-pandemics, it means that the pandemics (Covid-19) significantly impacts and changes Chinese subjects' distributional peferences with one larger degree of generosity in the dictator game; otherwise, the pandemics is not impacting the giving behaviors. Thus, in Column (3), we use the panel regression to estimates the difference in the effects of social infromation between pre- and post-pandemics. The coefficient for the interaction of MIT, Stage II, and Cov19 is not significant (b=0.029, p=0.234), indicating that the size of the pure effect of the social information is not significantly different between the pre- and post-pandemics. In other words, the pure effect of the pandemics is not significantly correlated with the giving share, in which the pure effect of the social information is completely dominant. For the rational-observations sample (CCEI$\geq$0.8), we also get the similar results.

FINDING 1: The information of the maximum giving in MIT indeed has a higher level of mean giving share than that of BT in Stage II.

[10] As mentioned earlier, the learning effect plays an important role in the giving share with the comparison between Stage I and Stage II for BT. The interaction of MIT and Stage II represents a pure effect of the social information becasue of excluding the learning effect with rounds.

Table 5: Panel estimates on the giving share in BT, MIT, and pandemics

Specifications	Dependent variable: Giving share					
	All subjects			CCEI≥0.8		
	Pre-C19	Post-C19	All	Pre-C19	Post-C19	All
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Without controls						
MIT	-0.033	0.0003	-0.033	-0.029	0.007	-0.029
	(0.031)	(0.278)	(0.020)	(0.031)	(0.030)	(0.031)
Stage II	0.029**	0.017	0.029**	0.029**	0.027**	0.029**
	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)	(0.013)
Cov19			0.00003			-0.011
			(0.032)			(0.034)
MIT×Stage II	0.040**	0.069***	0.040**	0.042**	0.057***	0.042**
	(0.018)	(0.017)	(0.017)	(0.018)	(0.018)	(0.018)
Stage II×Cov19			-0.012			-0.002
			(0.017)			(0.017)
MIT×Cov19			0.034			0.037
			(0.041)			(0.043)
MIT×Stage II×Cov19			0.029			0.015
			(0.024)			(0.025)
Constants	0.301***	0.301***	0.301***	0.294***	0.283***	0.294***
	(0.025)	(0.021)	(0.025)	(0.025)	(0.022)	(0.025)
Panel B: With controls						
MIT	-0.027	-0.003	-0.034	-0.026	0.002	-0.033
	(0.028)	(0.028)	(0.029)	(0.030)	(0.030)	(0.030)
Stage II	0.029**	0.017	0.029**	0.029**	0.027**	0.029**
	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)	(0.013)
Cov19			-0.004			-0.019
			(0.033)			(0.035)
MIT×Stage II	0.040**	0.069***	0.040**	0.042**	0.057***	0.042**
	(0.018)	(0.017)	(0.175)	(0.018)	(0.018)	(0.018)
Stage II×Cov19			-0.012			-0.002
			(0.016)			(0.017)
MIT×Cov19			0.033			0.040
			(0.041)			(0.043)
MIT×Stage II×Cov19			0.029			0.015
			(0.024)			(0.025)
Constants	0.327***	0.319	0.345***	0.318***	-0.005	0.306***
	(0.079)	(0.223)	(0.053)	(0.088)	(0.043)	(0.056)
Observations	2000	2360	4360	1900	2020	3920
Participants	100	118	218	95	101	196

Note: MIT, Stage II, and Cov19 are indicators. Standard errors clustered at the subject level. Significance level at * 10%, ** 5%, and *** 1%.

3.3.3 The price effect on the giving share

The relative price of giving identifies the cost of helping others with the value of p, which indicates that the recipient will receive p tokens at the cost of one token for the dictator. If the relative price of giving is high, it is more likely to induce dictators to be selfish rather than generous to recipients because it is too expensive to give more. Thus, in this section, we are exmaining whether (how) the social information impacts the dictator's decisions when she is facing budget lines with varying prices.

Table 6 reports the results on how the relative price of giving (cost of helping others) relates to giving share in Stage I and Stage II. We run a panel regression on the giving share $\frac{\pi_o}{\pi_o+\pi_s}$ with the all-observations sample (the only-rational-observations sample). In both Stage I and Stage II, the price is significantly and negatively correlated with the giving share. In other words, when the relative price is high, the dictator gievs less to the recipient; otherwise, she gives more to the recipient. Specifically, for the all-observations sample, Columns (1) and (2) present indicate that the relative price significantly and negatively relates to the giving share (b=-0.086, p=0.000) in Stage I. When we are adding the interaction of the price and MIT to the estimate, the coefficient is signifciantly negative, indicating that there is one difference in the slope of giving share over price. Although the decreasing of MIT's giving share is greater than that of BT, it is not robust in the estimate with the only-rational-observations sample (Column (9): b=-0.019, p=0.110). Thus, the decreasing of Stage I's giving share is relatively close between BT and MIT. On the other hand, for Stage II, the price is also significantly and negatively correlated with the giving share, and the interaction in Column (6) is significantly and negatively correlated with the giving share, indicating that the decreasing of MIT's giving share over price is greater than that of BT (b=-0.047, p=0.001). [11] Now, we are further answering why is there one difference in the slope of Stage II's giving share between BT and MIT over price? As Table 8 shows, as for both samples, we find that the mean giving share in MIT is significant greater than that of BT when the relative price is relatively low (*Price*=0.25, 0.33, 0.5, and 1), while the difference is not significant when price is equal to 2 and 3, but the giving share in BT is greater than that of MIT when the price is higher (*Price*=4). The above analysis results indicate that the social information makes the dictator more sensitive to the price of distributions, compared to the dictator not receiving such information. The dictators in MIT are more generous (less selfish) than those of BT when facing the relatively low price, whereas they are more selfish (less generous) than those of BT when facing the relatively high price.

A comparison within participants' is presented in Table 7, the panel regression on the giving share across stages within treatment. In BT, Column (1) and Coumn (2) indicate that the coefficient for the price is significantly negative (b=-0.074, p=0.000), and, more importantly, the coefficient for the interaction of the price and Stage II is not significant, meaning that there is no significant difference in BT's giving share over price between Stage I and Stage II. The indifference is consistent with the t test results in Section 3.3.1, indicating that no receiving information does

[11] With using the only-rational-observations sample (Columns (7)—(12)), we get the similar results to that of the all-observations sample. Although adding control variables, the estimates are still robust.

not change the dictator's giving behaviors. However, when the dictator recieves the social information (MIT), the giving share of Stage II is significantly greater than that of Stage I (Column (5): b=0.032, p=0.000) which is different from the result of BT. In Column (6), the significant and negative coefficient for the interaction of the price and Stage II indicates that the decreasing of the giving share over price in Stage II is greater than that of Stage I (b=-0.026, p=0.000). Stage II in MIT has a greater giving share than Stage II of BT when the price is the lowest (b=0.076, p=0.000). With the rational observations (CCEI$\geq$0.8) anaylsis, the results are similar to those results with the all-observations sample.

FINGDING 2: The giving share is significantly and negatively correlated with the relative price of giving in both BT and MIT. The giving share in MIT is more than BT at low prices but less than BT at the high price.

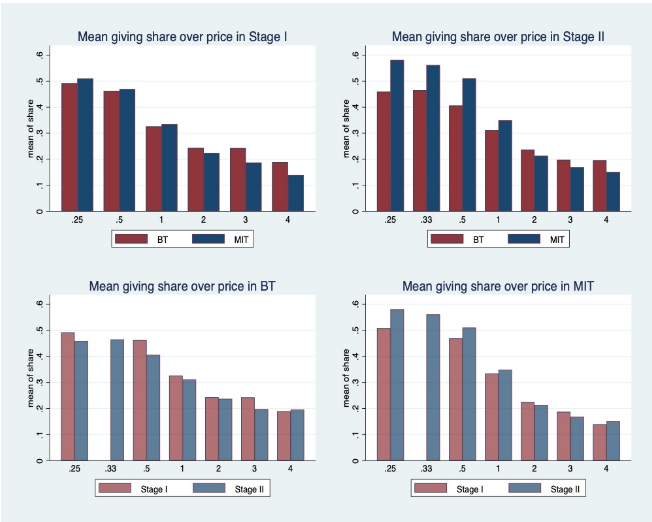

Figure 8: The mean giving share with price for all observations

Table 6: Panel regression on giving share ($\frac{\pi_o}{\pi_o+\pi_s}$) for Stage I and II

Specifications	Dependent varibale: Giving share											
	All subjects						CCEI≥0.8					
	Stage I			Stage II			Stage I			Stage II		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Without controls												
Price	-0.086***	-0.086***	-0.073***	-0.101***	-0.101***	-0.075***	-0.091***	-0.091***	-0.080***	-0.110***	-0.110***	-0.085***
	(0.006)	(0.006)	(0.008)	(0.007)	(0.007)	(0.009)	(0.006)	(0.006)	(0.009)	(0.007)	(0.007)	(0.010)
MIT		-0.017	0.024		0.038	0.106***		-0.012	0.025		0.037	0.102***
		(0.020)	(0.032)		(0.023)	(0.035)		(0.022)	(0.035)		(0.025)	(0.039)
MIT × Price			-0.022*			-0.047***			-0.019			-0.044***
			(0.012)			(0.014)			(0.012)			(0.014)
Constants	0.452***	0.462***	0.439***	0.491***	0.470***	0.432***	0.452***	0.459***	0.438***	0.497***	0.476***	0.439***
	(0.016)	(0.019)	(0.022)	(0.018)	(0.022)	(0.025)	(0.017)	(0.021)	(0.025)	(0.019)	(0.024)	(0.028)
Panel B: With controls												
Price	-0.086***	-0.086***	-0.073***	-0.110***	-0.110***	-0.075***	-0.091***	-0.091***	-0.080***	-0.110***	-0.110***	-0.085***
	(0.006)	(0.006)	(0.008)	(0.007)	(0.007)	(0.010)	(0.006)	(0.006)	(0.009)	(0.007)	(0.007)	(0.010)
MIT		0.023	0.024		0.039*	0.107***		-0.013	0.024		0.037	0.103***
		(0.032)	(0.035)		(0.023)	(0.035)		(0.022)	(0.035)		(0.025)	(0.038)
MIT × Price			-0.022*			-0.047***			-0.019			-0.045***
			(0.012)			(0.014)			(0.012)			(0.014)
Constants	0.480***	0.490***	0.467***	0.540***	0.519***	0.482***	0.452***	0.458***	0.438***	0.508***	0.488***	0.451***
	(0.049)	(0.051)	(0.052)	(0.052)	(0.056)	(0.057)	(0.051)	(0.053)	(0.055)	(0.057)	(0.059)	(0.062)
Observations	2180	2180	2180	2180	2180	2180	1960	1960	1960	1960	1960	1960
Groups	218	218	218	218	218	218	196	196	196	196	196	196

Note: Standard errors are clustered at the subject level. Significance level at * 10%, ** 5%, and *** 1%.

Table 7: Panel regression on giving share ($\frac{\pi_o}{\pi_o+\pi_s}$) for BT and MIT

Specifications	Dependent varibale: Giving share											
	All subjects						CCEI≥0.8					
	BT			MIT II			BT			MIT		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Without controls												
Price	-0.074***	-0.074***	-0.073***	-0.112***	-0.109***	-0.096***	-0.082***	-0.082***	-0.080***	-0.118***	-0.116***	-0.100***
	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Stage II		-0.009	-0.006		0.032***	0.076***		-0.007	0.001		0.029***	0.078***
		(0.008)	(0.013)		(0.008)	(0.014)		(0.007)	(0.014)		(0.008)	(0.014)
Price × Stage II			-0.001			-0.026***			-0.005			-0.029***
			(0.006)			(0.023)			(0.006)			(0.005)
Constants	0.435***	0.441***	0.439***	0.508***	0.489***	0.463***	0.439***	0.443***	0.438***	0.511***	0.493***	0.464***
	(0.023)	(0.023)	(0.022)	(0.023)	(0.022)	(0.023)	(0.026)	(0.026)	(0.025)	(0.025)	(0.024)	(0.024)
Panel B: With controls												
Price	-0.074***	-0.074***	-0.073***	-0.112***	-0.109***	-0.095***	-0.082***	-0.083***	-0.080***	-0.118***	-0.116***	-0.100***
	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Stage II		-0.009	-0.006		0.032***	0.076***		-0.007	0.001		0.029***	0.078***
		(0.008)	(0.013)		(0.008)	(0.014)		(0.007)	(0.014)		(0.008)	(0.014)
Price × Stage II			-0.002			-0.026***			-0.005			-0.029***
			(0.006)			(0.006)			(0.006)			(0.005)
Constants	0.411***	0.417***	0.415***	0.559***	0.539***	0.513***	0.364***	0.368***	0.363***	0.544***	0.527***	0.497***
	(0.084)	(0.083)	(0.084)	(0.051)	(0.052)	(0.053)	(0.089)	(0.089)	(0.089)	(0.055)	(0.055)	(0.056)
Observations	2180	2180	2180	2180	2180	2180	1960	1960	1960	1960	1960	1960
Groups	218	218	218	218	218	218	196	196	196	196	196	196

Note: Standard errors are clustered at the subject level. Significance level at * 10%, ** 5%, and *** 1%.

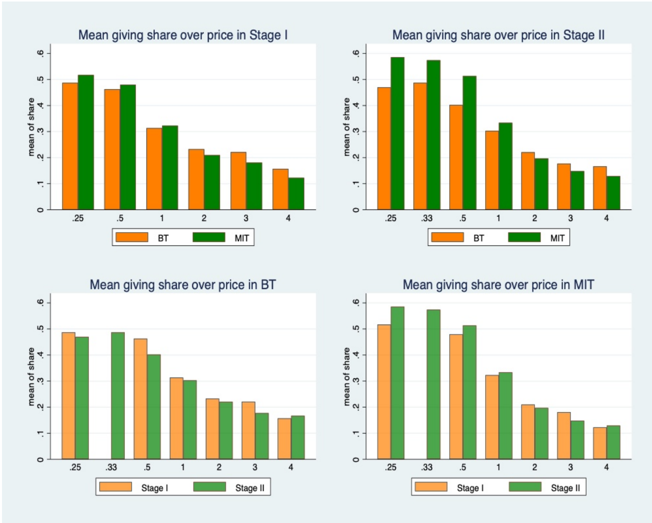

Figure 9: The mean giving share with price for the rational observations

Table 8: The t test on giving share in Stage II, BT, and MIT

Price	All subjects			CCEI≥0.8		
	BT	MIT	Difference	BT	MIT	Difference
0.25	0.459	0.581	-0.122**	0.469	0.585	-0.116***
0.33	0.465	0.562	-0.096**	0.487	0.574	-0.087**
0.5	0.406	0.511	-0.105***	0.402	0.514	-0.111***
1	0.312	0.349	-0.037**	0.303	0.334	-0.01*
2	0.237	0.213	0.024	0.221	0.197	0.024
3	0.198	0.169	0.028	0.177	0.148	0.029
4	0.196	0.151	0.045*	0.167	0.129	0.037*

Note: Difference=BT - MIT. Significance level at * 10%, ** 5%, and *** 1%.

3.4 Parameters Estimates for the CES Utility Functions

In this section, we will use non-linear Tobit estimates to measure parameters in a CES utility function to characterize individual preferences (Andreoni and Miller, 2002; Fisman et al., 2007, 2015a, 2015b). The CES utility function is described as follows:

$$u_s(\pi_s, \pi_o) = [\alpha \cdot (\pi_s)^\rho + (1-\alpha) \cdot (\pi_o)^\rho]^{\frac{1}{\rho}}$$

The estimated parameters α and ρ are indicators of preference types. An individual makes a tradeoff between self-insterest and fair-mindedness with α. When she is a perfectly selfish person, α equals to 1 which means she just considers her own interests instead of others'. If she is egalitarian, the parameter α is equal to 0.5. Additionally, when an individual is making a choice, she is not only making a tradeoff between self-interest and fair-mindedness, but also cares for how to make a balance between equality and efficiency. When she is efficiency-focused, the parameter ρ is greater than 0, and the more efficient he is, the closer the parameter ρ becomes to 1. However, if she is an equality-focused person, it means that the parameter ρ is less than 0. As he becomes more equality-focused the parameter ρ becomes approaches $-\infty$.

The CES expenditure function is given by

$$p_s \pi_s = \frac{g}{\left(\frac{p_s}{p_o}\right)^{\gamma} + g}$$

Where $\gamma = \frac{\rho}{\rho - 1}$ and $g = \left(\frac{\alpha}{1-\alpha}\right)^{\frac{1}{\rho}}$. This generates the following individual-level specification for each subject as follows:

$$p^i_{s,n} \pi^i_{s,n} = \frac{g_n}{\left(\frac{p^i_{s,n}}{p^i_{o,n}}\right)^{r_n} + g_n} + \varepsilon^i_n$$

Where $i = 1, ..., 20$ and ε^i_n is assumed to be distributed normally with mean zero and variance σ^2_n. Since participants' choices are censored at both ends of the budget constraint, we estimate the parameters γ and g for each type using two-limit tobit maximum likelihood, with restriction that $0 \leq p_s \pi_s \leq 1$ (Andreoni and Miller, 2002). We are classifying distributional preference into four types, like Leontief, Selfishness, Perfect substitutes, and Cobb-Douglas. The type of the dictator's distributional preference depends on the specific parameters α and ρ. For example, when the paramter ρ is equal to 1 and the parameter α is reaching 0.5, the dictator's utility function is described as $u_s(\pi_s, \pi_o) = 0.5 \cdot \pi_i + 0.5 \cdot \pi_o$ (Perfect substitutes), indicating she maximizes the efficiency in distributions by maximizing the sum of giving for her and the recipient. When the parameter ρ is close to 0, the utility function is characterized as $u_s(\pi_s, \pi_o) = \pi_i \cdot \pi_o$ (Cobb-Douglas). If the parameter ρ is approaching to $-\infty$, the utility function is the Leontief ($u_s(\pi_s, \pi_o) = \min\{\pi_i, \pi_o\}$). [12] When the parameter α is equal to 1, the utility function is described as Selfishness ($u_s(\pi_s, \pi_o) = \pi_s$).[13]

Due to $0 \leq \alpha \leq 1$ and $\rho \leq 1$ in CES utility functions, we are analyzing the difference between treatments (stages) with the all-observations sample or the only-rational-observations sample (CCEI$\geq$0.8).[14] Table 9 presents the mean estimated $\hat{\alpha}_n$ and $\hat{\rho}_n$ in Stage I and Stage II of BT (MIT). We are examining whether there is one difference between stages with regards to the estimated $\hat{\alpha}_n$ ($\hat{\rho}_n$). For BT with the all-observations sample, the estimated parameters $\hat{\alpha}_n$ of Stage I and Stage II are 0.689 and 0.706, respectively, and there is no significant difference in the estimated $\hat{\alpha}_n$ between stages (Wilcoxon Signed-rank test: z=0.528, p=0.598). We

[12] Once the parameter is approaching to $-\infty$, the value of the paramter α is not important for the utility function.

[13] If the paramter α is close to 1, the distributional preference is made Selfishness, but the value of the paramter ρ does not matter for the utility function.

[14] If individual choices satisfy GARP, Afrait's (1967) theorem indicates that there exists an increasing, continuous and concave utility function that rationalizes the data. With Afrait's (1967) theorem and the parameters' ranges, we finally get 73 out of 98 in BT and 102 out of 120 in MIT.

find the similar result for MIT, in which there is no significant difference in the estimated $\hat{\alpha}_n$ between stages (Stage I v.s. Stage II: 0.670 v.s. 0.684; Wilcoxon Signed-rank test: z=-0.948, p=0.343). We are examining whether there is one difference in the etsimated $\hat{\rho}_n$ between stages. As for BT with the all-observations sample, the estimated paramter $\hat{\rho}_n$ of Stage I is not significantly different from that of Stage II (Stage I v.s. Stage II: -3.640 v.s. -5.53; Wilcoxon Signed-rank test: z=-0.108, p=0.914), but there is one significant difference in the estimated $\hat{\rho}_n$ between stage in MIT (Stage I v.s. Stage II: -3.203 v.s. -1.637; Wilcoxon Signed-rank: t=-3.073, p=0.002), indicating that dictators receiving the social information get more efficient-focused (less equality-focused). We also use the only-rational-observations sample to exmaine the differences in the estimated $\hat{\alpha}_n$ ($\hat{\rho}_n$) between stages, and the results are same to those of the all-observations sample.

On the other hand, we are now examining whether there is one difference in the estimated $\hat{\alpha}_n$ ($\hat{\rho}_n$) between treatments. First of all, we should test the difference in Stage I between treatments for making it clear that no infromation in Stage I does not change dictators. With the Wilcoxon-Mann-Whitney test, we find there is no significant difference in Stage I's $\hat{\alpha}_n$ between BT and MIT (p=0.390). As for Stage II, we find one small significant difference in the estimated $\hat{\alpha}_n$ between treatment (Wilcoxon-Mann-Whitney test: z=1.713, p=0.088), but there is no significant difference in the estimated $\hat{\alpha}_n$ with the only-rational-observations sample (Wilcoxon-Mann-Whitney test: z=1.189, p=0.235), indicating that the results are not robust for both samples. With regrads to the estimated $\hat{\rho}_n$, there is no significant difference in Stage I between BT and MIT (Wilcoxon-Mann-Whitney test: z=-1.414, p=0.157), while one significant difference in Stage II between treatment is to be found here (Wilcoxon-Mann-Whitney test: z=-2.118, p=0.034), indicating that the MIT dictators are more efficiency-focused (less equality-focused) than those of BT.[15]

Table 9: The mean $\hat{\alpha}_n$ and $\hat{\rho}_n$

Treat.	All subjects				CCEI≥0.8			
	Mean $\hat{\alpha}_n$		Mean $\hat{\rho}_n$		Mean $\hat{\alpha}_n$		Mean $\hat{\rho}_n$	
	Stage I	Stage II	Stage I	Stage II	Stage I	Stage II	Stage I	Stage II
BT	0.689	0.706	-3.640	-5.53	0.704	0.697	-3.751	-5.697
	(0.265)	(0.277)	(11.013)	(17.154)	(0.253)	(0.283)	(11.439)	(17.779)
MIT	0.670	0.684	-3.203	-1.637	0.671	0.694	-3.239	-1.575
	(0.244)	(0.199)	(11.975)	(8.589)	(0.237)	(0.192)	(12.364)	(8.744)

Note: Standard errors are in the parentheses.

We conduct an OLS regression on the estimated $\hat{\alpha}_n$ and the quantile regression on the estimated $\hat{\rho}_n$ (see Table 10 and 11). There must be some changes in the estimated parameters $\hat{\alpha}_n$ or $\hat{\rho}_n$ if distributional preferences are different between

[15] With the only-rational-observations sample, we also find that there is one difference in $\hat{\rho}_n$ between BT and MIT (Wilcoxon-Mann-Whitney test: z=-1.895, p=0.058), indicating that the results are robust fro both samples.

stages for MIT. Table 10 reports the OLS regression on the estimated $\hat{\alpha}_n$ in Stage I, Stage II, BT, and MIT. The estimated $\hat{\alpha}_n$ indicates selfish preferences. Columns (1) and (2) indicate that there is no significant correlation between the estimated $\hat{\alpha}_n$ and MIT in Stage I (Stage II), which means that there is no signifciant difference in the estimated $\hat{\alpha}_n$ of Stage I (Stage II) between treatments. It suggests that the dictators' averagely do not change their tradeoff of selfishness and fairness, but it does not mean their distributional preferences are not impacted by the social information because it may impact/change the distributional preferences through the other dimension with regards to the efficiency-equality tradeoff. With the comparison of Stage I between BT and MIT, there is no significant difference in the estimated $\hat{\alpha}_n$ (Column (3): b=0.016, p=0.674), indicating that selfishness-fairness tradeoffs in BT of Stage I is close to that in MIT. More importantly, the MIT's Stage II has no significantly different value of the estimated $\hat{\alpha}_n$ from that of BT with the all-observations sample (Column (4)). The results with the only-rational-observations sample (Columns (5)—(8)) are close to those with the all-observations sample (Columns (1)—(4)). However, as for the observations (CCEI≥0.8 and $\hat{\rho}_n \leq 1$), there is no signifcicant difference in the estimated $\hat{\alpha}_n$ between MIT and BT of Stage I, indicating that subjects in both treatment have close generosity to the recipients (Column (9): b=-0.029, p=0.333), but the significant and negative coeeficient for MIT in Column (10) indicates that the MIT's estimated $\hat{\alpha}_n$ in Stage II is significantly less than that of BT (b=-0.088, p=0.003), which is consistent with the earlier tests on the giving share between treatment for Stage II (see Section 4.3.1). That Columns (9)—(12) are different from Columns (1)—(8) is due to excluding the observations whose estimated $\hat{\rho}_n > 1$ breaking the assumption ($\rho \leq 1$) in the CES utility function.[16] Thus, the pure effect of the social information on the dictators' giving behaviors is not quite stable, but it works in a rigorous conditions (CCEI≥0.8 and $\hat{\rho}_n \leq 1$).

Additionally, the estimated $\hat{\rho}_n$, which parameterizes attitudes towards efficiency-equality tradeoffs, is presented in Table 11. Following Fisman et al. (2015), we estimate quantile regression that are less sensitive to extreme values and find the distribution of $\hat{\rho}_n$ to be highly skewed. Table 11 reports the results for the 25th, 50th, and 75th percentiles. Columns (1)—(2) and Columns (5)—(6) present the results of the quantile regression on $\hat{\rho}_n$ for Stage I. We find that there are significant correlations between the estimated $\hat{\rho}_n$ and MIT in the 50th and 75th percentiles for Stage II, indicating that the dictator in MIT is more efficiency-focused (less equality-focused) than those in BT. Apart from the quantile regression, we also run the probit estimates on the indicator for the estimated $\hat{\rho}_n \leq 1$ in BT, MIT, Stage I, and Stage II (see Table 12). The dependent variable is 1 when $\hat{\rho}_n > 0$, and otherwise 0. In Columns (1) and (2), we do not find any significant difference in $\hat{\rho}_n > 0$ between stages in BT (MIT). In Column (4), participants in MIT are 38.4% more likely to be efficiency-focused in Stage II than those of BT (p=0.041). This may be because the dictators recieving the social information are sensitive to the

[16] A great amount of decisions with various budget lines can improve the accruacy of the estimated parameters, meaning that it will not have many breakings on assumpstions and be highly consistent with the dictators' true decisions. In the experimental design of Fisman et al. (2007), they used 50 decisions on budget lines, generating a relatively rich choice set, but we consider making subjects not get bored with the game in a repeated decisions via reducing the decision's rounds (10 decisions each stage).

relative of price of giving mentioned in Section 4.3.3, in which they are giving more when facing low prices but less facing high price,[17] which increases the efficiency of distributions. Thus, that giving more on low prices but a little less on the high price is improving the giving in Stage II for MIT, which is consistent with increasing efficiency in distributions.

FINDING 3: With the information of the maximum giving, the dictators get more efficiency-focused (less equality-focused) in distributional preferences.

Table 11: Quntile regression on the estimated $\hat{\rho}_n$

Specifications	Dependent variable: $\hat{\rho}_n$ ($\hat{\rho}_n \leq 1$)							
	All subjects				CCEI≥0.8			
	Stage I	Stage I	Stage II	Stage II	Stage I	Stage I	Stage II	Stage II
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
25th percentile								
MIT	1.681	2.173*	0.839	0.615	0.639	1.424	0.474	0.672
	(1.672)	(1.266)	(0.709)	(1.368)	(1.669)	(1.325)	(0.862)	(1.289)
Constants	-2.640	-4.810**	-1.364**	-2.591*	-1.536	0.164	-0.978	-2.961
	(1.602)	(2.348)	(0.682)	(1.447)	(1.652)	(0.235)	(0.834)	(5.978)
50th percentile								
MIT	0.241	0.049	0.254	0.339**	0.267	0.164	0.168	0.291*
	(0.173)	(0.211)	(0.185)	(0.141)	(0.182)	(0.235)	(0.154)	(0.165)
Constants	-0.219	-0.378	-0.098	-0.618***	-0.188	-1.009*	-0.011	-0.569
	(0.205)	(0.371)	(0.093)	(0.206)	(0.150)	(0.570)	(0.099)	(0.377)
75th percentile								
MIT	0.001	0.154	0.221**	0.249***	0.006	0.149**	0.210*	0.252**
	(0.119)	(0.136)	(0.100)	(0.088)	(0.097)	(0.073)	(0.106)	(0101)
Constants	0.382***	-0.171	0.309***	-0.224	0.386***	-0.182	0.329***	-0.299
	(0.095)	(0.345)	(0.045)	(0.173)	(0.033)	(0.337)	(0.070)	(0.183)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	186	186	186	186	173	173	173	173

Note: All subjects here does not contain those observations with $\hat{\rho}_n > 1$. Significant level at 10% *, 5% **, 1% ***.

[17] As we analyzed in Section 4.3.3, the dictators in Stage for MIT are giving less when *price*=0.25, 0.33, 0.5, and 1 than those BT, while there is no significant difference in the giving share between treatment when the relative price of giving is equal to 2 and 3, but they are giving a little more when *price*=4 (the highest price in the experimental design). Thus, this is consitent with the change in the paramter $\hat{\rho}_n$ (more getting efficiency-focused).

Table 10: OLS regression on the estimated $\hat{\alpha}_n$

Specifications	Dependent variable: $\hat{\alpha}_n$											
	All subject				CCEI≥0.8				CCEI≥0.8 and $\hat{\rho}_n \leq 1$			
	Satge I	Satge II	BT	MIT	Satge I	Satge II	BT	MIT	Satge I	Satge II	BT	MIT
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Without controls												
MIT	-0.019	-0.023			-0.033	-0.003			-0.029	-0.088***		
	(0.035)	(0.033)			(0.035)	(0.035)			(0.029)	(0.029)		
Stage II			0.016	0.014			-0.008	0.022			0.022	-0.013
			(0.039)	(0.029)			(0.041)	(0.029)			(0.031)	(0.026)
Constants	0.689***	0.706***	0.689***	0.670***	0.704***	0.697***	0.704***	0.671***	0.736***	0.761***	0.744***	0.703***
	(0.027)	(0.028)	(0.027)	(0.022)	(0.027)	(0.030)	(0.027)	(0.023)	(0.023)	(0.023)	(0.021)	(0.018)
R^2	0.0015	0.0023	0.0009	0.0009	0.0044	0.0000	0.0002	0.0027	0.0056	0.0504	0.0032	0.0012
Panel B: With controls												
MIT	-0.023	-0.025			-0.036	-0.006			-0.037	-0.093***		
	(0.035)	(0.033)			(0.035)	(0.035)			(0.029)	(0.029)		
Stage II			0.016	0.014			-0.008	0.022			0.021	-0.014
			(0.039)	(0.029)			(0.040)	(0.029)			(0.029)	(0.026)
Constants	0.719***	0.754***	0.783***	0.700***	0.756***	0.795***	0.812***	0.744***	0.869***	0.881***	0.951***	0.775***
	(0.078)	(0.075)	(0.092)	(0.063)	(0.082)	(0.077)	(0.101)	(0.064)	(0.067)	(0.069)	(0.079)	(0.057)
R^2	0.0107	0.0103	0.0287	0.0052	0.0205	0.0152	0.0339	0.0095	0.0610	0.0786	0.1098	0.0163
Observations	218	218	196	240	196	196	174	218	173	173	158	211

Note: The independent variables MIT, Stage II, Male, Han Chinese, and Grade are dummies. The sibling represents the number of siblings in one participant's family. Standard errors are clustered at the subject level. Significant level at 10% *, 5% **, 1% ***.

Table 12: Probit regression on the estimated $\hat{\rho}_n$ ($\hat{\rho}_n \leq 1$)

Specifications	Dependent variable: Indicator for $\hat{\rho}_n \geq 0$							
	All subjects				CCEI≥0.8			
	BT	MIT	Stage I	Stage II	BT	MIT	Stage I	Stage II
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Without controls								
Stage II	7.62e-17	0.141			4.76e-17	0.101		
	(0.202)	(0.172)			(0.209)	(0.179)		
MIT			0.243	0.384**			0.221	0.322*
			(0.187)	(0.188)			(0.194)	(0.194)
Constants	-0.208	0.035	-0.208	-0.208	-0.120	0.100	-0.120	-0.120
	(0.143)	(0.121)	(0.143)	(0.143)	(0.148)	(0.126)	(0.148)	(0.148)
R^2	0.0000	0.0023	0.0066	0.0164	-0.0000	0.0012	0.0055	0.0116
With controls								
Stage II	0.002	0.147			0.003	0.105		
	(0.207)	(0.175)			(0.213)	(0.183)		
MIT			0.297	0.462**			0.289	0.416**
			(0.190)	(0.192)			(0.198)	(0.201)
Constants	-1.223**	-0.700*	-0.884**	-1.235***	-1.052*	-0.954**	-0.864*	-1.514***
	(0.533)	(0.369)	(0.424)	(0.419)	(0.544)	(0.398)	(0.442)	(0.449)
R^2	0.0609	0.0420	0.0436	0.0691	0.0525	0.0614	0.0481	0.0822
Observations	158	214	186	186	146	200	173	173

Note: Significant level at 10% *, 5% **, 1% ***.

3.5 Changes in Distributional Preferences

Table 13 describes the estimates of parameters for the CES utility function by Andreoni and Miller (2002). We employ the Andreoni and Miller's categories to classify utility functions in Stage I and Stage II for BT and MIT. We find that some participants significantly change their preferences from one type to another. In BT, the distributional preferences of some participants are not stable across Stage I and Stage II, which we call mistakes. In Table 14, the elasticity of substitution for the weak Leontief utility function is σ=-0.74, showing a strong complementarity between π_s and π_o. The elasticities of substitution for the weak selfish is σ=-2.63 and for weak perfect substitute is σ=-3.02, indicating both have very flat indifference curves, but those for the weakly perfect substitutes are slightly flatter (Anderoni and Miller, 2002).

Table 13: Estimates of parameters (standard errors) for CES utility function for the three weak types (Andreoni and Miller, 2002)

	Weak Selfish	Weak Leontief	Waek Perf. Subst.
$g = \left(\frac{\alpha}{1-\alpha}\right)^{\frac{1}{1-\rho}}$	20.183	1.6023	2.536
	(5.586)	(0.081)	(0.311)
$\gamma = -\frac{\rho}{1-\rho}$	-1.636	0.259	-2.022
	(0.265)	(0.067)	(0.188)
α	0.758	0.654	0.576
ρ	0.621	-0.350	0.669
σ	-2.636	-0.741	-3.022
s.e.-self	0.2216	0.179	0.244
	(0.011)	(0.009)	(0.014)
$\ln likelihood$	-107.620	52.117	-69.583
Number of cases	380	230	242

In MIT, it is 29% of participants (30 out of 102) changing distributional preference from one type to another type in Stage I and Stage II while BT has 11% (8 out of 73) has unstable distributional preference which is caused by repeated decisions.[18] We take one-sided Fisher's exact test on the difference in changes of distributional preferences between BT and MIT and find that there is one significant difference in changes of preferences between treatments (p=0.004), indicating that MIT is more likely to change distributional preferences significantly than BT. The result of probit estimate in Table 14 is consistent with the one-sided Fisher's exact test, and the positive and significant coefficient indicates that the treatment group has 69% greater probability of changing types of preference from one to another than the control group (p=0.004) in Column (1). Moreover, in Column (2), there is one negative and significant correlation between education and change in preferences (b=-0.754, p=0.018), indicating that participants with more education experience are less likely to change their preferences.

The information of the maximum giving indeed changes some participants' minds on decisions of sharing in Stage II. In Figures 10—14, we draw the indifferent curves with the estimated combination values of ($\hat{\alpha}$, $\hat{\rho}$) with an individual level, where we can see these participants change their distributional preferences from Stage I to Stage II. The classifications of distributional preferences, like Perfect Substitutes, Leontief, Selfish, and Cobb-Douglas, are presented in these figures and the indifferent curves in Stage II change significantly, compared to Stage I. For exmaple, as Figure 10 shows, the participant (Subject ID: MIT01) has the distributional preference of substitution in Stage I but she changes her preference to be selfish for

[18] In the repeated decision-makings, some participants will change their preferences, like "mistakes", when they are making decisions although there is no intervention of the maximum information. However, there is a significant difference in changes of preferences between BT and MIT, indicating that the social information changes individual preferences significantly.

Stage II. Another participant (Subject ID:MIT11) has the preference of substitute ($\hat{\rho}$=0.867) in Stage I, while her preference is changed to be completely selfish with the estimated parameter $\hat{\alpha}$=1.

FINDING 4: The MIT has more changed preferences than the BT from Stage I to Stage II in an individual level analysis.

Table 14: Probit estimates on chenge in preferences

Specifications	Dependent varibale: $\hat{\rho}_n > 0$	
	(1)	(2)
MIT	0.687***	0.704***
	(0.236)	(0.246)
Male		-0.219
		(0.234)
Undergraduates		-0.754***
		(0.319)
Han		-0.212
		(0.353)
Sibling		-0.037
		(0.119)
Constants	-1.229***	-0.277
	(0.196)	(0.461)
Observations	175	175

Note: The dependent variable is the change of preference, in which it is equal to 1 when it represents the situation where one's preference changed to another type of preferences. Significance level at 10% *, 5% **, and 1% ***.

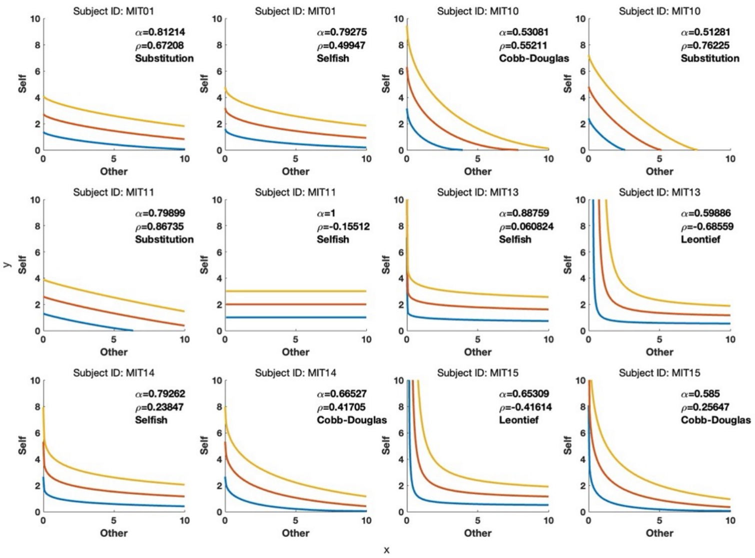

Figure 10: Indifferent Curves of Changed Preferences in BT

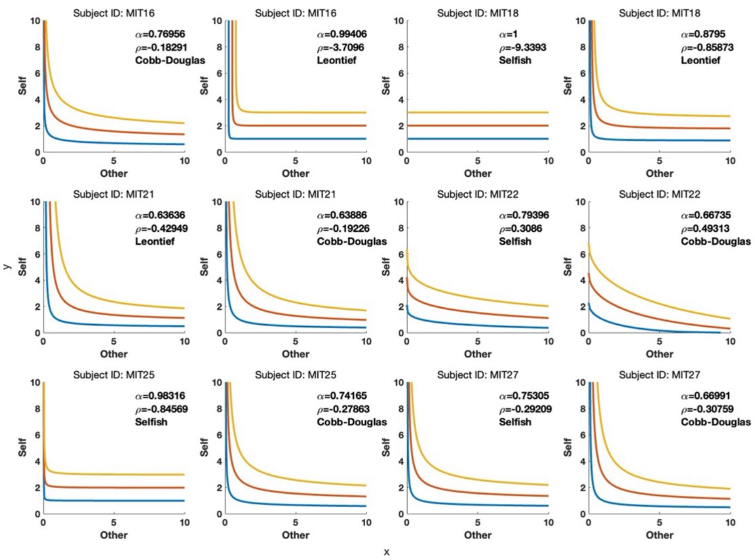

Figure 11: Indifferent Curves of Changed Preferences in MIT

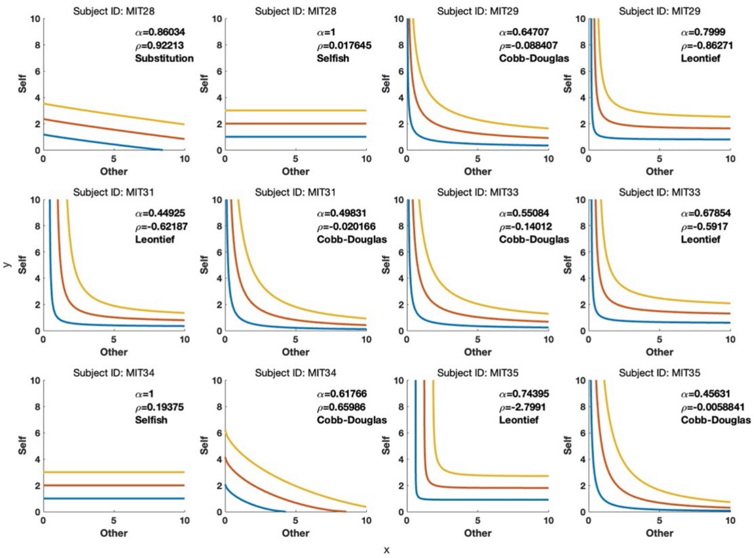

Figure 12: Indifferent Curves of Changed Preferences in MIT

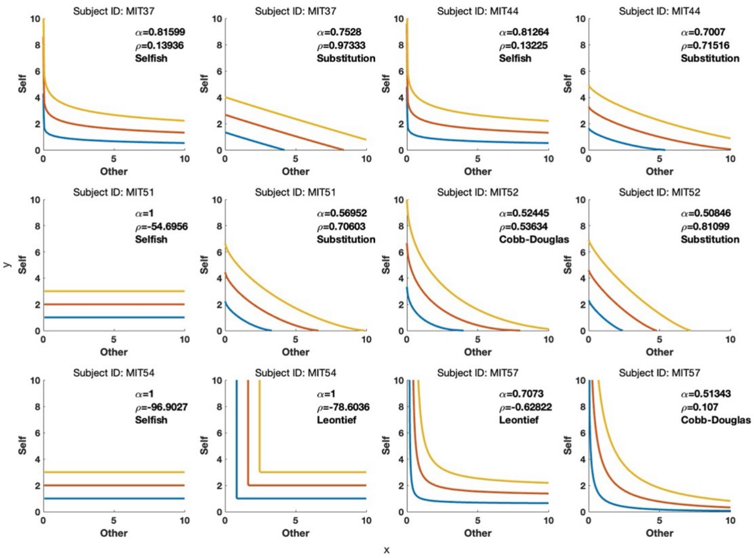

Figure 13: Indifferent Curves of Changed Preferences in MIT

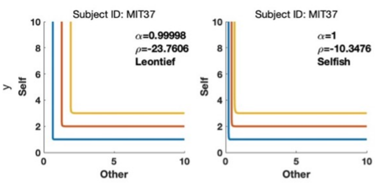

Figure 14: Indifferent Curves of Changed Preferences in MIT

As for the changed preferences, the scatters of estimated $\hat{\alpha}$ are plotted in Figure 15 where the picture contains the function line ($y = x$) and lines ($y = 0.5$ and $x = 0.5$). With the help of above lines, the scatters of estimated $\hat{\alpha}$ are presented in which areas clearly. The estimated $\hat{\alpha}_2$ is greater than the estimated $\hat{\alpha}_1$ if dots of $\hat{\alpha}_2$ are above the function line ($y = x$) otherwise the value of estimated $\hat{\alpha}$ decreases from Stage I to Stage II. The 63% (19 out of 30) of participants‘ $\hat{\alpha}$ gets less after receiving the information of the maximum giving in Stage II while the $\hat{\alpha}$ of the others (37%) gets greater, indicating that most participants are motivated to put more weights on fairness rather than selfishness in giving to recipients. On the other hand, the value of the estimated $\hat{\rho}$ changes from Stage I to Stage II. Figure 16 depicts the scatters of $\hat{\rho}_1$ and $\hat{\rho}_2$ are plotted where the function line ($y = x$) and the straight lines ($y = 0$ and $x = 0$) are added on the picture. The 70% (21 out of 30) of participants in MIT increases $\hat{\rho}$ and the rest percent (30%) of participants' $\hat{\rho}$ decreases, meaning that most participants with changed preferences are more efficiency-focused (less equality-focused) in Stage II than that of Stage I while some of them become less efficiency-focused (more equality-focused).

To examine the statistical relationship between the estimated $\hat{\alpha}$ and $\hat{\rho}$ between stages, we conduct the probit estimates on the difference in the estimated $\hat{\alpha}$ between Stage I and Stage II. As Table 15 shows, the dependent variable $\Delta\rho$ represents the difference in the parameter $\hat{\rho}$ between Stage I and Stage II ($\Delta\rho = 1$ if $\hat{\rho}_2 - \hat{\rho}_1 > 0$; otherwise, $\Delta\rho = 0$). The independent variable $\Delta\alpha$ represents the sign of $\hat{\alpha}_2 - \hat{\alpha}_1$, in which $\Delta\alpha$ is quale to 1 when $\hat{\alpha}_2 - \hat{\alpha}_1 > 0$; otherwise, its value is equal to 0. The regression result shows that there is one significant and negative correlation between $\Delta\alpha$ and $\Delta\rho$, indicating that the fairness has substitution for the efficiency. The correlation is reported in Table 15. Column (1) depicts that there is one significant and negative relationship between $\Delta\alpha$ and $\Delta\rho$ (b=-1.601, p=0.004), and, with control variables, the correlation is still significantly negative (b=-1.571, p=0.008). Among these changed preferences, participants pay more attention to fairness which increases the income of recipients, on the other hand, they increase the importance of the efficiency which maximizes the total incomes of both sides. From Figure 15 and Figure 16, the tendency of changes in the utility is to be more fairness-focused and efficiency-focused than before.

Finding 5: The tradeoff between selfishness and fairness has a significant substitution for the efficiency-equality tradeoff in distributions when the preferences are changed. Changed preferences are more likely to be more fair-minded and efficiency-focused with receiving information of others' maximum giving when participants are faced with selfishness-fairness and equality-efficiency tradeoffs.

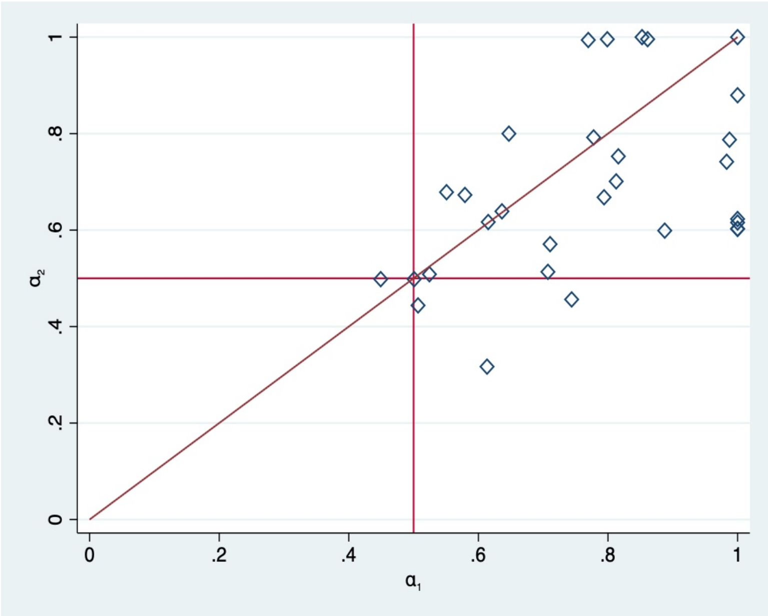

Figure 15: Scatters of the parameter $\hat{\alpha}$ for changed preferences in MIT

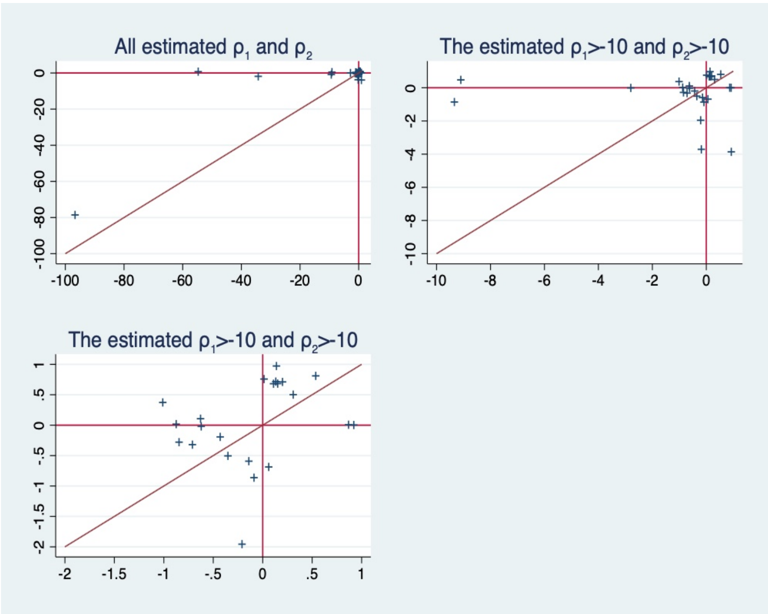

Figure 16: Scatters of the parameter $\hat{\rho}$ for changed preferences in MIT

Table 15: Probit estimates on the parameter $\Delta\rho$

Specifications	Dependent varibale: $\Delta\rho$	
	(1)	(2)
$\Delta\alpha$	-1.601***	-1.571***
	(0.556)	(0.593)
Male		-0.528
		(0.487)
Grades		0.316
		(0.483)
Han		-0.125
		(0.582)
Sibling		0.081
		(0.292)
Constants	1.252***	1.216***
	(0.393)	(0.604)
Observations	30	30

Note: $N = 30$; The dependent variable $\Delta\rho$ is equal to 1 when $\hat{\rho}_2 - \hat{\rho}_1 > 0$; otherwise it is equal to 0. The independent variable $\Delta\alpha$ is equal to 1 when $\hat{\alpha}_2 - \hat{\alpha}_1 > 0$; otherwise, its value is 0. Significance at 10% *, 5% **, and 1% ***.

4 Conclusion and Discussion

This paper explores the impact of social information on giving in a repeated dictatpr game and finds significant effects that depend importantly on the price of giving. The form of social information is the maximum amount given in the previous round. The experimental design builds on the work of Andreoni and Miller (2002) and extensions by Fisman et al. (2015a, 2015b). We find that the information on the maximum giving significantly improves participants' giving to recipients when participants receive the information. However, the improvement in generosity is especially effective when the relative price of giving (cost of helping) is low and higher. The giving share decreases significantly with the relative price increasing in both MIT and BT, but the difference in giving share between MIT and BT for Stage II is gradually getting reduced with price. This indicates that participants are more sensitive to increasing (reducing) the giving share only if the price is relatively low (higher). Using the GARP (generalized axiom of revealed preference), we measure the consistency with rationality for participants for excluding those participants who make mistakes (deviations from the rationality). We calculate the CCEI (ciritical cost efficiency index) to measure the degree to rationality (Afrait, 1967). We find that some participants in both BT and MIT break the rationality assumption, but most of them are consistent with the GARP, and there is no difference in the CCEIs between treatment for Stage I (Stage II). We employ the non-linear tobit to estimate the parameters of the CES utility functions to identify participants' selfishness-fairness tradeoff and efficiency-equality tradeoff. First, we find that there are significant differences in the estimated parameters between BT and MIT in Stage II, which indicates that the features of distributional preferences change in a group level from Stage I to Stage II. Thus, both experience and social information affect giving shares. However, MIT has more changed preferences than BT emphasizing the importance of the social information. At an individual level we classify prefereces as Leontief, Perfect Substitutes, Selfish, and Cobb-Douglas. These changed preferences are observed to be more efficiency-focused (less equality-focused) when the social information is available which presents a relationship of substititution between fairness and efficiency.

Our results are different from the finding of Murphy et al. (2015), which means that environmental factors may induce preference changes at an individual level, but it is still stable at a group level because the intervention induced inverse directive changes, leading to an offset at a group level. However, this changing pattern in our paper has some interesting features—those with changed preferences are more generous and equality-focused in Stage II than Stage I and it increase demands for fairness and efficiency in distributions. The results are different from Cason and Mui (1998) whose dictators are more selfish because their experimental design is a sequential dictator. Compared with previous literatures on preference stability, this paper uses a laboratory experiment to show how the information about others' actions as dictators affects dictators' behavioral choices. This paper provides another feasible method for exploring the stability of preferences. Although economists often use the prisoner dilemma or dictator game with frameworks to study the preference stability. Those methods cannot determine behaviors change by affecting their beliefs or preferences.

However, there are still many shortcomings in this paper. First, due to the limitation of experimental samples, some conclusions on preferences changed need to support with more evidence. Therefore, we will continue to carry out more experiments to get more data. The experimental design does not contains sufficient decisions, leading to some errors in our analysis, especially for the non-linear tobit estimates in the CES utility faunction. In our future study, we will enrich budget lines and add more situations with varying the relative price of giving and intercepts on the beudget lines. Second, this paper only considers the social information of maximum giving to recipients, which is insufficient for exploring changes on preferences, so we will add additional treatments containing other factors in the future. More importantly, our paper only examines whether environmental factors impact people's distributional preference in the laboratory, but we still need to do more work for checking its effects outside lab. At last, emotions of people play an import role on human's decision-makings in real life, and there is a lack of research on how emotions affect human's preferences in this paper. These are directions we will work hard to explore in the future.

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A Appendix : Instructions

Welcome to participate in this experiment!

Some rules for the experiment are as follows: 1. No communicating with others. This experiment will last 30 minutes To make sure the whole experiment goes well, you are not allowed to talk to other participants and should focuse on your own decisions. If you have any question, please raise your hand up but not ask it publicly. The experimenters will come to you there and answer your questions privately. 2. You will get money from the experiment which depends on your decisions. One experimental currency token is equal to 0.3 RMB. Your final payment is equal to your earnings plus one show-up fee (10 RMB). 3. Anonymity. The experiment is anonymous to all participants. Based on data security in China, your decision data will be treated safely.

A.1 Instrcutions for BT

The whole experiment consists of 20 rounds decisions which will approximately last for 40 minutes. All participants will be randomly assigned into groups of two. You will be atsked with making decisions between yourself and the other participant. When the experiment starts, you will see a budget line displaying on the computer screen. The budget line has two dimensions (self and other), in which you should make a distribution via clicking on the line for you and the other participant. The point which you choose on the budget line is a combination of (x, y) in which x and y represent the allocated amount of tokens for *Other* (the other participant) and $Self$ (yourself), respectively. After doing one round and clicking "$Confirmation$" button, you will see the profits earned from this round.

Finally, after completing all decisions for 20 rounds, the computer randomly determines the role distributions for both members with group. If you are selected as the role *Red* and the other participant is selected as the role $Blue$, the computer will randomly choose one decision from your 20-rounds decisions as the final payment (plus one show-up fee) for you and the other participant. But the other participant is selected as the role *Red* (the role *Blue* for you), the final payment is randomly selected one from her decisions to determine her and your payments. At the end of the experiment, you should complete a questionnaire. These questions are not relevant to your privacy. It will not record your name and identity.

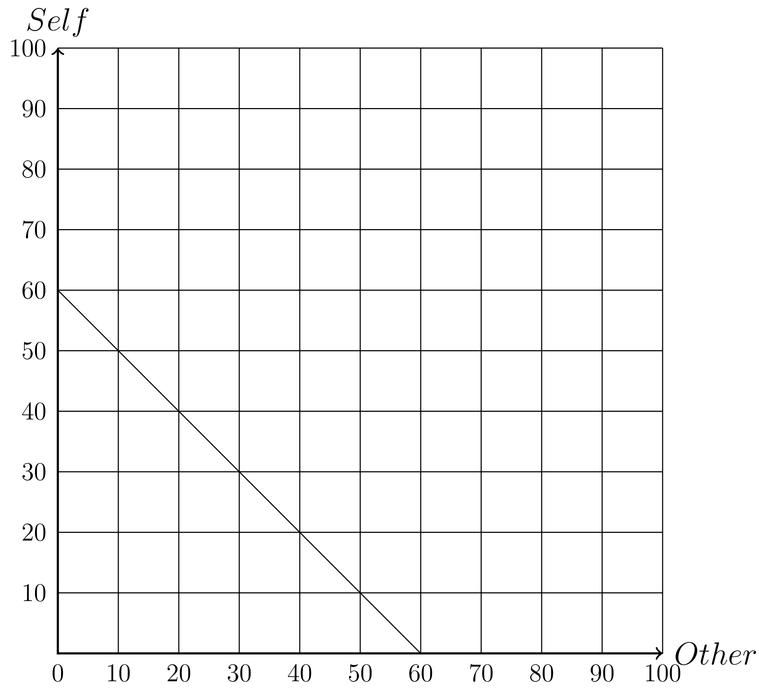

Figure 17: An example for the budget line

A.2 Instructions for MIT

The whole experiment consists of 20 rounds decisions which will approximately last for 40 minutes. All participants will be randomly assigned into groups of two. You will be atsked with making decisions between yourself and the other participant. When the experiment starts, you will see a budget line displaying on the computer screen. The budget line has two dimensions (self and other), in which you should make a distribution via clicking on the line for you and the other participant. The point which you choose on the budget line is a combination of (x, y) in which x and y represent the allocated amount of tokens for *Other* (the other participant) and *Self* (yourself), respectively. After doing one round and clicking "*Confirmation*" button, you will see the profits earned from this round.

The experiment consists of two stages, including Stage I and II. Stage I is the first 10 rounds decisions, and Stage II is the second 10 rounds decisions. In Stage I, you will make decisions with facing a series of budget lines but not see any information of the maximum giving, while, in Stage II, you can see the information of the maximum giving from all participants' decisions. After reading the information, you should complete the next decision. For example, you could see the information of the maximum giving in round $i - 1$ before you continue the decision in round i.

Finally, after completing all decisions for Stage I and II, the computer randomly determines the role distributions for both members with group. If you are selected as the role *Red* and the other participant is selected as the role *Blue*, the computer will randomly choose one decision from your 20-rounds decisions as the final payment (plus one show-up fee) for you and the other participant. But the other participant is selected as the role *Red* (the role *Blue* for you), the final payment is randomly selected one from her decisions to determine her and your payments. At the end of the experiment, you should complete a questionnaire. These questions are not relevant to your privacy. It will not record your name and identity.

Exercise

Please complete the exercise. If you have any questions, please raise your hand up. The experimenters will come to you there and answer your questions privately.

(1) If you are made the role *Blue*, the other participant who is matched with you is made the role __________ (*Red* or *Blue*); your role is made __________ (*Red* or *Blue*) in the next round.
(2) If you made the role of *Red*, your decisions will determine the payments for yourself and the other participant? (Yes or No)
(3) As for the budget line 1, you get __________ tokens, and the other participant gets __________ tokens.

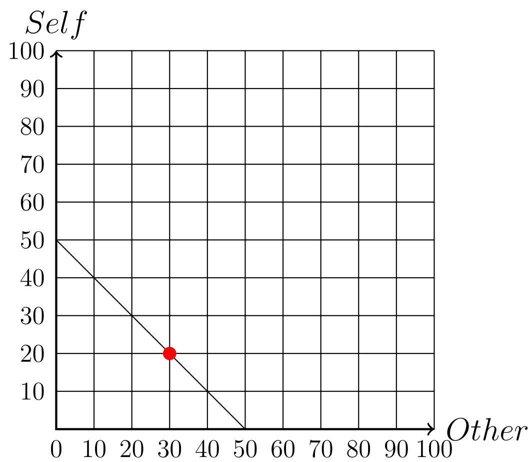

Figure 18: Budget line 1

(4) As for the budget line 2, you get __________ tokens, and the other participant gets __________ tokens.

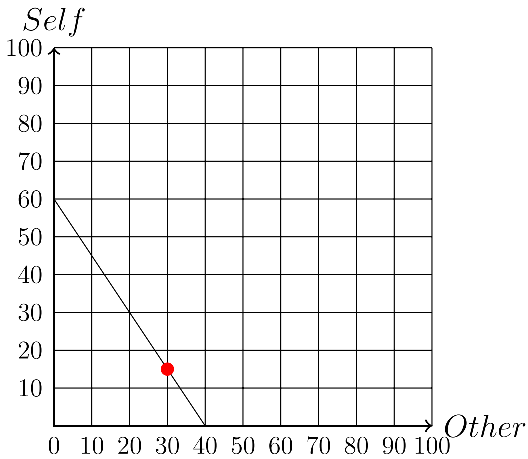

Figure 19: Budget line 2

(5) As for the budget line 3, you get __________ tokens, and the other participant gets __________ tokens.

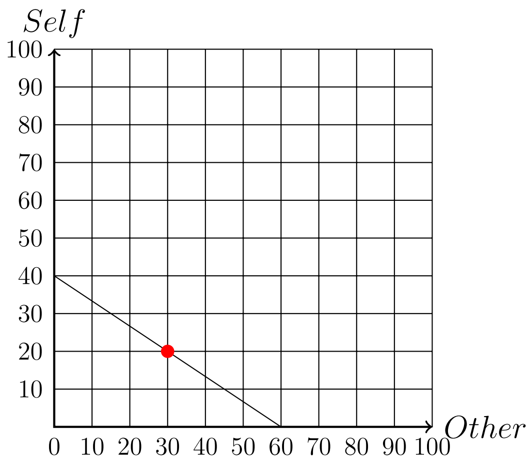

Figure 20: Budget line 3

(6) As for the budget line 4, you get __________ tokens, and the other participant gets __________ tokens.

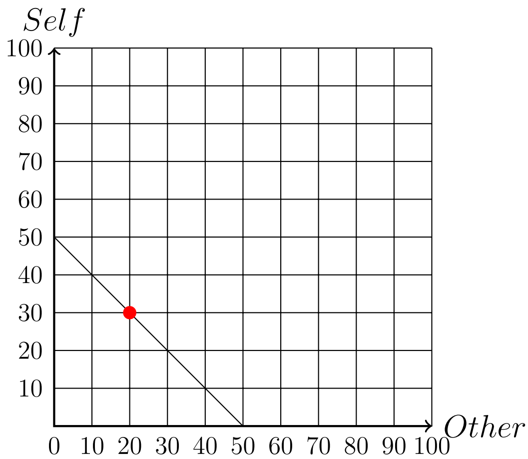

Figure 21: Budget line 4

(7) As for the budget line 5, you get __________ tokens, and the other participant gets __________ tokens.

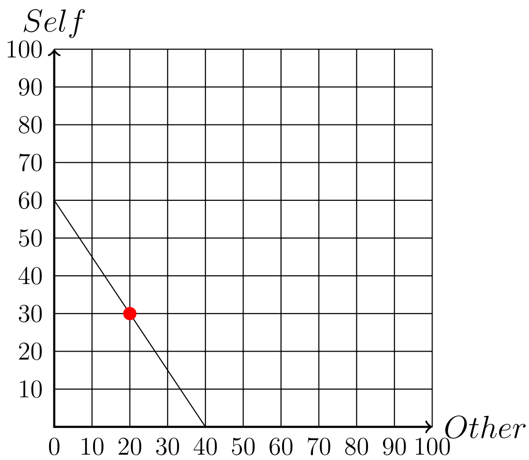

Figure 22: Budget line 5

(8) As for the budget line 6, you get __________ tokens, and the other participant gets __________ tokens.

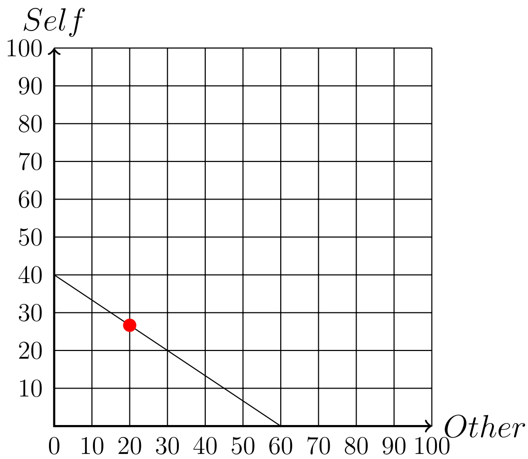

Figure 23: Budget line 6