Giving When Responsible For Others' risk*

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Abstract

Social support is often thought of as an insurance scheme, allowing citizens to take more risk than they would in autarky. Provision of social support also involves uncertainty since providers have incomplete information and cannot fully predict future outcomes. Societies organize provision of social support in different ways, and we know little about how this influence the willingness of providers to take risk. In a stylized experiment, I investigate how two different institutions affect risk taking in provision. In one institution, everyone is entitled to social support and also voice their opinions on how much risk to take. In the other institution, support is voluntarily given and not guaranteed. I find that in the voluntary institution, providers of social support take 22% of a standard deviation more risk on behalf of others and only 48% receive support. The experimental design allows to decompose this difference in risk taking into a selection effect and an effect of the institution itself. The voluntary institution lead to greater risk taking, but this effect is counteracted by selection of cautious volunteers.

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1 Introduction

Often, social support is thought of as an insurance scheme (Sinn, 1995). But, from the point of view of the providers of social support, the choice among different sorts of assistance and support is also a decision under uncertainty. Providers face uncertainties that arise from incomplete information and uncontrollable factors. These uncertainties make the ultimate benefits difficult to predict. In some welfare institutions, everyone is entitled to social insurance and also voice their opinions through democratic election, as exemplified by the Nordic welfare states. In other welfare institutions, social insurance is voluntarily organized, provided and decided by volunteers, as exemplified by the village economies studied by Townsend (1994). Many societies lie somewhere in between these extremes, but volunteerism is important also in developed economies (Romero, 1986). Whether and how these differences in welfare institutions influence decision making in the provision of social support remain an open question in behavioral public economics.

To reveal the relationship between the welfare institutions and welfare decisions, I designed an experiment with stylized welfare institutions in different treatments. Around 2000 subjects participated in an online experiment. First, participants were randomized into groups that were paid or not paid for taking part in a survey. Second, the lucky participants could provide support to the unlucky participants in two different treatments that are consistent with different institutions for support. One group of the decision makers made risky decisions on behalf of recipients with money that the recipients were already entitled to. The other group chose whether or not to voluntarily provide support to the recipients and made risky decisions on behalf of the recipients with money that the decision makers contributed themselves.

The decision making can differ between welfare institutions by two main mechanisms. The first mechanism is that same people behave differently in different institutions, which I will refer to as an *institutional effect*. Previous research has documented effects of institutions on behavior. In particular, people behave differently when regulations are exogenously imposed than when the same regulations are freely chosen (Bó et al., 2010). Similar impacts of endogenous rule choice on behavior are also found to result from self-crafted irrigation rules (Bardhan, 2000), voted tax policy (Frey, 1998), and self-chosen reward and punishment in public good games (Sutter et al., 2010). The findings indicate that the decision making in social assistance may vary with different welfare institutions. The decision making can be different when the social assistance depends on voluntary contribution and decisions are made by contributors, than when everyone is entitled to the social assistance and voice their opinions on decision making.

The second mechanism is that different people make different decisions on behalf of others regardless of the external institutions, which I will refer to as a *selection effect*. Among other sources, the mechanism focuses on the heterogeneity of risk taking on behalf of others that arises from the different preferences for volunteering to help others. Unlike the former mechanism from the external institutions, the intrinsic different attitudes toward volunteering is endogenous and result from people's social preferences. The relation between the social preferences and decision making on behalf of others has been studied by Andersson et al. (2013a). They showed that people who give more in dictator game take less risk on behalf of others than people who give less. Also, Montinari and Rancan (2013) found that risk taking on behalf of others decreases with social distance. These findings suggest that the different degrees of social minding between people can lead to different decision makings on behalf of others.

To further understand the selection effect, it is possible to examine whether different people make different decisions on behalf of others compared to on behalf of themselves. An established literature has examined this question, but the results are quite mixed. Some studies found that people take more risk on behalf of others than themselves (Andersson et al., 2016; Chakravarty et al., 2011; Sutter, 2009); others found that people take less risk on behalf of others than themselves (Bolton and Ockenfels, 2010; Bolton et al., 2015; Charness and Jackson, 2009; Eriksen and Kvaløy, 2010; Reynolds et al., 2009); and finally, some found that there is no difference between decisions on behalf of others and on behalf of oneself (Ertac and Gurdal, 2012). To compare the risk taking among people with different strengths of social concern would tell whether social preferences can explain any difference there might be between decisions on behalf of others and on behalf of oneself, and this may provide insights about the mixed results found in the previous literature comparing decisions on behalf of others to those on behalf of self.

A preview of results is that there is a significant difference in risk taking on behalf of others between different institutions. The decision makers who voluntarily contribute to provide social assistance are much less risk averse on behalf of others than the decision makers in the institution where everyone has to make decisions on behalf of others. The difference in risk taking between the institutions can be explained by both external institutions and intrinsic personal characteristics. On one hand, given the willingness to volunteer, the decision makers are less risk averse in the institution when the choice to volunteer is present than when they have to make decisions on behalf of others. This can be accounted for by warm glow (Andreoni, 1989), optimism from good intentions (Niehaus, 2014), and impact seeking. This confirms the impacts of institutions on behavior. On the other hand, the decision makers who volunteer are more risk averse than those who do not. This provides evidence that social preferences are correlated with risk taking on behalf of others. Additionally, volunteers are more risk averse on behalf of others than on behalf of themselves and there is no such other-self difference among the decision makers who have to decide on behalf of others. Therefore, this paper sheds light upon the role of welfare institutions on decision making in provision of social support, and helps us understand which factors determine decisions in different institutions.

The paper proceeds as follows: Section 2 presents the experimental design, Section 3 explains the empirical strategy, Section 4 demonstrates the results before Section 5 concludes.

2 Experiment

The experiment is designed to compare the risk taking decisions made in different welfare institutions, and to distinguish the mechanisms of the differences of decision making. The experiment contains two treatments, *Non-voluntary* treatment and *Voluntary* treatment. *Non-voluntary* treatment represents the welfare institution where everyone is entitled to the social assistance and *Voluntary* treatment represents the welfare institution where the social assistance depends on the voluntary contribution. In *Non-voluntary* treatment, the decision makers are aware of the availability of social assistance to everyone and they are supposed to make risky decisions on behalf of others. In *Voluntary* treatment, first, the decision makers who voluntarily contribute to the social assistance would make risky decisions on behalf of others. Then, the decision makers who would not like to contribute to help others are asked to make risky decisions for some other recipients who are not the same recipients whom the decision makers chose not to help. So, the comparison of the decisions in different welfare institutions can be achieved. Since the decision makers in *Non-voluntary* treatment are not asked whether to volunteer or not, their willingness to contribute to social assistance is unobserved. Thus, the decision makers in *Voluntary* treatment who are unwilling to provide assistance to others are *surprisingly* asked to make decisions for different recipients who are entitled to the social assistance. This allows us to observe the risk taking decisions of the participants in *Voluntary* treatment who are unwilling to assist others *if they were in Non-voluntary treatment*.

2.1 General procedure

The participants are recruited from Amazon Mechanical Turk. All of the participants are residents in USA. The experiment was held in two waves, a small share of participants finished the experiment in a pilot before the large share of participants were recruited. Both waves were finished in March 2017. The design follows the pre-analysis plan (Xu, 2017). The design is almost same in the pilot study and the rest of the sample except that the price of the experimental currency unit. In the pilot part, each token is 0.03 cent US dollar and in the rest part each token is 0.02 cent US dollar. Participants in this experiment are asked to make risky decisions on behalf of themselves and of others in different situations. Payoffs for the participants consist of a show-up fee (one US dollar) and an earning which is based on the decision outcomes (0.02-0.03 US dollar per token). The experiment instructions can be found in Appendix B Consent form.

2.2 Experiment design

Figure 1 shows the experiment procedure. First, all participants finish a hypothetical dictator game (Kerschbamer, 2015). The dictator game includes ten binary choices and requires the same workload of all participants. The ten choices are listed in Appendix A Dictator game.

This task not only creates an expectation of getting paid for finishing the task among participants, but also provides information about social preferences for the analysis of the selection effect. Kerschbamer and Muller (2017) have used the same dictator game as the task to elicit social preferences and found that the decisions in the game are a valid predictor for distributional attitudes and voting behaviors. The participants are informed that their final payoffs are irrelevant with their decisions in this task. After this game, the recipients are asked a couple of hypothetical question about risk taking, and finish a short follow-up survey. While, the decision makers continue to the following steps, as illustrated in Figure 1. There is no feedback about any decision outcome or payoff throughout the whole experiment, all participants receive the payoffs after the experiment.

Second, the decision makers are rewarded 100 tokens for finishing the task. With the 100 tokens, they are asked to play an investment game. Each token is 2 cents US dollars.[1] In the investment game (Charness and Gneezy, 2012; Gneezy and Potters, 1997; Haigh and List, 2005), decision makers need to choose how many tokens out of the 100 tokens, x, to invest in an asset that may return $2.5x$ with a chance of 1/3, or lose all invested tokens with a chance of 2/3. The expected payoff is $100 + \frac{1}{6} \cdot x$. So risk averse people would invest some tokens between 0 and a hundred, and the investment decisions of risk-neutral and risk-seeking people should be close to 100 tokens. They are told that the final payments depend on the random process of the lottery. Let the decisions on behalf of themselves be notated as Y_i^S, where the subscript i is a decision maker and the superscript S means that the decision is made on behalf of oneself.

Third, the decision makers are randomly allocated in two treatments, *Non-voluntary* treatment and *Voluntary* treatment. The proportion of *Non-voluntary* treatment and *Voluntary* treatment are one third (33%) and two thirds (67%), respectively. The unequal distribution between the two treatments is because the proportion of the decision makers who would choose to contribute is assumed to be 50%. Since the number of decision makers in *Voluntary* treatment is around twice of the decision makers in *Voluntary* treatment, the number of decision makers *Non-voluntary* treatment and the number of decision makers in *Voluntary* treatment who would choose to volunteer would be around same. In *Non-voluntary* treatment, decision makers are asked to play the investment game on behalf of the recipients randomly matched with them. They are told that no other questions would be relevant with payoffs after this decision. Let the decisions by these decision makers be notated as Y_i^{NV}, where the subscript i is a decision maker and the superscript NV means that the decision is made on behalf of others and the decision maker is asked to decide instead of volunteering to help and deciding on behalf of others. Meanwhile, the decision makers in *Voluntary* treatment are asked to make a choice between the following two alternatives. One alternative is to make decisions in the investment game

[1] Due to the limit of budget, each token in the pilot part of the experiment is 3 cents US dollars. In the rest part of the experiment, each token is 2 cents US dollars. Participants in the pilot part of the experiment count around 25% of the total participants. The decisions do not differ between the pilot part and the rest part of the experiment (p-value is 0.26 of the t test for the decisions on behalf of oneself and p-value is 0.29 of the t test for the decisions on behalf of others).

on behalf of the recipients randomly matched with them. The recipients would get earnings from the outcomes of their decisions, and their final earnings would still be the outcomes of their own decisions. The other alternative is to get twice as much as the outcomes of their own decisions. The recipients would get zero earnings. After making the choice, those who choose to make decisions on behalf others, here and after known as volunteers, are told that no other questions would be relevant with payoffs after the decisions for the recipients. Whereas, there is no such message for the non-volunteers who choose the latter alternative. Let the decisions for the recipients by the volunteers be notated as Y_i^V, where the subscript i is a decision maker and the superscript V means the the decision is made on behalf of others and the decision maker voluntarily provide help and decide on behalf of others.

Fourth, the non-volunteers are told that they are re-matched with different recipients, and they need to make decisions on behalf of these re-matched recipients. Before making the decisions, they are told that this is the last question that is relevant with the payoffs. Let the decisions made by these non-volunteers be notated as Y_i^{NV}, where the subscript i is a decision maker and the superscript NV means that the decision is made on behalf of others and the decision maker is asked to decide instead of volunteering to help and deciding on behalf of others. Because the decision makers who are unwilling to volunteer to help others are asked to make the decisions on behalf of re-matched recipients, the decisions are made in a situation that is same as the decisions in *Non-voluntary* treatment. Thus, the decisions of the non-volunteers are notated with NV. Due to the re-matching between the non-volunteers and different recipients, the number of recipients is larger than the number of the decision makers.

Last, all participants finish a short survey. This survey asks their background information such as age, gender, education and political tendencies.[2] The follow-up survey can be found in Appendix G Questionnaire.

[2]For political tendencies, participants are asked what party they would choose if there was an election tomorrow. They need to choose among Democratic, Republican and others.

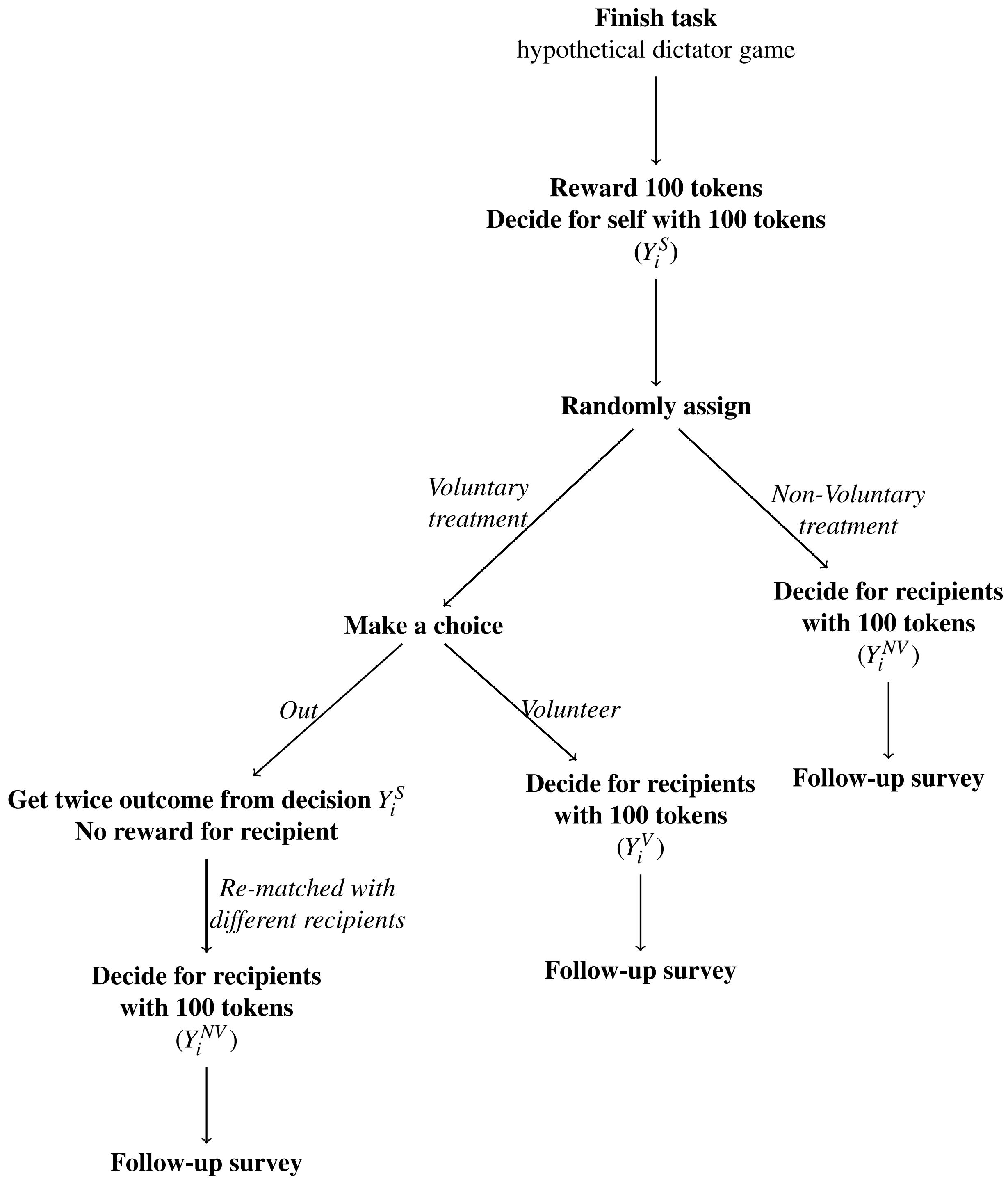

Figure 1: Experiment design

Note: This figure describes the steps that all decision makers have gone through sequentially. One third of decision makers (33%) are assigned to *Non-voluntary* treatment and the rest two thirds of decision makers (67%) to *Non-voluntary* treatment. When choosing between *Volunteer* and *Out*, subjects are unaware of the subsequent decision making for re-matched recipients. Recipients finish the first step of hypothetical dictator game, and answer a couple of hypothetical questions about risk taking. The follow-up survey is same for all the participants. All decision outcomes are revealed after the experiment is over.

3 Empirical strategy

In this section, I will show how the decisions of the experiment are used to answer whether the decision making differs in different welfare institutions and what mechanisms could explain the (in)difference of decision behaviors. This section starts with forwarding the hypotheses in Section 3.1. In Section 3.2, the effects proposed in the hypotheses are identified with the decisions in the experiment. Last, Section 3.3 details the methods of estimation.

3.1 Hypotheses

The experiment allows to answer the question whether different welfare institutions bring about different risk taking decisions of social assistance. Such an overall difference of risk taking decision may arise from the different external decision institution and/or different decision makers. Thus, I begin with a hypothesis of the overall difference of decision between the institutions. Then, the next two hypotheses propose the possible mechanisms. The last hypothesis will extend to the discussion about the difference between decisions on behalf of others and oneself.

Hypothesis 1. *Risk taking decisions in social assistance are different in different welfare institutions (overall difference).*

In *Non-voluntary* treatment, every subject is involved in the decision making on behalf of others. Decision makers are exogenously assigned. Whereas, in *Voluntary* treatment, decision makers are endogenous through a costly self-selection. By giving up twice of their own decision outcomes, self-selected subjects prevent passive recipients from no earnings. These self-selected decision makers decide on behalf of the help recipients. The decision makers who are unwilling to help can decline and get twice of their own earnings.[3] Decision making of the two groups differ in two ways, *how* the decision makers emerge and *who* are the decision makers. On one hand, decision makers are endogenous from self-selection in *Voluntary* treatment, but are exogenously assigned in *Non-voluntary* treatment. Compared to the assigned decision makers who would choose to volunteer *Non-voluntary* treatment, the voluntary decision makers in *Voluntary* treatment reveal their social minding by contributing and making the decisions. The voluntary decision makers decide on behalf of others with their own contributions and their counterparts in *Non-voluntary* treatment decide with public social support. On the other hand, voluntary decision makers are intrinsically different from those unwilling to help, in terms of characteristics underlying the willingness to help. These differences may result in different decisions on behalf of others in different institutions. The *overall difference* is defined as,

$$\textit{Overall difference} \equiv E[Y^V|V=1] - E[Y^{NV}].$$

[3] Later as a surprise, decision makers who opt out are asked to decide on behalf of others in the experiment. The decisions will be used in analyses.

$E[Y^V|V=1]$ is the expected decision on behalf of others of the decision makers who are willing to volunteer to help others in *Voluntary* treatment, see also Figure 1. V is an indicator for the choice to volunteer or not, and it equals one is a decision maker is willing to volunteer and zero if unwilling to volunteer. Y^{NV} is the decision on behalf of others of the decision makers in *Non-voluntary* treatment.

Hypothesis 2. *Same people take different risk taking decisions in social assistance in different welfare institutions (institutional effect).*

Given that one is willing to contribute to social assistance, she would behave differently in risky welfare decisions on behalf of others in the institution where social assistance depends on voluntary contributions and decisions are made by contributors, compared to the institution where social assistance is available to everyone and everyone is involved in the decision making. Bó et al. (2010) found that people behave differently in cooperation game when a fine is endogenously chosen by the subjects than when it is exogenously imposed with the selection and the informational content controlled. Thus, we may not expect people to behave the same way between when they self-select to be in a context of decision making and when they are placed in the same context. In a field experiment of introducing a fine on late-arriving parents at kindergartens, Gneezy and Rustichini (2000) argue that a simple external change may change the perception of people regarding the environment and change the decision making. The dependence of social assistance on voluntary contribution may arouse the social minding and social responsibility. This changes the perception of these people regarding the decision making in social assistance from their perception of decision making in the other institution. Because in the other institution, they need not to contribute but make decisions on behalf of others. As social responsibility is found to affect risk taking on behalf of others (Bolton et al., 2015; Pahlke et al., 2015), we may expect the institutional change to impact the risk taking decisions in social assistance. The institutional effect is defined as,

$$\textit{Institutional effect} \equiv E[Y^V|V=1] - E[Y^{NV}|V=1].$$

$E[Y^V|V=1]$ is the expected decision of voluntary decision makers. $E[Y^{NV}|V=1]$ is the expected decision of subjects willing to self-select in non-voluntary institution.

Hypothesis 3. *People with different attitudes toward voluntary contribution to social support behave differently in risk taking decisions of social assistance (selection effect).*

Given people make decisions in the institution where voluntary contribution to social support is not necessary, people who would voluntarily contribute to help others may behave differently in risky welfare decisions than those who would not contribute. The impacts of social caring on risk taking for others has recently drawn attention in research of decision behavior

(Andersson et al., 2016; Montinari and Rancan, 2013). This is a relevant issue for looking into what factors drive the different decision making in different welfare institutions. Apart from the institutions, when the social assistance is relied on voluntary contributions, the decision makers are more socially minded than others since they self-select to help and decide for others. This makes them different from the decision makers who are assigned to make decisions on behalf of others with resources not contributed by them. Thus, we reserve a consideration regarding the impacts of intrinsic attitudes toward voluntary provision of social support on risk taking in welfare decisions. The selection effect is defined as,

$$Selection\ \ effect \equiv E[Y^{NV}|V=1] - E[Y^{NV}|V=0].$$

$E[Y^{NV}|V=1]$ is the expected decision made in the involuntary institution by subjects willing to self-select. $E[Y^{NV}|V=0]$ is the expected decision made also in the involuntary institution by subjects unwilling to self-select.

Hypothesis 4. *People with different attitudes toward voluntary contribution to social support behave differently in risk taking decisions of social assistance, compared to decisions on their own behalf (selection effect on other-self difference).*

The third hypothesis extends from the second hypothesis by looking at the difference of risk taking in decisions on behalf of others and on behalf of oneself. The issue of other-self difference in risk taking has been documented in many studies, and the results are mixing with cautious shifts, risky shifts, and no difference between decisions for others and for oneself. By forwarding this hypothesis, we may see if the intrinsic social caring can add insights in the so far mixing findings about the difference between risk taking on behalf of others and oneself. The selection effect on the difference between decisions for others and oneself is defined as,

$$Selection\ effect\ on\ other\text{-}self\ difference \equiv E[(Y^{NV} - Y^{S})|V=1] - E[(Y^{NV} - Y^{S})|V=0]$$

The first component is the expected other-self difference in risky decisions made by subjects unwilling to help others. The second component is the expected other-self difference in risky decisions made by subjects willing to help others.

3.2 Identification

In this section, I will explain how the effects in the hypotheses are identified with the decisions of the experiment. Although most of the components in the effects can be observed in the experiment, the challenge is that volunteering to help others is always an endogenous choice and cannot be observed in *Non-voluntary* treatment. So, the decision makers cannot be randomly assigned to the treatments based on their preferences for volunteering, though the opportunity of volunteering that is present in *Voluntary* treatment can be randomly assigned. Hypotheses 2, 3, and 4 all concern the heterogeneity of the preference for volunteering, since the effects all contain the decisions in *Non-voluntary* treatment made by the decision makers who would volunteer. Taken the challenge in account, I will show the quantitative measures of the effects can be identified with the data of the experiment.

Hypothesis 1 states that the risk taking in welfare decisions differs between different institutions. As shown in Equation 1, the overall difference can be identified by comparing the decisions of the volunteer decision makers in *Voluntary* treatment and the decisions in *Non-voluntary* treatment. Both of the two groups of decisions can be directly observed in the experiment.

$$\textit{Overall difference} \; = \; E[Y^{V}|V=1] \; - \; E[Y^{NV}]. \tag{1}$$

Furthermore, to see how the difference of decisions between the institutions is driven by different mechanisms, we rewrite the expression of the overall difference as Equation 1.1. It can be seen that the first component represents the difference of institutions, whether the opportunity to help and decide on behalf of others is present or not. The second component is the effect of the willingness to help others on decisions multiplied with expected proportion of people unwilling to help.[4]

$$\begin{aligned}\textit{Overall difference} \; = \; & \underbrace{\Big(E[Y^{V}|V=1] \; - \; E[Y^{NV}|V=1]\Big)}_{\textit{Institutional effect}} + \\ & \underbrace{\Big(E[Y^{NV}|V=1] \; - \; E[Y^{NV}|V=0]\Big)}_{\textit{Selection effect}} \cdot \Big(1-P(V)\Big).\end{aligned} \tag{1.1}$$

$E[Y^{NV}|V=1]$ is the expected decision of the decision makers in *Non-voluntary* treatment who are willing to volunteer to help others. $E[Y^{NV}|V=0]$ is the expected decision of the decision

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$$\begin{aligned}\textit{Overall difference} \; = \; & \underbrace{\Big(E[Y^{V}|V=1]\cdot P(V) \; + \; E[Y^{V}|V=1]\cdot(1 \; - \; P(V))\Big)}_{E[Y^{V}|V=1]} \; - \\ & \underbrace{\Big(E[Y^{NV}|V=1]\cdot P(V) \; + \; E[Y^{NV}|V=0]\cdot(1 \; - \; P(V))\Big)}_{E[Y^{NV}]}\end{aligned}$$

combine and re-arrange, get

$$\begin{aligned}\textit{Overall difference} \; = \; & \Big(E[Y^{V}|V=1] \; - \; E[Y^{NV}|V=1]\Big)\cdot P(V) + \\ & \Big(E[Y^{V}|V=1] \; - \; E[Y^{NV}|V=0]\Big)\cdot\Big(1 \; - \; P(V)\Big) \\ = \; & \Big(E[Y^{V}|V=1] \; - \; E[Y^{NV}|V=1]\Big)\cdot P(V) + \\ & \Big(E[Y^{V}|V=1] \; - E[Y^{NV}|V=1] \; + \; E[Y^{NV}|V=1] \; - \; E[Y^{NV}|V=0]\Big)\cdot\Big(1 \; - \; P(V)\Big) \\ = \; & \Big(E[Y^{V}|V=1] \; - \; E[Y^{NV}|V=1]\Big) \; + \; \Big(E[Y^{NV}|V=1] \; - \; E[Y^{NV}|V=0]\Big)\cdot\Big(1 \; - \; P(V)\Big).\end{aligned}$$

makers in *Non-voluntary* treatment who are unwilling to volunteer to help others. $P(V)$ is the expected proportion of the subjects who would volunteer to help others.

Hypothesis 2 states that the risk taking in decisions on behalf of others may change with the external institutions. The decision makers make different decisions when they can volunteer and make decisions than when they are asked to make the decisions with the choice of volunteering absent. The institutional effect can be seen by comparing the decisions of volunteer decision makers to the decisions of of the decision makers who are willing to volunteer and make decisions in *Non-voluntary* treatment without opportunity to volunteer themselves. And, the two groups of decisions are shown in the definition of the institutional effect in Equation 2.

$$\textit{Institutional effect} \;=\; E[Y^V|V=1] \;-\; E[Y^{NV}|V=1]. \tag{2}$$

Because the preferences for volunteering is unobserved in *Non-voluntary* treatment, the decisions of the decision makers who would like to volunteer in *Non-voluntary* treatment cannot be directly seen. So, the second component in the institutional effect cannot be achieved from the decisions in the experiment. However, if we consider the decisions in *Non-voluntary* treatment and the pooled decisions of both the volunteers and non-volunteers in *Voluntary* treatment, the institutional effect can be identified by comparing the decisions between the two treatments. This is because since the decision makers who are unwilling to help others would never make decisions as volunteers, the institutional effect only influences the decision making of the decision makers who are willing to volunteer. This means that if the proportion of the subjects willing to help others is not zero, then the difference of decisions between the two treatments should arise from the institutional effect.[5] To see how the institutional effect is identified by comparing the decisions between the treatments, we first decompose the decisions in *Non-voluntary* treatment as

$$E[Y^{NV}] \;=\; E[Y^{NV}|V=1]\cdot P(V) \;+\; E[Y^{NV}|V=0]\cdot(1-P(V)).$$

Then, subtract the pooled decisions in *Voluntary* treatment with the decomposed $E[Y^{NV}]$,

$$\underbrace{E[Y^V|V=1]\cdot P(V) \;+\; E[Y^{NV}|V=0]\cdot(1-P(V))}_{\textit{Pooled decisions in Vol treat}} \;-\; E[Y^{NV}]$$
$$=\; (E[Y^V|V=1] \;- E[Y^{NV}|V=1])\cdot P(V).$$

[5]The choice between self-selecting and opting out is assumed to be independent of treatment assignment. The independence assumption is based on random assignment into the treatments. So, the expected probability of self-selecting should not differ between treatments. This means that the component, $P(V)$, can represent the expected proportion of the subjects willing to help others in both *Voluntary* treatment and *Non-voluntary* treatment.

If $P(V) \neq 0$, then

$$E[Y^V|V=1] - E[Y^{NV}|V=1] \;=\; \frac{\textit{Pooled decisions in Vol treat} \;-\; E[Y^{NV}]}{P(V)}.$$

The left hand side is the institutional effect. Thus, the institutional effect can be written as

$$\begin{aligned} \textit{Institutional effect} \;&=\; E[Y^V|V=1] - E[Y^{NV}|V=1] \\ &=\; \Big\{ \underbrace{E[Y^V|V=1]\cdot P(V) \;+\; E[Y^{NV}|V=0]\cdot(1-P(V))}_{\textit{Pooled decisions in Vol treat}} - E[Y^{NV}] \Big\} \Big/ P(V). \end{aligned} \tag{2.1}$$

So, we identify the institutional effect with the fraction of the different of decisions between the treatments and the expected proportion of volunteering. And, both the difference of decisions and the proportion of volunteering can be observed in the experiment.

Hypothesis 3 focuses on whether people with different preferences for volunteering make different decisions on behalf of others. The selection effect can be seen by comparing the decisions of the decision makers who are willing and unwilling to volunteer to help others. Since the decision makers who are unwilling to volunteer would never decide as volunteers, the comparison takes place only for the decisions made by the assigned decision makers. And, the two groups of decisions are shown in the definition of the selection effect in Equation 3.

$$\textit{Selection effect} \;=\; E[Y^{NV}|V=1] \;-\; E[Y^{NV}|V=0]. \tag{3}$$

In the selection effect, the decisions of the assigned decision makers who are unwilling to volunteer can be observed from the decisions made the non-volunteers in *Voluntary* treatment. As the institutional effect, the selection effect also contains the unobserved component, the decisions of the decision makers in *Non-voluntary* treatment who would like to volunteer. But, the selection effect can be identified by comparing the decisions in *Non-voluntary* treatment and the decisions of the non-volunteers in *Voluntary* treatment. This is because both the non-volunteers and the decision makers in *Non-voluntary* treatment are asked to decide on behalf of others, if the intrinsic characteristics behind volunteering do not influence the decision making, then the decisions made by the non-volunteers and the decision makers in *Non-voluntary* treatment should not be different. Otherwise, if there is difference between the decision makers in *Non-voluntary* treatment and the decisions of the non-volunteers in *Voluntary* treatment and the proportion of volunteering is not zero, then we may expect the selection effect. The arguments for how the selection effect can be identified by comparing the decisions of the non-volunteers and the decisions in *Non-voluntary* treatment are similar to the arguments in the identification of the institutional effect. Details of the arguments are reserved in Appendix H. The selection effect is written as

$$\begin{aligned} \textit{Selection effect} &= E[Y^{NV}|V=1] - E[Y^{NV}|V=0] \\ &= \Big\{ E[Y^{NV}] \;-\; \underbrace{E[Y^{NV}|V=0]}_{\textit{Decisions of non-volunteers}} \Big\} \Big/ P(V). \end{aligned} \tag{3.1}$$

So, the selection effect can be identified by the ratio of the difference of the decisions in *Non-voluntary* treatment and the decisions of the non-volunteers, and the proportion of the decision makers who would like to volunteer. All the components can be observed in the experiment.

Hypothesis 4 focuses on whether people with different preferences for volunteering show different patterns of the (in)difference between self- and other-regarding decisions. This hypothesis takes the individual risk taking decisions as a benchmark and asks if the selection effect impacts the difference between decisions on behalf of others and on behalf of oneself. The selection effect on the difference between decisions on behalf of others and on behalf of oneself is defined as,

$$\textit{Selection effect on other-self difference} = E[(Y^{NV} - Y^{S})|V=1] \;-\; E[(Y^{NV} - Y^{S})|V=0] \tag{4}$$

The selection effect on other-self difference extends the selection effect to the difference between other- and self-regarding decisions. Likewise, the selection effect on other-self difference contains an unobserved component, the difference of other- and self-regarding decisions of the decision makers in *Non-voluntary* treatment who would like to volunteer. However, the effect can be identified by comparing the decision makers in *Non-voluntary* treatment and the non-volunteers in *Voluntary* treatment. This is because if people with different preferences for volunteering do not have different other-self comparison in decision making and the proportion of volunteering is not zero, then the other-self comparison between the decision makers in *Non-voluntary* treatment and the non-volunteers in *Voluntary* treatment should not be different. Otherwise, if there is difference between the two groups of decision makers, then we may expect the selection effect on other-self difference. The arguments for how the selection effect on other-self difference can be identified by comparing the decision makers in *Non-voluntary* treatment and the non-volunteers in *Voluntary* treatment are detailed in Appendix H. The selection effect on other-self difference of decisions is written as

$$\begin{aligned} \textit{Selection effect on other-self difference} &= E[(Y^{NV} - Y^{S})|V=1] - E[(Y^{NV} - Y^{S})|V=0] \\ &= \Big\{ E[(Y^{NV} - Y^{S})] \;-\; \underbrace{E[(Y^{NV} - Y^{S})|V=0]}_{\textit{Other-self diff of non-volunteers}} \Big\} \Big/ P(V). \end{aligned} \tag{4.1}$$

3.3 Estimation

To check the overall difference of decisions between the two decision making institutions, I compare decisions between the volunteer decision makers in *Voluntary* treatment and the assigned decision makers in *Non-voluntary* treatment. Since the decisions of the two groups of decision makers can be directly observed in the experiment, the estimate of the overall difference is shown as,

$$\widehat{\textit{Overall difference}} = \overline{Y}_{\textit{Vol, V=1}} - \overline{Y}_{\textit{Non-vol}}.$$

$\overline{Y}_{\textit{Vol, V=1}}$ is the mean of the decisions made by the volunteer decision makers in *Voluntary* treatment. $\overline{Y}_{\textit{Non-vol}}$ is the mean of the decisions made by the decision makers in *Non-voluntary* treatment.

To estimate the effects in Hypotheses 2-4, I consider two methods of estimation. One method is built on the expressions of the effects identified in Section 3.2. First, the institutional effect in Hypothesis 2 is identified by comparing the decisions between *Voluntary* treatment and *Non-voluntary* treatment. However, the difference of decisions between the two treatments is not necessarily equal to the institutional effect. The estimate of the institutional effect equals the difference between the two treatments divided by the expected proportion of the decision makers who are willing to volunteer.

$$\widehat{\textit{Institutional effect}} = \frac{\overline{Y}_{\textit{Vol}} - \overline{Y}_{\textit{Non-vol}}}{\overline{P(V)}}.$$

$\overline{Y}_{\textit{Vol}}$ is the mean of the decisions of all the decision makers in *Voluntary* treatment. $\overline{Y}_{\textit{Non-vol}}$ is the mean of the decisions of all the decision makers in *Non-voluntary* treatment. $\overline{P(V)}$ is the mean probability of choosing to volunteer. The estimate of the institutional effect is based on the expression in Equation 2.1. When estimating the effect, due to Jensen's inequality, the expected inverse of the estimated probability, $E[\frac{1}{\overline{P(V)}}]$, is not equal to the inverse of the probability, $\frac{1}{P(V)}$.[6] So, there is a bias in the estimate from the true effect size. According to statistical computation (see Appendix I), given the sample size and the observed proportion of volunteering, the bias is very small.

Second, the selection effect in Hypothesis 3 is checked by comparing the decisions of the non-volunteer decision makers in *Voluntary* treatment and the decision makers in *Non-voluntary* treatment. Similarly, the observed difference in decisions is not necessarily equal to the selection effect and it equals the difference of decision between the non-volunteers and the decision makers in *Non-voluntary* treatment divided by the expected proportion of the decision

[6]Jensen's inequality states that if Z is a random variable and φ is a convex function, then $\varphi(E[Z]) \leq E[\varphi(Z)]$.

makers who are willing to volunteer.

$$\widehat{Selection\ effect} = \frac{\overline{Y}_{Vol,\ V=0} - \overline{Y}_{Non\text{-}vol}}{\overline{P(V)}}.^{7}$$

$\overline{Y}_{Vol,\ V=0}$ is the mean of the decisions made by the non-volunteer in *Voluntary* treatment. $\overline{Y}_{Non\text{-}vol}$ is the mean of the decisions made by the decision makers in *Non-voluntary* treatment. $\overline{P(V)}$ is the mean probability of choosing to volunteer. Since the estimate of the selection effect contains the mean probability of volunteering, the discussed bias in the institutional effect could exist in the selection effect as well. However, because the component in the estimate, $\frac{1}{E[P(V)]}$, is smaller than the component in the estimate, $E[\frac{1}{P(V)}]$, the estimate of the selection effect would be smaller than the true effect size and the difference is very small given the sample size of the experiment.

Last, the selection effect on other-self difference of risk taking in Hypothesis 4 is identified by comparing the decisions of the non-volunteer decision makers in *Voluntary* treatment and the decisions of the decision makers in *Non-voluntary* treatment. The estimate of the selection effect on other-self difference equals the difference between the non-volunteers in *Voluntary* treatment and the decision makers in *Non-voluntary* treatment divided by the expected proportion of the decision makers who are willing to volunteer.

$$\widehat{Selection\ effect\ on\ other\text{-}self\ difference} = \frac{\overline{(Y - Y^S)}_{Vol,\ V=0} - \overline{(Y - Y^S)}_{Non\text{-}vol}}{\overline{P(V)}}.^{8}$$

$\overline{(Y - Y^S)}_{Vol,\ V=0}$ is the mean of other-self difference of decisions of the non-volunteer decision makers in *Voluntary* treatment. $\overline{(Y - Y^S)}_{Non\text{-}vol}$ is the mean of other-self difference of the decisions in *Non-voluntary* treatment. $\overline{P(V)}$ is the mean probability of choosing to volunteer. Similarly, the bias arising from the component of the mean probability of volunteering would make the estimate smaller than the true effect size and the difference is very small given the sample size of the experiment.

The other method to estimate the effects is based on the propensity score matching (Angrist and Pischke, 2009; Morgan and Winship, 2007). The first method above treats all the decisions in *Non-voluntary* treatment as a unity and compare these decisions to the decisions in *Voluntary* treatment made by the voluntary decision makers and by the opt-out decision makers. This leads the comparison outcomes to be a combination of the expected probability of volunteering and the estimates of the effects, and the latter component is what we aim for. This means that the estimates of the effects rely on both the comparison outcomes and the estimate of expected probability of volunteering. In the other method, on the other hand, I identify the decision makers in *Non-voluntary* treatment who would choose to volunteer with propensity score

[7] See Equation 3.1 and Appendix H for how the expression is derived.
[8] See Equation 4.1 and Appendix H for how the expression is derived.

matching. Thereby, a comparison group of decision makers is selected from *Non-voluntary* treatment. And, the effects can be estimated by comparing the selected comparison group to the voluntary decision makers and the opt-out decision makers. So, the difference between the two estimation methods lies in how to approach the decisions made by the subjects willing to volunteer in *Non-voluntary* treatment, wherein the preferences for the choice of volunteering is unobserved. In the first method, the expected probability of volunteering is aggregately estimated and used as a component in estimating the effects. While, in the second method, the expected probability of volunteering is individually estimated, and such estimates of probability of volunteering are used to select a comparison group, instead of being a component of the estimations of the effects.

Based on the methods introduced by Imbens and Rubin (2015),[9] I conduct the propensity score matching as follows. First, I regress the self-selecting decision in *Voluntary* treatment on self-regarding risky decisions, decisions in the dictator game (see Appendix A), age, gender, education, political tendency, etc. Second, a propensity score is estimated for each of all the decision makers based on the model. The higher the propensity score is, the more likely the subject is to self-select as a decision maker. Last, each of the voluntary decision makers in *Voluntary* treatment is matched with one decision maker in *Non-voluntary* treatment based on the principle of nearest neighbor with replacement.[10] A voluntary decision maker in *Voluntary* treatment is matched with one decision maker in *Non-voluntary* treatment whose propensity score is closest to hers.

4 Results

There are 1990 participants in this experiment.[11] 1143 participants are passive recipients. 847 participants are decision makers. 564 decision makers are assigned to *Voluntary* treatment. 283 decision makers are assigned to *Non-voluntary* treatment. The average payment is 3.32 US dollars. Descriptive statistics of all decision makers are summarized in Table 1.

The x-score and y-score are computed from choices in the dictator game, see Appendix A Dictator game.[12] The two scores indicate distributional preferences in unfavored (x-score)

[9] In particular, I focus on Chapters 12, 13, and 14 to apply the propensity score matching method.

[10] The matching allows replacement, such that a decision maker in *Voluntary* treatment can be matched with more than one decision makers in *Non-voluntary* treatment.

[11] Sample size is determined by a simulation based on a series of possible effect size (i.e. selection effects size). The simulation is based on bold assumptions of mean and standard deviations of the investment game. The assumptions are referred to previous experimental studies with the same investment game (Charness and Gneezy, 2012; Andersson et al., 2016). The sample size is chosen so that the simulated estimation power is around 80%. Details of determining the sample size can be found in the pre-analysis plan (Xu, 2017), which is registered on AEA RCT Registry before the experiment started.

[12] The transformation from choices to the scores depends on the consistency of decisions in this game. 39 (4.6%) subjects switch more than once in the dictator game. X-score and y-score of the inconsistent subjects are set zero. Consistency will be controlled in remaining analyses, and assigning zero value causes no difference in means or standard deviations of the two scores.

and favored (y-score) inequality. The higher the scores are, the more a decision maker is more pro-social. Other socio-economic information includes age, gender, education[13] and political tendency,[14] etc. The overview of decisions are shown in Figure 2 and 3. All decisions indicate tokens invested in the investment game on behalf of oneself or others. Both distributions display a three-hump curve, and most decisions fall in 0, 50, and 100 tokens. On average, subjects invest more tokens and take more risk on behalf of others, than on behalf of themselves. Figure 4 plots the joint distribution of the decisions on behalf of others and on behalf of oneself, together with the regression line. It seems that the decisions on behalf of oneself can explain, to some extent, the decisions on behalf of others. In the meanwhile, many decision makers invest less tokens for others than for themselves.

Table 1: Descriptive statistics of the decision makers

Variable	Mean	S.D.	Min	Max	Obs
x-score[15]	-0.57	1.34	-2.5	2.5	808[12]
y-score[16]	1.21	1.29	-2.5	2.5	808[12]
age	35.88	11.33	19	73	847
female	0.45	0.50	0	1	847
High education	0.63	0.48	0	1	847
Prefer Republican party	0.26	0.44	0	1	847

4.1 Who volunteer?

Choosing *Out* means that a subject will double her own decision outcome and the recipient will have no reward. Choosing *Volunteer*, however, means that a subject will keep her own outcome as it is and decide on behalf of the recipient. When making a choice, subjects face a trade-off between costs and motives in both pecuniary and moral concerns. Costs of volunteering include the expected payoff, responsibility in risk taking for others, and possibly guilt for undesirable outcomes. While, motives to volunteer include inequality aversion, altruism, warm glow, desire for social impacts, etc. To see how the factors function in making the choice, I regress the binary choice on the observed covariates. Table 2 shows the marginal effects of covariates on the choice from a Logit model. The first column only contains the decisions on behalf of oneself as the explanatory variable. The second column include the decisions in the dictator game and the consistency of the dictator decisions. The reason for the large marginal effect of the dummy

[13]The dummy variable, "High education", equals one if a subject has college degrees, Master degree, Doctoral degree, or professional degrees such as JD (Juris Doctor), MD (Doctor of Medicine). Otherwise, the dummy equals zero.

[14]The dummy variable, "Prefer Republican party", equals one if a subject would vote for Republican party in a hypothetical election. Else if a decision maker would vote for Democratic party or else, the dummy equals zero.

[15]With the inconsistent decision makers included, the mean and standard deviation of x-score are -0.54 and 1.31, respectively.

[16]With the inconsistent decision makers included, the mean and standard deviation of y-score are 1.16 and 1.28, respectively.

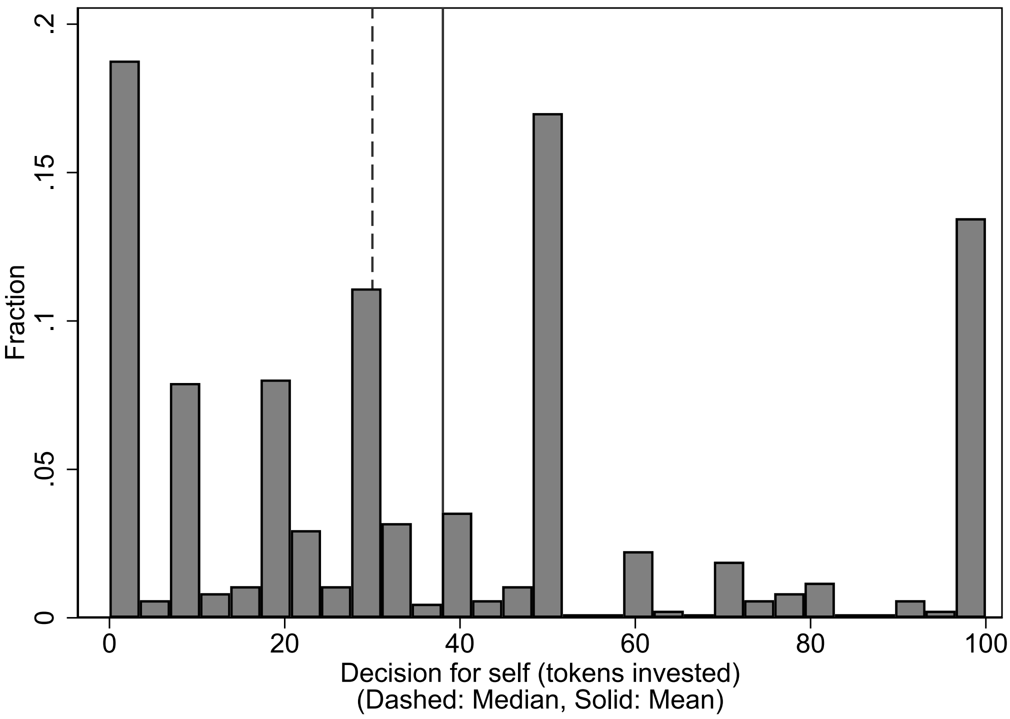


Figure 2: Distribution of decisions on behalf of self

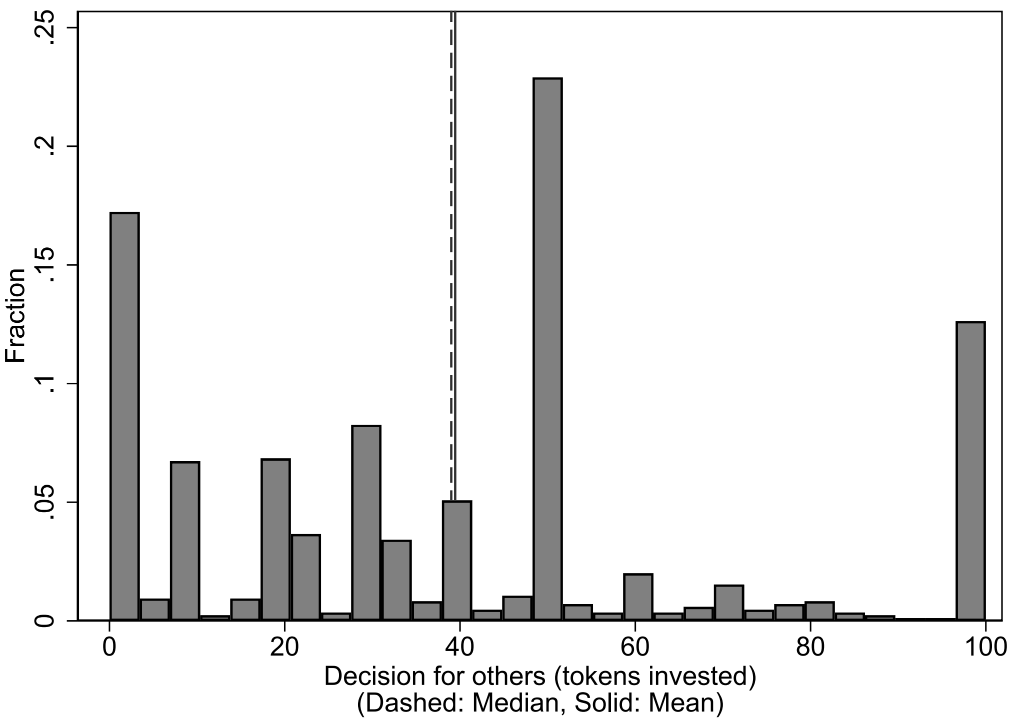


Figure 3: Distribution of decisions on behalf of others

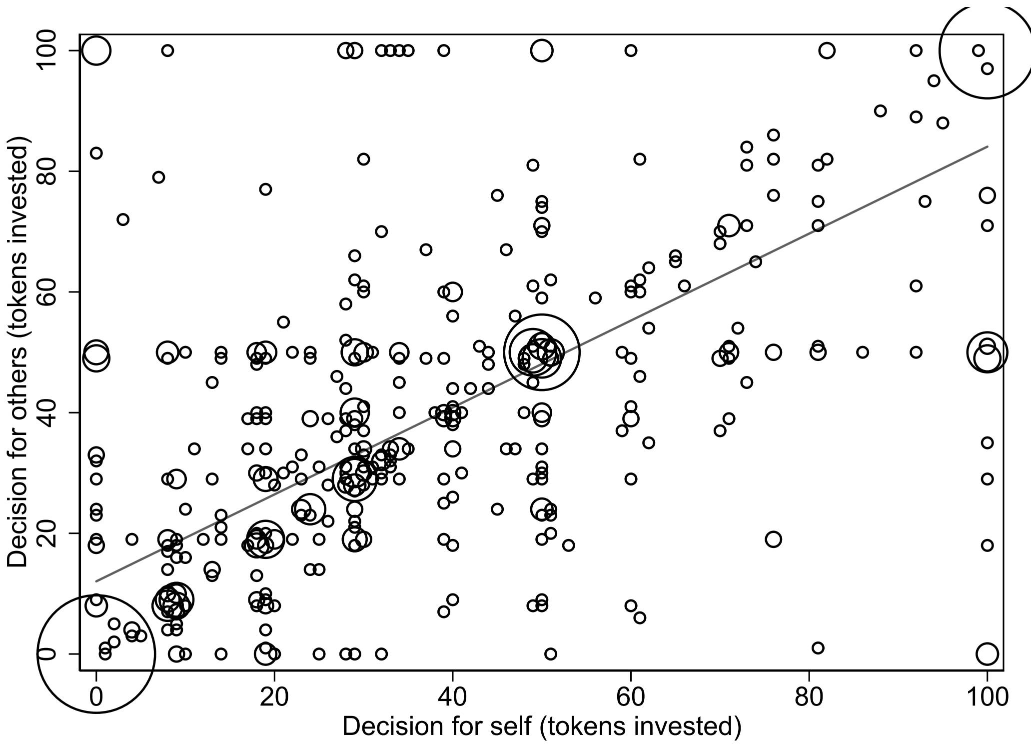


Figure 4: Joint plot of decisions for self and others with weighted marker

for the consistency is that 29 subjects in *Voluntary* treatment (5%) show inconsistent choices in the dictator game and 19 of them (65.5%) chose to volunteer to help and decide for others. Also, the x-score and y-score are both set as zero for the decision makers who are inconsistent in the dictator game, this makes the magnitude of the effect of inconsistency dummy large as well. The third column includes the demographic variables as explanatory variables. The last column includes all the observables in the model and the effects of the variables do not differ much in the last column from the models in the other columns. The likelihood to volunteer increases with the investment made on own behalf, with a very small magnitude of effects. The pro-sociality index, y-score, has very large effects on the likelihood to volunteer. The positive effects of y-score confirms the motive role of pro-social preferences.[17] The positive effects of pro-sociality on the tendency to volunteer is consistent with the findings by Carpenter and Myers (2010) and Kerschbamer and Muller (2017).[18] Consistency in dictator game and gender

[17]The larger the y-score is, the more one prefers equality to a favorable inequality. Since the choice is between equal ex-ante payoff and favorable inequality, y-score well represents distributional preferences in the current context. X-score indicates pro-sociality when a subject is in unfavorable inequality. The larger x-score is, the more one prefers unfavorable inequality to equality. Since people generally prefer favorable inequality to unfavorable inequality, the larger x-score is, the more one prefers favorable inequality to equality. Thus, the likelihood to volunteer may decrease with x-score. This helps explain the negative effects of x-score on the likelihood to volunteer, as well as the negative correlation between x-score and y-score ($p < 0.01$).

[18]Carpenter and Myers (2010) found that altruism has positive effects on self-selecting as volunteer firefighters. Kerschbamer and Muller (2017) showed that the elicited social preferences from the hypothetical dictator game are valid predictors for the distributional attitudes.

also have significant effects on the likelihood to volunteer.[19]

When the motives to volunteer outweigh the costs, subjects tend to voluntarily self-select as decision makers for others. Such subjects account for 47.5% (268) in *Voluntary* treatment. The remaining 52.5% subjects (296) chose to opt out. Given that the covariates are balanced between the treatments,[20] we may anticipate some subjects in *Non-voluntary* treatment to self-select as decision makers if they were in *Voluntary* treatment. Comparing the decisions of the volunteers in *Voluntary* treatment and of their counterparts in *Non-voluntary* treatment may tell if the volunteers decide in different ways in different institutions. And, when willingness to volunteer is muted in *Non-voluntary* treatment, comparing between subjects willing and unwilling to volunteer may show how volunteer willingness, though unrevealed, influences decisions on behalf of others. The external and internal impacts may lead to different risk takings in different institutions, thereto different amounts of risk the recipients are exposed to.

[19]Female are found to be more likely to be inequality averters by Kamas and Preston (2015). Consistency in the dictator game has large effects on the binary choice, because 19 out of 29 inconsistent subjects choose to volunteer.

[20]All the covariates in the Logit model are balanced between *Voluntary* treatment and *Non-voluntary* treatment, $p > 0.25$ in the t-tests of all the covariates.

Table 2: Marginal effects on the probability of volunteering

	(1)	(2)	(3)	(4)
decision for self	0.002***			0.002***
	(0.001)			(0.001)
x-score		-0.034**		-0.030**
		(0.015)		(0.015)
y-score		0.139***		0.132***
		(0.014)		(0.014)
consistency in dictator game		-0.363***		-0.366***
		(0.083)		(0.082)
age (in years)			0.003	0.002
			(0.002)	(0.002)
female			0.120***	0.105***
			(0.041)	(0.038)
high education			0.003	0.040
			(0.043)	(0.040)
Republican			-0.031	0.005
			(0.048)	(0.044)
pilot			-0.071	-0.037
			(0.049)	(0.045)
N	564	564	564	564

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The dependent variable is the dummy for choosing to volunteer. It equals one if a subject voluntarily help and make the decision on behalf of others, otherwise it equals zero if a subject chooses to double her own decision outcome and leave the others with no reward. The observations consists of the subjects in *Voluntary* treatment who make the volunteering choice. The independent variables include decision for the decision maker herself, x-score and y-score from the dictator game (see Appendix A Dictator game), dummy for consistency in the dictator game, age, dummy for female, dummy for high education, dummy for preferring Republican party, and dummy for being in pilot study. The higher the x-score (y-score) is, the more altruistic a subject is in unfavored (favored) inequality. The dummy for consistency is one is a subjects makes consistent choices in the ten decisions of the dictator game. The dummy for high education is one if a subjects has college or higher degree, otherwise it is zero. The dummy for preferring Republican is one if a subject prefers to vote for Republican party in an assumed election, otherwise the dummy is zero if a subject votes for Democratic party or others. The dummy for being in the pilot study is one is a subject participated in the pilot study, otherwise the dummy is zero if a subject participated in the other part of the study.

4.2 Overall difference

The overall difference manifests the interactive impacts of institutional and intrinsic characters on risk taking for others. To check if such overall difference exists, Figure 5 plots the decisions of the self-selected decision makers in *Voluntary* treatment and the decision makers in *Non-voluntary* treatment. On average, self-selected decision makers in *Voluntary* treatment invest 6.93 more tokens on behalf of others than their counterparts do in *Non-voluntary* treatment. The overall difference is significantly large (two sided t-test, $p < 0.01$; $N = 551$). The stark difference indicates that self-selected decision makers are less risk averse than assigned decision makers when deciding on behalf of the recipients. So, decision outcomes borne by recipients would contain more volatilities when decision are made by subjects who voluntarily provide help, than by those who are exogenously assigned to make the decision. Next, we see if the observed difference is bolstered by institutions, intrinsic characteristics, or both.

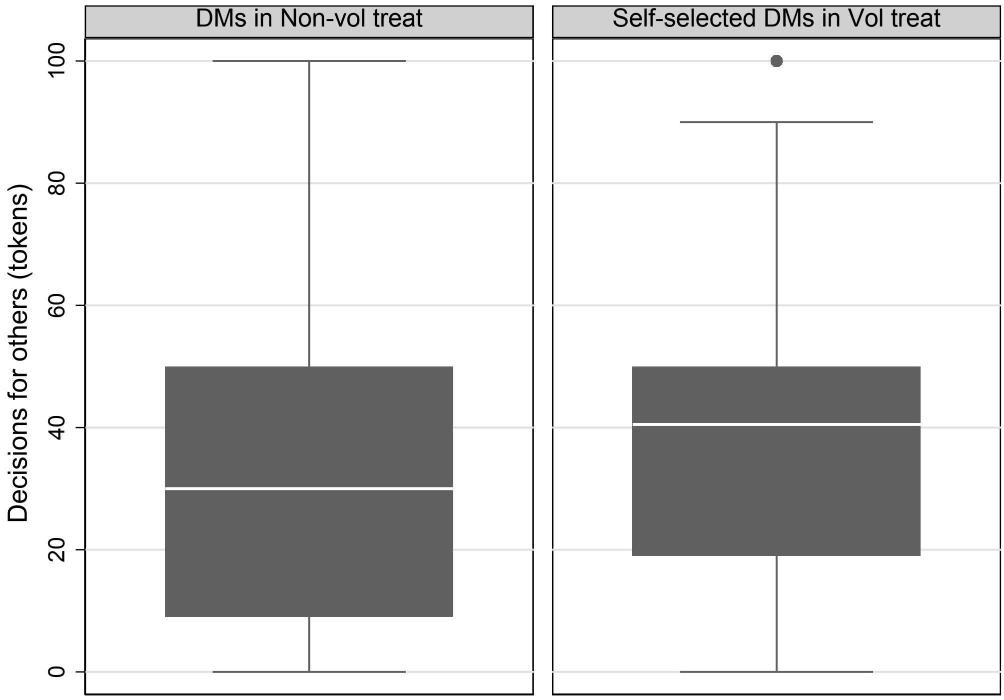


Figure 5: Overall difference

4.3 Institutional effect

Figure 6 shows the comparison between pooled decisions in *Voluntary* treatment and in *Non-voluntary* treatment. The average number of tokens invested is obviously higher in *Voluntary* treatment than in *Non-voluntary* treatment. In the first column of Table 3, decision makers averagely invest 5.30 more tokens for the recipients in *Voluntary* treatment than in *Non-voluntary* treatment with all else equal. This foreshadows the institutional effect on risk taking on behalf of others, since the decisions should not differ between the two treatments if there is no institutional effect. However, the conditional difference is not equal to the institutional effect, unless the expected probability of volunteering is equal to one. To estimate the institutional effect, we need to divide the observed conditional difference by the mean probability of volunteering.

$$\underbrace{(E[Y^V|V=1] - E[Y^{NV}|V=1])}_{\textit{Institutional effect}} = \frac{\overline{Y}_{Vol} - \overline{Y}_{Non\text{-}vol}}{\overline{P(V)}}.$$

The expected probability of volunteering is computed from the Logit model shown in Table 2. The average expected probability of all the decision makers is around 0.47. According to the equation above, the institutional effect is estimated, and the result is shown in Table 4. The subjects willing to self-select as decision makers take more risk on behalf of the recipients in *Voluntary* treatment, than they do in *Non-voluntary* treatment. The difference is around 16.4 tokens, which is significant ($p < 0.01$). So, it is evident that the decision making institutions have impacts on the risk taking on behalf of the recipients, and the presence of voluntary self-selecting causes more risk taking.

As seen in Table 3, some other factors also impact the decisions on behalf of the recipients. Self-regarding decisions has positive effects on decisions for others. This implies that subjects, to some extent, rely on first-order belief about good decisions. I will return to the other-self comparison with more details in Section 4.5. Both age and y-score have negative effects on the risk taking for others. The negative effects of the pro-sociality index (y-score) conform to the findings that social preferences may influence the risk taking on behalf of others (Andersson et al., 2013b; Montinari and Rancan, 2013).

4.4 Selection effect

Figure 7 depicts the comparison of the decisions between the subjects unwilling to self-select as decision makers in *Voluntary* treatment and the subjects in *Non-voluntary* treatment. The subjects unwilling to self-select as decision makers invest more tokens on behalf of the recipients than subjects in *Non-voluntary* treatment do. With all else equal, the opt-out subjects in *Voluntary* treatment invest averagely 8.25 more tokens for the recipients than subjects in *Non-voluntary* treatment, as seen in the second column of Table3. If there is no selection effect, the two groups of decision makers should behave in a same way, all else equal. The observed difference, however, shows that there may be the selection effect. Recall the expression of the selection effect,

$$\underbrace{(E[Y^{NV}|V=1] - E[Y^{NV}|V=0])}_{\textit{Selection effect}} = \frac{\overline{Y}_{Non\text{-}vol} - \overline{Y}_{Non\text{-}volunteers\ in\ Vol}}{\overline{P(V)}}.$$

Table 3: Components of observed differences in Hypotheses 2-4

Covariate	1		2		3	
	Decisions for others		Decisions for others		Other-self difference	
	Vol vs. Non-vol		*Opt-out vs. Non-vol*		*Opt-out vs. Non-vol*	
Vol treatment	7.09***	5.30***	7.23***	8.25***	9.33***	8.95***
	(2.26)	(1.39)	(2.64)	(1.81)	(1.99)	(1.99)
Decision for self		0.72***		0.70***		
		(0.03)		(0.03)		
x-score		-0.29		-0.57		-0.75
		(0.51)		(0.69)		(0.74)
y-score		-1.42**		-1.18		-1.17
		(0.59)		(0.74)		(0.83)
age		-0.12**		-0.14**		-0.07
		(0.06)		(0.07)		(0.08)
female		-1.64		0.18		-0.06
		(1.40)		(1.81)		(1.94)
high education		0.83		1.98		1.88
		(1.37)		(1.79)		(1.96)
consistency		2.41		3.26		5.44
		(2.35)		(3.27)		(3.42)
Republican		1.06		2.19		1.63
		(1.67)		(2.14)		(2.31)
pilot		0.30		-0.02		-0.60
		(1.72)		(2.16)		(2.39)
Constant	34.73***	11.91***	34.73***	10.49**	-1.53	-4.67
	(1.84)	(3.25)	(1.73)	(4.23)	(1.09)	(4.33)
r2	0.01	0.58	0.01	0.53	0.03	0.04
Observations	847	847	579	579	579	579

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The dependent variable of the first four regressions is the decisions made on behalf of others (in tokens, 0-100). The dependent variable of the last two regressions is the difference of decisions made on behalf of others and the decision maker themselves (in tokens, 0-100). The independent variables are decision for oneself (excluded in the third column), x score and y score from the dictator game (see Appendix A Dictator game), age, dummy for female, dummy for high education, dummy for consistency in dictator game, dummy for preferring Republican party, and dummy for being from the pilot study. The first column includes the decisions for the recipients made by all decision makers in both treatments. The second and third columns include the decisions made by the opt-out subjects in *Voluntary* treatment and the subjects in *Non-voluntary* treatment.

Table 4: Estimates of the effects (Bootstrap s.e.)

	Unconditional estimates	Conditional estimates
Institutional effect	14.92***	16.39***
	(4.669)	(5.51)
Selection effect	-15.23***	-28.13***
	(5.543)	(8.55)
Selection effect on other-self difference	-19.63***	-30.53***
	(4.301)	(9.43)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: All the effects are in tokens. Institutional effect indicates the difference of the tokens invested by the subjects willing to self-select as decision makers in *Voluntary* treatment and in *Non-voluntary* treatment. Selection effect indicates the difference of the tokens invested by the decision makers willing to help and decide on behalf of others and the decision makers unwilling to help. Selection effect on other-self difference indicates the difference of other-self difference in invested tokens between the decision makers willing to volunteer and unwilling to volunteer. The first column includes the estimates that are unconditional on the covariates. So, the coefficients used to compute the estimates in the first column correspond to the coefficients of the dummy for *Voluntary* treatment in the first, third, and fifth columns in Table 3. And, the estimate for the expected proportion of volunteering is the observed proportion of volunteering in *Voluntary* treatment. The estimates are computed by dividing the coefficients with the observed proportion of volunteering. The second column includes the estimates that are conditional the covariates. So, the coefficients used in the second column correspond to the coefficients of the dummy for *Voluntary* treatment in the second, fourth, and sixth columns in Table 3. The estimate for the expected proportion of volunteering is first estimate the Logit model in Table 2 and compute the expected probability of volunteering (propensity score) for each subject, then divide the coefficients with the propensity scores and take the average of the ratios. Same as the observations in the regressions, all the decision makers are included in estimating the institutional effect. For the selection effect and the selection effect on other-self difference, only the opt-out subjects and the subjects in *Non-voluntary* treatment are included in the estimation. The bootstrap includes 800 replications and the standard errors are estimated from the replications without dropping observations.

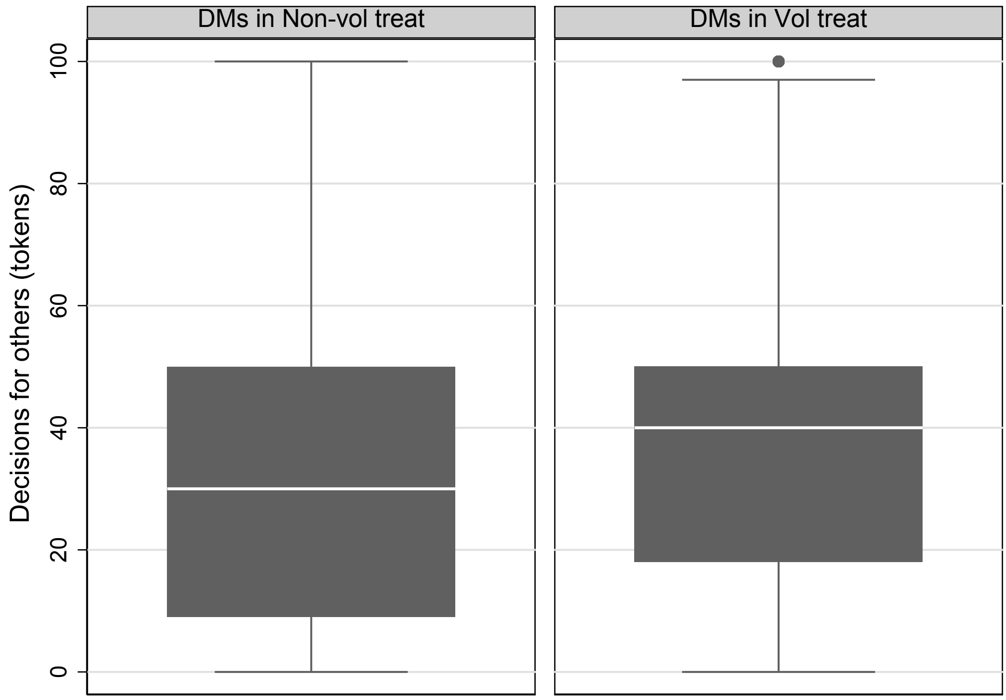


Figure 6: Decision for others: Non-vol treat and Vol treat

The conditional average difference of the regression results is not equal to the selection effect, unless the expected probability of volunteering is one. To estimate the selection effect, the conditional average difference is divided by the expected probability of volunteering. As estimated from the results in Table 2, the average expected probability among the opt-out subjects in *Voluntary* treatment and the subjects in *Non-voluntary* treatment is around 0.42. The selection effect is around 28.1 tokens, which is significant ($p < 0.01$). So, subjects with different preferences toward voluntary self-selection exhibit different risk attitudes on behalf of others, although their preferences are muted as the self-selection is absent. Specifically, subjects unwilling to volunteer to help others take more risk on behalf of the recipients than those willing to volunteer.

4.5 Selection effect on other-self difference of risk taking

Figure 8 depicts the comparison of decisions for oneself and others among the opt-out subjects in *Voluntary* treatment and the subjects in *Non-voluntary* treatment. We first look at the pattern of other-self difference in each of the two groups. Subjects in *Non-voluntary* treatment averagely invest 1.53 less tokens for others than for themselves. This mild cautious shift is not significant (two-sided t test, $p = 0.16$; $N = 283$), similar with previous findings (Andersson et al., 2016; Eriksen et al., 2017). Whereas, subjects unwilling to self-select as decision makers in *Voluntary* treatment averagely invest 7.80 tokens more for others than for themselves. This risky shift is significant (two-sided t test, $p < 0.01$; $N = 296$). The pattern of other-self differ-

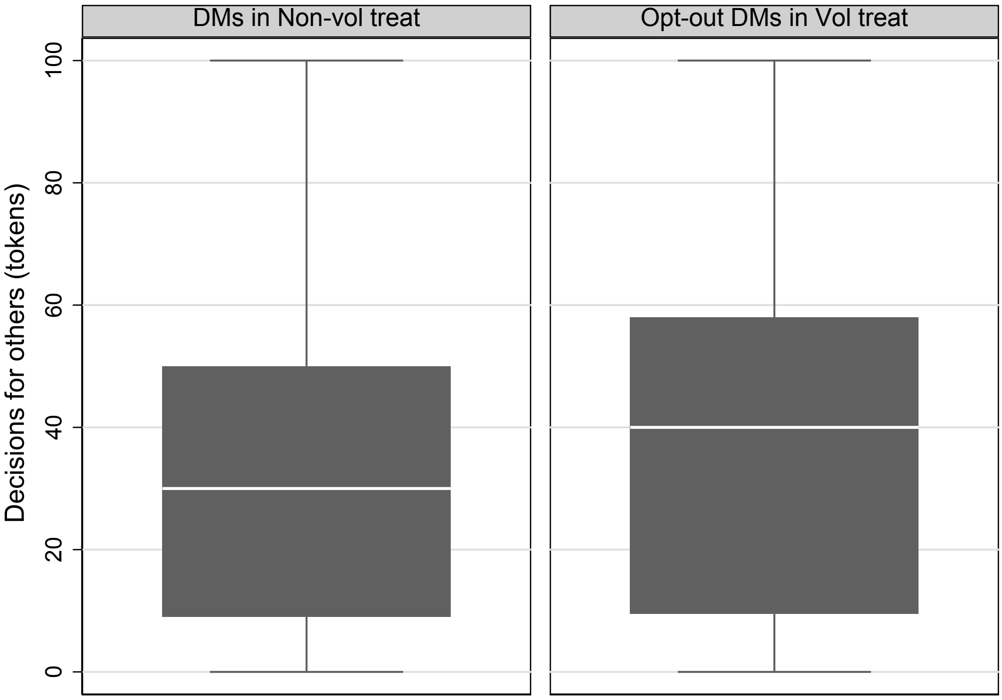


Figure 7: Decision for others: Non-vol treat and Opt-out DMs

ence between the two groups drastically differs from each other ($p < 0.01$) with other covariates controlled, as seen in the third column of Table3. This shows evidence against the indifferent pattern of other-self comparison suggested by no selection effect on other-self difference of risk taking. Since there is no difference of self-regarding decisions between the two groups (two-sided t test, $p = 0.44$; $N = 579$), the different patterns of other-self comparison arise mainly from the difference of decisions on behalf of the recipients. In addition, self-selected decision makers in *Voluntary* treatment are found to exhibit a cautious shift by investing 2.55 tokens less for others than for themselves (two-sided t test, $p < 0.01$; $N = 268$), similar to previous findings (Reynolds et al., 2009; Bolton et al., 2015).[21]

Similar to the selection effect, the selection effect on other-self difference of risk taking is not equal to the coefficient associated with the dummy for treatment in Table 3, unless the expected probability of volunteering is one. As shown in the expression for the effect below, the estimate of this effect is achieved by dividing the observed difference (the dummy for the treatment) by the expected probability of volunteering.

$$\underbrace{(E[(Y^{NV} - Y^S)|V = 1] - E[(Y^{NV} - Y^S)|V = 0])}_{\textit{Selection effect on O-S diff}} = \frac{\overline{(Y - Y^S)}_{\textit{Vol, V=0}} - \overline{(Y - Y^S)}_{\textit{Non-vol}}}{\overline{P(V)}}.$$

[21]In particular, Bolton et al. (2015) did not find that the any link between distributional preferences and conservative risk behavior for others. Such a link, however, is found significant in this study. The more pro-social one is in a favored inequality (y-score), the smaller the other-self difference of risk taking is, see Table H1 in Appendix J.

Estimated from the results of the Logit regression in Table 3, the average expected probability of volunteering among the opt-out subjects in *Voluntary* treatment and the subjects in *Non-voluntary* treatment is around 0.42. The estimate of the selection effect on other-self difference is around 30.5 tokens (see Table 4), which is significant ($p < 0.01$).

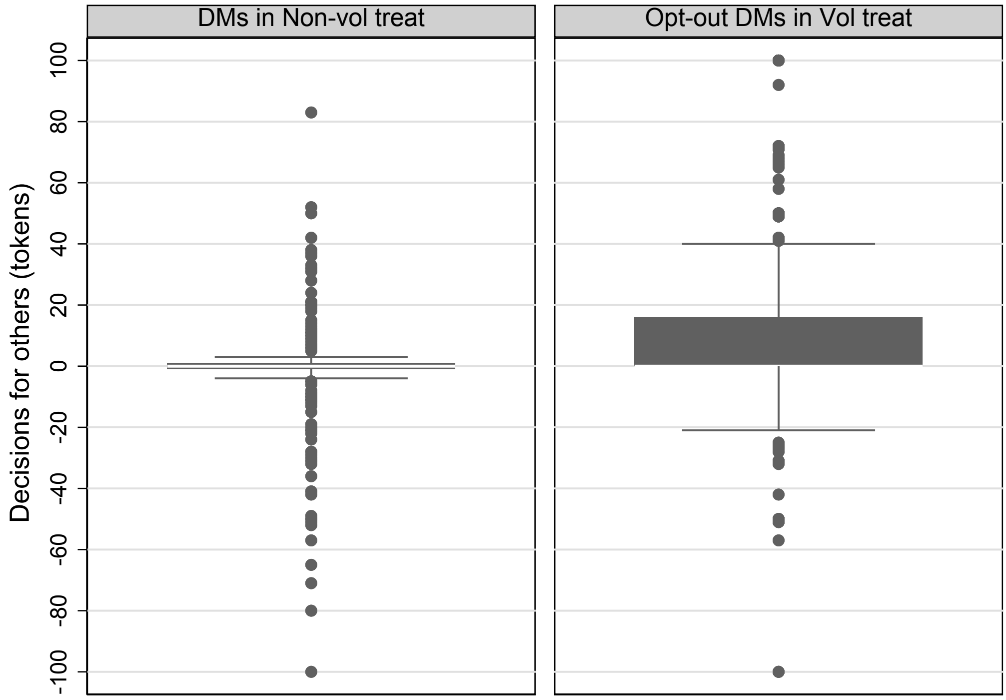


Figure 8: Other-self difference: Non-vol treat and Opt-out DMs

4.6 Implement propensity score matching

A key assumption in so-far analyses is that the expected probability of self-selecting as decision makers ($P(V)$) holds same between treatments. To check robustness to this assumption, I use the propensity score matching to identify preferences toward self-selecting as among subjects in *Non-voluntary* treatment. Decisions of subjects who are identified as willing to self-select, may provide an alternative approach to the expected decision of subjects in *Non-voluntary* treatment who prefer self-selecting to opting-out ($E[Y^{NV}|V=1]$). And, this individual matching frees the estimation from the assumption of indifferent proportion of self-selected subjects.[22] Then, I compare decisions of these identified subjects to those of self-selected subjects and opt-out subjects. Details of the propensity matching method can be found in Appendix K.

The estimates in Table 5 confirm the robustness of the results. The estimates of effects all hold the same directions and similar magnitudes with the propensity matching method. The estimate of selection effect is smaller and less pronounced than the identified estimate. This, in fact, bolsters the large positive overall effect, with the selection effect as a negative component and the institutional a positive component (see Eq.1.1). Because the selection effect is smaller and less significant than identified, we observe a relatively stronger role of the institutional effect and a large positive overall effect between the two institutions.

Table 5: Estimates from propensity matching

	Estimates (Bootstrap s.e.)
Institutional effect	6.03**
	(3.03)
Selection effect	-6.34*
	(3.46)
Selection effect on other-self difference	-11.07***
	(2.33)

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: All the effects are in tokens. Institutional effect indicates the difference between the tokens invested by self-selected subjects and by matched subjects. Selection effect indicates the difference between the tokens invested by the decision makers in *Non-voluntary* treatment who are willing to volunteer and the non-volunteers in *Voluntary* treatment. Selection effect on other-self difference indicates the difference of other-self difference between the decision makers in *Non-voluntary* treatment who are willing to volunteer and the non-volunteers in *Voluntary* treatment. The bootstrap includes 800 replications and the standard errors are estimated from the replications without dropping observations.

[22]The matching is conducted at individual level, and the estimate ($E[Y^{NV}|V=1]$) is derived from the average decision of the matched subjects. So, the estimate should not be influenced even if the proportion of subjects willing to self-select differs between treatments.

5 Conclusion

Social support helps build stronger communities and promote equality and opportunity. The providers of social support often face tough decisions that involve uncertainties and unpredictable outcomes. In social support for the unemployed, the unemployment agencies need to allocate limited resources between different schemes like essential life assistance and job training support. In child care for disadvantaged children, the child services may recruit enough low-qualified teachers to ensure all children to be taken care of, or fewer high-qualified teachers to promote children's development but possibly leave some children with insufficient care. In health care, medical professionals choose what treatments and therapies to cover for poor patients and different treatments have different risks for patients. Common for these examples is that during provision and implementation of social support, decisions of providers influence the final benefits received by the disadvantaged.

The risk attitudes of decision makers have crucial impacts on the welfare of societies. In some societies, social support is available to everyone and everyone is expected to voice their opinions on welfare decisions through democratic elections. In other societies, social support relies on voluntary contributions and the contributors to social support also make decisions about the provision of support. This study is devoted to reveal whether and how decision making differs in two different institutional settings intended to imitate different welfare institutions.

I designed an experiment to have the subjects make risk taking decisions on behalf of others in the two different treatments. I investigate whether the decision behavior is different between the institutions and the mechanisms underlying the difference in decision making. The results show that the voluntary decision makers take more risk than the assigned decision makers do. And, the different risk borne by recipients in different institutions can be explained by both the institutions and the attitudes toward volunteering of the decision makers. For the decision makers who are willing to volunteer, they take more risk on behalf of others when it is possible to volunteer than when the opportunity of volunteering is absent. The decision makers who are willing to volunteer take less risk for others than those unwilling to. In addition, voluntary decision makers take less risk for others than for themselves. The decision makers unwilling to volunteer take more risk for others when they are assigned decision makers.

The results of this study imply that inequality of social benefits may be larger when the social support relies more on voluntary private sector contributions. This is not only because of incomplete coverage, but also because volunteers take more risk on behalf of others. Notably, decision making in the public sector is usually under external review and evaluation, and such an accountability is found to reduce risk taking on behalf of others.[23] On the other side, the outcome-based earning incentives for workers in voluntary private sectors may encourage risk

[23] Previous studies have shown that responsibility and accountability may reduce risk taking on behalf of others (Charness and Jackson, 2009; Bolton et al., 2015; Pollmann et al., 2014; Füllbrunn and Luhan, 2015; Pahlke et al., 2015; Vieider et al., 2015).

taking on behalf of others (Andersson et al., 2013a). Therefore, the difference that I found in the experiment might be further strengthened by other institutional differences in the field. Further research is needed in order to quantify the importance of risk attitudes for the provision of social support in society.

Appendices

A Dictator game

The dictator game consists of ten binary choices (Kerschbamer, 2015), participants need to choose between the binary choices that contain different hypothetical payoffs for themselves and someone else.[24]

The decisions of the dictator game are transformed into a score vector, (x, y). The generated x-score and y-score are indicators of social preferences, and will be used as control variables in following analysis.

The ten choices are shown in Table 6. The choices describe in the upper part describe one's distributional preferences in a disadvantageous situation. The earlier one switches to the option LEFT, the more altruistic she is, and the higher x-score will be. The decisions will be transformed into a x-score, as seen in Table 7. Likewise, the choices of the lower part in Table 6 describe one's distributional preferences in an advantageous situation. The decisions of the lower part will be transformed into *y-score*, as in Table 7. The earlier one switches to the option LEFT, the less selfless she is, and the lower *y-score* will be. The participants who exhibit inconsistent choices in the dictator game will be assigned x-score and y-score with zero.[25]

[24]As a method of eliciting social preferences, this dictator game does not discriminate between arbitrary set of preference types. Also it does not impose any assumptions of structural formulation of preferences, or require participants of much time and efforts to elicit social preferences.

[25]The aim of assigning a value to x- and y-score is to keep the inconsistent participants in the sample. How much the values are does not matter in later analysis as the consistency will be controlled by a dummy.

Table 6: Dictator game

X-list:

Dec. Nr.	LEFT		Your Choice		RIGHT	
	you receive	other person receive			you receive	other person receive
1	8 dollars	13 dollars	LEFT ◯	RIGHT ◯	10 dollars	10 dollars
2	9 dollars	13 dollars	LEFT ◯	RIGHT ◯	10 dollars	10 dollars
3	10 dollars	13 dollars	LEFT ◯	RIGHT ◯	10 dollars	10 dollars
4	11 dollars	13 dollars	LEFT ◯	RIGHT ◯	10 dollars	10 dollars
5	12 dollars	13 dollars	LEFT ◯	RIGHT ◯	10 dollars	10 dollars

Y-list:

Dec. Nr.	LEFT		Your Choice		RIGHT	
	you receive	other person receive			you receive	other person receive
6	8 dollars	7 dollars	LEFT ◯	RIGHT ◯	10 dollars	10 dollars
7	9 dollars	7 dollars	LEFT ◯	RIGHT ◯	10 dollars	10 dollars
8	10 dollars	7 dollars	LEFT ◯	RIGHT ◯	10 dollars	10 dollars
9	11 dollars	7 dollars	LEFT ◯	RIGHT ◯	10 dollars	10 dollars
10	12 dollars	7 dollars	LEFT ◯	RIGHT ◯	10 dollars	10 dollars

Table 7: Determination of (x, y)-Score

subject chooses LEFT for the 1st time in row	in X-list (x-score)	in Y-list (y-score)
1	2.5	-2.5
2	1.5	-1.5
3	0.5	-0.5
4	-0.5	0.5
5	-1.5	1.5
never	-2.5	2.5

B Consent form

Introduction

Welcome to this research project! We appreciate your participation very much.

This is a study about decision-making. Norwegian School of Economics has provided funds for this project.

Procedures

This survey consists of several parts. You will be given instructions on screen before every single part of the survey. Please note that there is no way back to revise your answers, so always make sure to read the instructions and consider your decisions carefully before you continue.

Benefits

Your payment will consist of the participation fee and possibly a bonus. Every participant will get a participation fee of $1 for completing the HIT. The bonus $0-$7 [The bonus $0-$10.5 in the pilot study] depends on the tokens you accumulate throughout the HIT. The exact amount of tokens that you receive will depend on your and/or others' decisions. In the end, each token is converted into US dollars, with 2 cents per token [3 cents per token in pilot study].

Payment

At the end of this survey, you will be given a participation code. You will need to copy this code to the survey code field on the AMT web page that directed you here at the beginning. If you earn a bonus, it will be paid to you using the bonus system within a few days after the completion of this HIT. Your payment for taking the HIT will be sent to you shortly after the completion of this HIT.

Confidentiality

All data collected from this survey will be used only for research purpose. The worker IDs will never be published. Only the primary investigator, who is in charge of payment, will have access to the worker IDs.

Questions about the Research

Should you have questions regarding this survey, please contact thechoicelab@nhh.no.

I have read, understood and agreed with the above consent form. I want to participate this study.

◯ Yes

◯ No

C Assign worker ID

Welcome!

Please note that your participation will be registered on the following Amazon Mechanical Turk worker ID:

The worker ID was retrieved automatically when you clicked on the link that brought you here. This step is necessary for assigning payments to the right account and to ensure that you participate in this study only once.

D Decision for self

Now you are rewarded 100 tokens for finishing the questionnaire. You are asked to make a decision with the rewarded 100 tokens.

You need to decide how many tokens, from 0 up to 100 tokens, you would like to invest in the following game: With a chance of 1/3 (33%) you will make two and a half times the amount you invest; with a chance of 2/3 (67%) you will lose the amount you invest.

Your bonus will be total amount of tokens earned from the game and tokens that are not invested.

Please click the continue button and make your decision.

Recall the game:

You are asked to make a decision with the rewarded 100 tokens.

You need to decide how many tokens, from 0 up to 100 tokens, you would like to invest in the following game: With a chance of 1/3 (33%) you will make two and a half times the amount you invested; with a chance of 2/3 (67%) you will lose the amount you invested.

Your bonus will be total amount of tokens earned from the game and tokens that are not invested.

Please move the slider to the amount you would like to invest.

E Voluntary treatment

Now you are anonymously matched with another participant in this study. You need to make a choice between two alternatives. Your decision would influence the bonus of the participant matched with you, and s/he knows that his/her bonus would depend on another participant's decision.

Please click the continue button and make your choice.

Recall the game:

You need to decide how many tokens, from 0 up to 100 tokens, you would like to invest in the following game: With a chance of 1/3 (33%) two and a half times the amount invested; with a chance of 2/3 (67%) lose the amount invested.

The bonus will be total amount of tokens earned from the game and tokens that are not invested.

Please consider carefully and choose between alternatives A and B:

A: The participant matched with you will be rewarded 100 tokens for finishing the questionnaire. On behalf of this participant, you need to decide how many tokens to invest in the previous game. The bonus of this participant would depend on your decision for him/her. Your own bonus will still depend on your decision for yourself.

B: The participant matched with you will not be rewarded anything for finishing the questionnaire. The bonus of this participant will be zero. Instead, your own bonus will be doubled (i.e. the total amount of tokens you earn from the game and tokens not invested will be doubled).

◯ A

◯ B

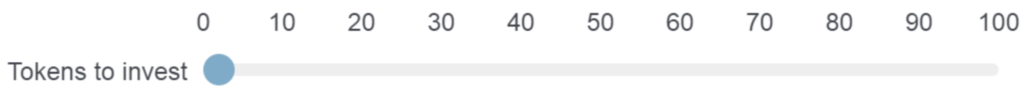
(The page if the subject chooses A)

Recall the game:

You need to decide how many tokens, from 0 up to 100 tokens, you would like to invest in the following game: With a chance of 1/3 (33%) two and a half times the amount invested; with a chance of 2/3 (67%) lose the amount invested.

The bonus will be total amount of tokens earned from the game and tokens that are not invested.

Please move the slider to the amount of tokens you would like to invest on behalf of the participant matched with you.



(The page if the subject chooses B)

This is the last question that may affect payments for you and others. Now you are **matched with another participant**, different from the one in the previous question. This new participant is rewarded 100 tokens for finishing the questionnaire and knows that his/her bonus would depend on another participants' decision.

On behalf of this participant, you need to decide how many tokens to invest in the previous game. The bonus of this participant would depend on your decision for him/her. Your own bonus will not be affected.

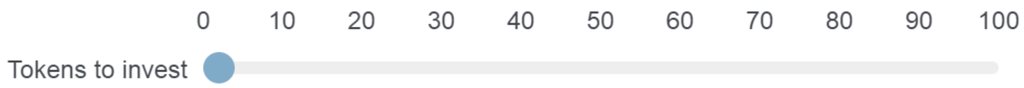
Please click the continue button and make the decision.

Recall the game:

You need to decide how many tokens, from 0 up to 100 tokens, you would like to invest in the following game: With a chance of 1/3 (33%) two and a half times the amount invested; with a chance of 2/3 (67%) lose the amount invested.

The bonus will be total amount of tokens earned from the game and tokens that are not invested.

Please move the slider to the amount of tokens you would like to invest on behalf of **the participant newly matched with you**.



F Non-voluntary treatment

This is the last question that may affect payments. Now you are anonymously matched with another participant in this study. S/he is rewarded 100 tokens for finishing the questionnaire and knows that his/her bonus would depend on another participant's decision. On behalf of this participant, you need to decide how many tokens to invest in the previous game.

The bonus of this participant would depend on your decision for him/her. Your own bonus will not be affected.

Please click the continue button and make the decision.

Recall the game:

You need to decide how many tokens, from 0 up to 100 tokens, you would like to invest in the following game: With a chance of 1/3 (33%) two and a half times the amount invested; with a chance of 2/3 (67%) lose the amount invested.

The bonus will be total amount of tokens earned from the game and tokens that are not invested.

Please move the slider to the amount of tokens you would like to invest on behalf of the participant matched with you.

G Questionnaire

Thank you for finishing the above questions. Now we would like you to fill in the form before the end of this HIT.

How old are you?

What is your gender?

◯ Male

◯ Female

What is the highest level of education you have completed?

◯ Less than High School

◯ High School / GED

◯ Some College

◯ 2-year College Degree

◯ 4-year College Degree

◯ Masters Degree

◯ Doctoral Degree

◯ Professional Degree (JD, MD)

Which political party would you vote for if there was an election tomorrow?

◯ Republican

◯ Democratic

◯ Other

H Arguments for the identification of the selection effect and selection effect on other-self difference

For the selection effect, we start with decomposing the decisions in *Non-voluntary* treatment,

$$E[Y^{NV}] \;=\; E[Y^{NV}|V=1]\cdot P(V) \;+\; E[Y^{NV}|V=0]\cdot(1-P(V)).$$

Then, subtract the decomposed $E[Y^{NV}]$ with the decisions of the non-volunteer decision makers

$$E[Y^{NV}] \;-\; E[Y^{NV}|V=0] \;=\; (E[Y^{NV}|V=1] \;-\; E[Y^{NV}|V=0])\cdot P(V).$$

If $P(V)\neq 0$, then

$$E[Y^{NV}|V=1]-E[Y^{NV}|V=0] \;=\; \frac{E[Y^{NV}] \;-\; E[Y^{NV}|V=0]}{P(V)}.$$

For the selection effect on other-self difference in decisions, we start with decomposing the other-self difference in *Non-voluntary* treatment,

$$E[(Y^{NV}-Y^{S})] \;=\; E[(Y^{NV}-Y^{S})|V=1]\cdot P(V) \;+\; E[(Y^{NV}-Y^{S})|V=0]\cdot(1-P(V)).$$

Then, subtract the decomposed expression with the other-self difference of the non-volunteers,

$$E[(Y^{NV}-Y^{S})] \;-\; E[(Y^{NV}-Y^{S})|V=0] \;=\; (E[(Y^{NV}-Y^{S})|V=1]-E[(Y^{NV}-Y^{S})|V=0])\cdot P(V).$$

If $P(V)\neq 0$, then

$$E[(Y^{NV}-Y^{S})|V=1]-E[(Y^{NV}-Y^{S})|V=0] \;=\; \frac{E[(Y^{NV}-Y^{S})] \;-\; E[(Y^{NV}-Y^{S})|V=0]}{P(V)}.$$

I The difference between $\frac{1}{E[\overline{P(V)}]}$ in the estimates and $\frac{1}{P(V)}$ in the effects

The expected proportion of the decision makers who are willing to volunteer is the number of the decision makers who volunteer divided by the total number of the decision makers. So, $E[\overline{P(V)}]$ can be written as

$$E[\overline{P(V)}] = E[\frac{\overline{X}}{N}] = \frac{E[\overline{X}]}{N}.$$

X is the number of volunteers and N is the number of the decision makers in *Voluntary* treatment. Suppose that X follows Binomial distribution $B(N;p)$, where N is the maximum number of the volunteers, which is the number of the decision makers in *Voluntary* treatment. p is probability of each decision maker choosing to volunteer. Since we assume that the proportion of volunteering is not zero, the number of volunteers, X, would be at least one. So, comparing $\frac{1}{E[\overline{P(V)}]}$ to $\frac{1}{P(V)}$ is equivalent to comparing $\frac{1}{E[\overline{X}|X\geq 1]}$ to $E[\frac{1}{X}|X \geq 1]$, because the number of the decision makers in *Voluntary* treatment is a constant, N.

First, we consider $\frac{1}{E[\overline{X}|X\geq 1]}$ and compute the denominator $E[\overline{X}|X \geq 1]$. We expand $E[\overline{X}]$ as,

$$E[\overline{X}] = 0 \cdot (1-p)^N + E[\overline{X}|X \geq 1] \cdot \underbrace{(1-(1-p)^N)}_{Prob(X\geq 1)}.$$

Since $X \sim B(N;p)$ and $(1-p)^N \doteq 0$ when N is large, $E[\overline{X}] = Np$ and the right hand side equals to $E[\overline{X}|X \geq 1]$. We get

$$\frac{1}{E[\overline{X}|X \geq 1]} = \frac{1}{Np}. \tag{I.1}$$

Second, we consider $E[\frac{1}{X}|X \geq 1]$. The probability of each value of $\frac{1}{X}$ should be same as the probability of the given value of X, since $X \sim B(N;p)$, we have

$$E[\frac{1}{X}|X \geq 1] = \sum_{k=1}^{N} \frac{1}{k} \binom{N}{k} p^k (1-p)^{N-k} \Big/ (1-(1-p)^N). \tag{I.2}$$

Given the number of the decision makers in *Voluntary* treatment, $N = 564$, and the observed proportion of volunteering, $p = 0.475$, we plug the values into Equations I.1 and I.2. The value of $\frac{1}{E[\overline{X}|X\geq 1]}$ is around 0.0037327 and the value of $E[\frac{1}{X}|X \geq 1]$ is around 0.0037397. The difference between the two is very small, only 0.19% of the component in the effect, $E[\frac{1}{X}|X \geq 1]$. Thus, the difference between $\frac{1}{E[\overline{P(V)}]}$ and $\frac{1}{P(V)}$ is very small. Moreover, the difference would be smaller when the sample size gets larger and the estimates of the effects are consistent.

J Regression of other-self differences of decisions

Table H1: Other-self difference of risk taking

Covariate	Dependent variable: Other-self difference
Vol treatment	4.59***
	(1.51)
x-score	-0.37
	(0.56)
y-score	-1.92***
	(0.67)
age	-0.08
	(0.06)
female	-2.22
	(1.52)
high education	0.50
	(1.51)
consistency	5.63**
	(2.64)
Republican	-0.34
	(1.83)
pilot	-0.69
	(1.90)
Constant	-1.19
	(3.41)
r2	0.03
N	847

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

K Propensity matching method

In order to identify subjects in *Non-voluntary* treatment who would self-select as decision makers, the choice between volunteer and opt-out in *Voluntary* treatment are regressed on self-regarding decisions, x-score, y-score, and other controls in a Logit model. The selection of covariates into the specification follow the method proposed by Imbens and Rubin (2015). Details of how to select covariates can be found in Appendix L. The rationale of selecting the covariates into the specification is to obtain balance of important covariates between treatments. This ensures that important covariates for explaining the probability of self-selecting are included in the model. As shown in Table 9, self-regarding decisions, y-score, age, gender, consistency in dictator game,[26] squared y-score, interaction of gender and x-score, and interaction of consistency and age, and squared decision for self, have significant effects in explaining the probability of volunteering. Y-score has very large positive effects on choosing to volunteer. Propensity scores are computed from the estimated model. Last, each subject in *Non-voluntary* treatment is matched with a subject in *Voluntary* treatment. The matching procedure follows the principle of nearest neighbor. The results of matching can be seen in Table 10. 137 subjects in *Non-voluntary* treatment are identified as willing to volunteer. The remaining 146 subjects in *Non-voluntary* treatment do not show large enough propensity scores, and are not identified as willing to volunteer. Decisions of these matched subjects in *Non-voluntary* treatment who prefers volunteering to opting out are compared to those of self-selected and opt-out subjects to test the hypotheses. This procedure is replicated in Bootstrap to derive standard errors of the estimate.

[26]Consistency in dictator game has large effects on volunteering decision, because 19 out of 29 inconsistent decision makers choose to give to others.

Table 9: Marginal effects on choosing *volunteer*

	Logit
Decision for self	0.006***
	(0.002)
x-score	0.016
	(0.019)
y-score	-0.128**
	(0.055)
age	-0.016**
	(0.008)
female	0.217***
	(0.067)
high education	0.046
	(0.038)
consistency in dictator game	-0.968***
	(0.271)
y score × y socre	0.038***
	(0.008)
female × x score	-0.059**
	(0.030)
consistency × age	0.019**
	(0.009)
deci_self^2	-0.000**
	(0.000)
N	564

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The dependent variable is the binary variable for volunteering decision. It equals one if a decision maker chooses to make the decision for the recipient, and equals zero if the decision maker chooses to double his own payoff. The independent variables are decision for the decision maker herself, x score and y score from the dictator game (see Appendix A Dictator game), age, dummy for female, dummy for high education, dummy for consistency in dictator game, interaction between female and x score, interaction between consistency and age, and squared decisions on behalf of oneself. The selection procedure of the covariates in the specification of the model can found in Appendix L Selecting covariates into the Logit model.

Table 10: Descriptives after matching (s.d. in parentheses)

	Volunteers	Non-volunteers	Comparison group in Non-vol	Remaining in Non-vol
# Obs	268	296	137	146
Decisions for self	44.21 (31.62)	34.17 (33.05)	38.90 (31.21)	33.78 (32.47)
Decisions for others	41.66 (29.25)	41.96 (34.18)	35.63 (27.44)	33.88 (30.76)
x score	-0.75 (1.40)	-0.38 (1.19)	-0.65 (1.42)	-0.42 (1.26)
y score	1.64 (1.24)	0.73 (1.22)	1.52 (1.26)	0.88 (1.12)
Age	36.99 (11.95)	35.05 (11.00)	37.19 (11.94)	34.30 (9.93)
Female	0.52 (0.50)	0.39 (0.49)	0.47 (0.50)	0.41 (0.49)
High education	0.61 (0.49)	0.61 (0.49)	0.67 (0.47)	0.63 (0.48)
Prefer Republican	0.25 (0.43)	0.27 (0.44)	0.24 (0.43)	0.27 (0.45)

L Selecting the covariates into the Logit model

In this study, nine covariates are candidates of the linear predictors for the volunteering decision. They are decision for self, x-score, y-score, age, dummy for female, dummy for high education, dummy for support for Republican, dummy for consistency in dictator game, and dummy for whether a decision maker is in pilot study or not, see Table 11. In addition, four quadratic covariates and thirteen interaction covariates, are among the candidates of the predictors of the volunteering decision. The quadratic covariates include squared decision for self, squared age, squared x-score, and squared y-score. The squared term of other covariates do not enter the quadratic covariates, because those are all binary covariates and squared terms are same as the original values. The other thirteen interaction covariates are either combination of a dummy covariate and a continuous covariate, or two dummy covariates, see Table 12.

The procedure of selecting the covariates follows the method introduced by Imbens and Rubin (2015). The point of the method is to find a suitable specification for the propensity score, that would obtain balance on the important covariates. The procedure has three parts. First, basic covariates are chosen on substantive grounds. These basic covariate are *a priori* viewed as important for explaining the volunteering decision and plausibly related to the measures for other-regarding decisions. Second, some of the remaining covariates are selected into the specification of the Logit model. One of the remaining covariates, each at a time, is added into the model, together with the basic covariates. A likelihood ratio statistic is calculated to assess the null hypothesis that the newly included covariate has a zero coefficient. The pre-set threshold for the test statistic is one (Imbens and Rubin, 2015). If all the likelihood ratio test statistics are less than one, the selection procedure ends. If at least one of the likelihood ratio test statistics is larger than one, the covariate with the largest likelihood ratio statistic is added into the model. So the covariate that increases the likelihood function sufficiently largely, will be selected into the model. The process continues until all likelihood ratio statistics are less than one. Third, some of the quadratic and interaction covariates are selected into the specification of the Logit model. Essentially same as the process in second part, one of the high-order covariates, each at a time, is added into the model, together with the basic covariates and the selected linear covariates that are selected in the second step. A likelihood statistic is calculated to assess the null hypothesis that the newly included covariate has a zero coefficient. The pre-set threshold for the test statistic is 2.71 (Imbens and Rubin, 2015). If all the likelihood ratio test statistics are less than 2.71, the selection procedure ends. If at least one of the likelihood ratio test statistics is larger than 2.71, the covariate with the largest likelihood ratio statistic is added into the Logit model. The process continues until all likelihood ratio statistics are less than 2.71.

In the first part, three basic covariates are selected because they are believed to have large impacts on the volunteering decision. The three covariates are decision for self, x-score denoting pro-sociality in unfavored inequality, and y-score denoting pro-sociality in favored inequality. In the second and third parts, at each step of the process, the covariate with the largest test statistic (also larger than threshold values) is selected into the Logit model, as shown in Table 11 and Table 12. Final specification of the Logit model includes decision for self, x-score, y-score, age, female, dummy for high education, dummy for consistency in dictator game, squared y-score, interaction between consistency and age, interaction between female and x-score, and squared decision for self.

Table 11: Likelihood ratio statistics for sequential selection of covariates to enter linearly

Covariate	Step				
	1	2	3	4	5
age	2.06	3.23	**2.22**		
female	7.42	**8.20**			
high education	0.07	0.83	1.21	**1.09**	
Republican	0.05	0.02	0.06	0.02	0.02
consistency	**16.72**				
pilot	1.35	0.78	0.82	0.76	0.69

Note: Boldface numbers in each column are the largest likelihood ratio test statistic at each step. In the Logit model for volunteering decision, the base covariates include decisions for self, x-score, and y-score. The remaining covariates include age, dummy for female, dummy for high education, dummy for support for Republican, dummy for consistency in the dictator game, and dummy for whether in pilot study. At each step, one of the remaining covariates is added into the Logit model and a likelihood ratio test is conducted to check whether the coefficient of the newly added covariate is zero or not. The pre-set threshold for the test statistic is one. If all likelihood ratio statistics are less than one, the selection procedure ends, and no covariate is added. If at least one of the likelihood ratio statistic is greater than one, the covariates with the largest likelihood ratio test statistic is added into the model.

Table 12: Likelihood ratio statistics for sequential selection of quadratic and interaction covariates

Covariate	Step				
	1	2	3	4	5
decision for self × decision for self	4.11	3.91	4.09	**4.18**	
age × age	0.00	0.01	0.17	0.11	0.13
x score × x score	2.09	0.01	0.03	0.06	0.08
y score × y score	**19.19**				
female × decision for self	1.60	1.91	2.47	2.80	2.33
female × x score	4.93	4.59	**4.10**		
female × y score	0.00	0.01	0.01	0.06	0.13
female × age	0.15	0.08	0.02	0.12	0.09
female × high education	0.23	0.33	0.32	0.15	0.14
female × consistency	0.48	0.51	0.07	0.21	0.36
high education × decision for self	0.18	0.60	0.72	0.67	0.59
high education × xscore	0.06	0.15	0.24	0.28	0.17
high education × y score	1.84	0.95	0.65	0.55	0.50
high education × age	0.07	0.45	0.85	0.70	0.37
high education × consistency	0.05	0.05	1.02	0.88	0.70
consistency × decision for self	1.08	1.13	1.90	1.78	1.62
consistency × age	6.21	**6.00**			

Note: Boldface numbers in each column are the largest likelihood ratio test statistic at each step. In the Logit model for volunteering decision, the linear covariates include decisions for self, x-score, y-score, age, dummy for female, dummy for high education, and dummy for consistency in dictator game. The candidate quadratic and interaction covariates include squared decisions for self, squared age, squared x score, squared y score, and the interaction terms combined with a dummy covariate and a continuous covariate, and two dummy covariates. At each step, one of the remaining quadratic and interaction covariates, is added into the Logit model with all the linear covariates that are selected. A likelihood ratio test is conducted to check whether the coefficient of the newly added covariate is zero or not. The pre-set threshold for the test statistic is 2.71. If all likelihood ratio statistics are less than 2.71, the selection procedure ends. If at least one of the likelihood ratio statistic is greater than 2.71, the covariate with the largest likelihood ratio test statistic is added into the model.

M Assessing the balance conditional on the estimated propensity score

The adequacy of the Logit model specification is checked by exploiting a property of the propensity score. That is, the treatment indicator and the covariates are independent of each other, given the estimated propensity score.[27] Ideally, the sample is first stratified into subsamples or blocks within each of which all observations have the exact same value of estimated propensity score. Then, check whether covariates are independent of treatment indicator. But, the first step is feasible only if the estimated propensity score takes on relatively small number of values. In practice, the sample is split into blocks within each of which the estimated propensity score varies very little. Within the resulting blocks, the independence of the treatment indicator and the covariates is assessed. The iterative process of constructing blocks starts from the whole sample, and a t test is conducted to check if the the linearized propensity score[28] is independent of the treatment indicator. Within each block, if the t-statistic is in absolute value less than one, then the linearized propensity score is uncorrelated with the treatment indicator. Otherwise, if the t-statistic is absolutely larger than one, then the linearized propensity score is not independent of treatment and the block will be split to two new blocks with equal subsample size[29]. The iterative process continues until all t-statistics of all blocks are in absolute values below one. As shown in Table 13, the whole sample[30] is split into two blocks, within each of which the linearized propensity score is uncorrelated with the treatment indicator.

To assess the balance of covariates, there are three sets of tests (Imbens and Rubin, 2015). First, a test for each covariate in the model specification based on the average of the within-block average differences by treatment indicator. Specifically, for each covariate and each block, the within-block difference and the within-block sampling variance are computed. Then, the average difference is the weighted within-block difference, and the sampling variance is the weighted within-block variances. The weights are the block sizes relative to the total sample size. Covert the average difference and the sampling variance into a z-value. If the z-values are not substantially larger in absolute values than one, then there is satisfactory balance in the covariates. This suggests that the specification of the propensity score is adequate. The z-values are shown in the third column of Table 14. None of the z-values is absolutely much

[27] The estimated propensity score substitutes the super-population propensity score, to investigate the property.

[28] The linearized propensity score is $\hat{l}(x) = ln(\frac{\hat{e}(x)}{1-\hat{e}(x)})$ where $\hat{e}(x)$ is estimated propensity score. The reason to use linearized propensity score is that, compared to the propensity score, the linearized propensity score is more likely to have a distribution that is well approximated by a normal distribution Imbens and Rubin (2015).

[29] The block is split into two new blocks based on the median of the linearized propensity score. The observations with linearized propensity score less than the median will be one new block, and the other half observations with linearized propensity score larger than median will be the other new block.

[30] There are three observations are trimmed from the whole sample (847), to ensure some overlap between the treatment groups. The observations in *Non-voluntary treatment* with propensity scores that are less than the smallest propensity score among *Voluntary treatment*, are dropped. The observations in *Voluntary treatment* with propensity scores that are greater than the largest propensity score among *Non-voluntary treatment*, are dropped.

larger than one, indicating excellent balance. Second, for each covariate and each block, the covariate is regressed on the block dummy and the interaction of block dummy and treatment indicator. A F-test is conducted on the coefficients on the interaction terms. Large positive test statistics suggest that the covariates are not balanced within the block, so the specification of the propensity score is inadequate. The test statistics are shown in the fourth column of Table 14. The small values suggest that the difference in average covariate values is zero in each block. Third, for each covariate and each block, the difference between treatments is checked by a t-test. A t-statistic with smaller absolute value than conventional critical value, suggests that the covariate is well balanced within the block. In the first and second columns of Table 14, the t-statistic with the largest absolute value is 1.91, which is smaller than conventional critical value of t-test (1.96). This, again, suggests that the covariates are well balanced within each block. Therefore, the assessments show that the overall balance of covariates for the specification of the Logit model is satisfactory, and the model specification is adequate.

Table 13: Determination of the number of blocks and their boundaries

Step	Block	Lower bound	Upper bound	Width	# Non-vol treatment	# Vol treatment	t-Statistic
1	1	0.08	0.90	0.82	283	561	1.05
2	1	0.08	0.42	0.34	150	272	0.121
	2	0.43	0.90	0.47	133	289	-0.015

Note: At each step, within each block the t test is conducted to check whether the linearized propensity score varies between the two treatments or not. The t-statistic is shown in the last column in the table. The lower and upper bounds, and the interval between the lower and upper bound are listed in the second, third, and fourth column, respectively. The numbers of observations in *Non-voluntary* treatment and *Voluntary* treatment are in the sixth and seventh column. At the first step, the whole sample is taken as one single block. The t-statistic of first step is in absolute value larger than one. Continue to the second step, this block is split into two new blocks with equal size. At the second step, the t-statistic is in absolute value less than one in both blocks. The block construction ends here. There are two blocks, within each of which the linearized propensity score is independent of the treatment indicator.

Table 14: z-Values for balancing tests: Specification of propensity score

	Within blocks		Overall		1-Block
	1	2	t-Test	F-test (z-Value)	t-Test
Covariate					
decision for self	0.48	0.79	0.89	0.24	−1.07
x score	−0.81	0.54	0.02	0.40	0.35
y score	−0.89	−0.49	−0.93	0.61	−0.18
age	−0.61	0.56	0.04	0.31	−0.17
female	−0.36	0.38	0.03	0.12	−0.16
high education	0.07	−1.50	−1.04	0.00	1.05
consistency	−1.29	−0.50	−0.84	0.28	1.07
y score × y score	0.74	−0.06	0.36	0.34	−1.19
consistency × age	−1.17	0.27	−0.41	0.84	0.40
female × x score	−1.02	1.62	0.96	0.47	−0.58
decision for self × decision for self	0.50	0.75	0.89	0.25	−1.00

Note: The rows corresponds to the eleven covariates. The first two columns show the t-statistics for each block and each covariate. The third and fourth columns are for the overall tests, and the third one for the z-value of the test of equality of (unadjusted) average covariate values for the two treatments, and the fourth one for the test of the block-adjusted average covariate values for the two treatments. The last column, for comparison purpose, presents the t-statistics for the null hypothesis that the overall covariate values are equal in the two treatments, not adjusted for the blocks.

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