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Excusable Selfishness: A Rawlsian Explanation for Maximizing One's Own Chances to Win a Lottery *

有理由的自私：羅斯對人們最大化贏得彩卷機率之解釋

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Abstract

Most subjects maximized own chances to win a lottery in previous experimental studies. Scholars have explained the result by a weak concern for ex ante equality. Rawls (1971/1999) provides a psychological motive for the weak preference. He argues that distributing income according to the outcome of a lottery is "arbitrary" and unfair. Moreover, he believes that treated by the unjust institution, people could possess "excusable envy" towards potential winners, which leads them to deal with others unfairly by maximizing own chances. This study tests experimentally whether subjects practice excusable selfishness. Our results support Rawlsian thought, since many exhibited a weak preference for an equal expected payoff and deviated their baseline social preferences. The finding provides the first psychological explanation for why most people maximize their winning probabilities and casts doubts on the equally lucky view of equality of opportunity.

Keywords:Equality of opportunity; Social Preferences; John Rawls; Risk

I. Introduction

Economists have tested altruism under risk experimentally and many of them found that most subjects maximized own chances to win a lottery (e.g. Krawczyk and Le Lec 2010; Bolton and Ockenfels 2010; Brock, Lange, and Ozbay 2013; Freundt and Lange 2017; Miao and Zhong 2018).[3] The general conclusion is that although a mixed model of ex ante and ex post equality may best account for the data, the preference for an equal chance is quite weak.[4]

The little concern for ex ante equality contradicts the belief of Roemer (1998), who argues that the following two concepts of equality of opportunity are widely implemented by modern societies. First, everyone should be "equally evaluated" in competing jobs and positions. Second, each society member should be "equally educated", such that children unluckily born into the disadvantaged class could also compete positions in society. Krawczyk (2010) and Eisenkopf, Fischbacher and Föllmi-Heusi (2013) implement the two views in their experimental researches.

Because previous empirical studies, consistent with Roemer's belief, also report that equally evaluated and equally educated are prevalent preference, why experimental participants become so selfish in allocating winning probabilities under risk requires some explanations. Using survey method (e.g. Konow 2001; Schokkaert and Devooght 2003) and experimental approaches (e.g. Eisenkopf, Fischbacher and Föllmi-Heusi 2013), researchers find that many people do accept an equal chance to succeed as a fairness idea. Hence, it is most natural for us to ask how one quickly transforms into a selfish player by not sharing winning chances. In this paper, we test experimentally whether Rawlsian "excusable" selfishness could provide a psychological explanation. Hence, this study does not test the most important

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3 Trautmann and Vieider (2012) provide a review of earlier literature. Recently, Andreoni et al. (2016) find the time-inconsistency between ex ante and ex post fairness.

4 See, for instance, the debates between Krawczyk and Le Lec (2016) and Brock, Lange, and Ozbay (2016).

thought of Rawls: people would adopt the difference principle behind the veil of ignorance (VOI), which has been tested by other studies (e.g. Schildberg-Hörisch, 2010; Teng, Wang and Yang, 2020).

Political economists or philosophers, such as Roemer (1998) and Rawls (1971/1999), might explain the deviation from the equally lucky view by the unfairness of the lottery system. They point out that the birth lottery allocates more education resources to children born into rich families. In fact, their "equally educated" view of equality of opportunity does not accept the random outcomes, even though every baby shares an equal chance to be born with a silver spoon in her mouth. It takes a step further to provide compensatory education to rectify the injustice, so that everyone has a chance to pursue her future success. The underpinning moral principle of equality of opportunity is that a person should only be responsible for what she can control (Roemer 1998). This view is supported by experimental results of Cappelen et al. (2013) and Krawczyk (2010), as they find a preference for redistribution when luck determines incomes.

Notably, Rawls (1971/1999) argues that treated by the arbitrary and unfair lottery, people might amplify envy towards the rich. He uses "excusable envy" to describe a person's understandable reaction to income inequality caused by the unjust institution (p. 468-474, 1999). Rawls believes that people are more likely to envy under the following three conditions. First, when they lack self-respect because they do not have primary social goods (necessary means for future success, such as education) to realize their life goals. Second, the inequality of income and wealth is too great and visible when the society is not well-ordered according to principles of justice (second paragraph, p. 470). Third, people do not have other constructive alternatives but envy because the positions in a society are only open to fortunate people. Since outcomes of a lottery will be arbitrary, according to the second condition, a subject might consider that it is totally justifiable to envy the winner strongly, if she turns out to be the loser.

Subjects might also apply the excusable thought to another social preference:

guilt. They do not feel guilty from having higher winning probabilities or ex post income. This is supported by experimental evidence that altruism, which is motivated by avoiding guilt, is quite unstable and vulnerable to minor changes of context. For example, in the dictator game, many dictators did not give receivers anything when they could avoid being found stingy (e.g. Dana, Cain and Dawes, 2006; Broberg, Ellingsen and Johannesson, 2007).

In addition to amplifying envy and downplaying guilt, subjects could also apply the excusable idea to the preference for equality of opportunity directly: While they accept that everyone should be equally evaluated and educated, they totally ignore ex ante equality under the equally lucky setting. Henceforth, we use the term "excusable selfishness" for the maximization behavior motivated by any of the above three excusable thoughts.

Albeit previous studies have explained winning probabilities maximization by the little concern for ex ante equality, they have not provided the psychological motive for the weak preference. Hence, the aim of the paper is to test experimentally whether excusable selfishness could be an explanation. As it will be analyzed in Section III, the theory of Saito (2013) predicts that excusable selfishness would lead to the following two observations. First, people have a very weak preference for equal expected payoffs. Second, the link between the likelihood of sharing winning probabilities and baseline social preferences collapses, because subjects emphasize and downplay social feelings of envy and guilt, respectively.

In our experiments, we elicit subjects' baseline social preferences by dictator and ultimatum games for the following three reasons. First, they are quite standard approaches to measure feelings of guilt and envy (e.g. Fehr and Schmidt, 1999; Camerer, 2003). Second, Saito applies values estimated by these two games to his model directly.[5] Third, other theories of equality of opportunity also use guilt and envy of Fehr and Schmidt (1999) in their models (e.g. Krawczyk and Le Lec, 2010;

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5 See footnote 11 of Saito (2013).

Brock, Lange an Ozbay, 2013; Greundt and Lange, 2017). We conducted the two games about two weeks after the probabilistic game, in order to avoid the carry-over of social preferences between experiments. We found evidence supporting excusable selfishness, as the above two predictions of excusable selfishness are identified.

The main contribution of this study is to provide the first psychological explanation for the selfish behavior of maximizing own chances to win a lottery. Our results also cast doubts on the equally lucky view of equality of opportunity.

The rest of the paper is organized as follows. Section II introduces our experimental design. In Section III, we derive theoretical predictions of experiments. Section IV analyzes experimental results and Section V concludes.

II. Experimental design

To test the two predictions stated in Introduction, each subject participated two sessions of experiments. The first was the probabilistic game, with three different treatments in this between-subjects study. In the second session, we estimated subjects' baseline social preferences.

II. A. Probabilistic dictator treatment

Following Rawlsian observation of the real world, there were advantaged Player 1 and disadvantaged Player 2 in this treatment. Rawls argues that the "social lottery" arbitrarily allocates resources unequally between children born into various social classes (Section 12). This creates different chances to succeed among people. Hence, the initial distribution of probabilities to win 200 New Taiwan dollars (NT$) was (75%, 25%), where the first and second numbers in the parenthesis represent chances of Player 1 and Player 2, respectively.

We describe the procedure of this treatment as follows. First, we randomly divided all subjects into groups of two. Second, roles (either Player 1 or Player 2) were randomly assigned to each group member, with the initial winning probabilities (75%, 25%). Third, each member could either stick to (75%, 25%) or choose from one of the following more equal distributions of chances: (70%, 30%), (65%, 35%), (60%, 40%), (55%, 45%), and (50%, 50%). Note that Player 2's maximum chance was 50%, resembling that real world reforms of inequality of opportunity usually stop when the playing field is leveled for everyone. Forth, the computer randomly appointed one player's choice as the decisive distribution. Finally, according to the decisive distribution, the computer picked the winner through a random procedure. (The full instruction can be found in Appendix A.)

II. B. Other treatments

In addition to the probabilistic dictator game, we conducted two more treatments. The second is the "disadvantaged majority treatment". Its aim is not to produce treatment effect. Since the main theme of this research is to test excusable selfishness, we are more interested in whether subjects still practice it in an environment closer to the real world.

We find attributes of the real world by looking at high quality public education, a popular policy to rectify inequality of opportunity. For instance, children from rich families living in good areas enjoy the best schools nearby. The UK government plans to establish more "grammar schools" around the nation, so that children from normal or poor families can also receive good education.[6] In this case, we observe the following two features. First, vested interests enjoying a greater chance are usually the minority. Second, in modern societies, whether to implement proposals reforming inequality of opportunity is often decided by a democratic procedure, such as voting. (In the UK, citizens vote members of parliament endorsing the policy.)

To incorporate these two characteristics into the treatment, there were three players with two disadvantaged members. The initial winning probabilities for Player 1, 2 and 3 were 80%, 10% and 10%, respectively. Each player could either stick to it or switch to an equal distribution (33.33% for each player). The final distribu-

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[6] Richardson, H. (2017, 1 March) Top state schools 'dominated by richest families', *BBC News*. Retrieved from https://www.bbc.com/news/education-39076204

tion of winning chances was decided by the majority rule.

The third is the VOI treatment. Rawls would predict that many advantaged players maximize probabilities in the first two treatments, since he believes that the lottery system is unfair. Rawls then introduces role uncertainty behind the VOI to achieve fair equality of opportunity (Sections 12-14).[7] Following Rawlsian approach, we checked whether more subjects pursued equality of opportunity behind the VOI. The VOI has been used to explore income redistribution (Becker and Miller 2009; Schildberg-Hörisch 2010). It should be interesting to apply it to the research on the distribution of winning probabilities.

II. C. Baseline envy and guilt

About two weeks after a subject's first session, she came back for the second session, in which her baseline social preferences were elicited. Below we explain the rationale behind this arrangement. As it will be analyzed in Section III, subjects could perform excusable selfishness by amplifying envy and downplaying guilt. Had we have measured baseline social preferences right after or before probabilistic games, subjects, in order to experience consistency, might have carried social feelings between experiments. Then social feelings in probabilistic games were similar to the baseline level. We therefore did not observe highlighted envy and deemphasized guilt, and would conclude that there was no practice of excusable selfishness. However, this is not because subjects did not perform it, but because they focused on consistency. Hence, we elicited baseline values after two weeks.

As argued in Introduction, there are two good reasons to estimate baseline social preferences with dictator and ultimatum games. (The full instruction of the sec-

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7 Although Rawls believes that people would choose a more equal distribution of income behind the VOI, his solution for equality of opportunity is not to equalize probabilities to win a lottery, but to provide everyone necessary means for future success. He argues that people, behind the VOI, would follow the maximin principle by maximizing the benefits of the least-advantaged, such that she also has primary social goods (e.g. education) to realize her life goals (Sections 12-14) .

ond session can be found in Appendix A.) Our dictator game was quite standard, but the ultimatum game deviated from the typical one in two aspects.

First, instead of facing only one proposal, subjects were given 11 binary decision problems to winnow out their envy. Each problem consisted of two options. In one option, two players had an equal payoff, while in the alternative, the other player's payoff was higher by an amount between 0 and 100. Second, in the standard design, if a responder rejects the unequal proposal, both players earn nothing. In our design, rejection only led both players to receive the lower payoff of the unequal option. (See Figure A5 for details of the two options.)

The rationale to modify the standard ultimatum game is explained as follows. In our experiment, when the unequal option was (5, 95), the alternative was (5, 5), where the first and second numbers in each parenthesis represented payoffs of oneself and the other player, respectively. Because one's payoff was fixed, she only had to consider the differences of income inequality and total efficiency between the two alternatives, whereas in the standard design, with (0, 0) as a consequence of rejecting (5, 95), she had to contemplate the difference of her payoff between two options additionally.

In Section IV, we will use both parametric and non-parametric empirical models to analyze the data. In non-parametric models, envy and guilt is numbers of fair options chosen by a subject. In the parametric models, following the estimation of Fehr and Schmidt (1999), there are four values of envy: 4, 1, 0.5 and 0, with the proportions of 10%, 30%, 30% and 30%, respectively. The values of guilt are 0.6, 0.25 and 0, with the proportions of 40%, 30% and 30%, respectively.

II. D. Survey and risk attitudes

Several attitudes might be related to decisions in probabilistic games. Hence, we elicited them with survey and experiments. First, we asked subjects' preference for equality of opportunity by the end of the first session. Following European Social Survey, we described the following person. "She/he thinks it is important that every person in the world should be treated equally. She/he believes everyone should have equal opportunities in life." Then a subject must choose an integer between 1 and 6, where 6 means that the person is very much like her and 1 means that the person is not like her at all. In Section IV, we will use the value from the survey for non-parametric models analysis, while we will estimate it directly in the parametric models.

Second, since a subject, in the first session, faced uncertainty in winning 200, her attitude towards risk should have an impact on her decision. Therefore, following the designs of Holt and Laury (2002) and Shupp et al. (2013), we evaluated participants' risk attitude and loss aversion in the second session. Finally, subjects may have non-monetary utility from winning the lottery. Following Sheremeta (2016), we conducted Tullock contest with a zero payoff.

II. E. Sessions and payments

These between-subjects experiments were conducted with zTree (Fischbacher 2007) between March and June of 2016 at National Taipei University. A total of 174 university students were recruited via an online recruiting website, in which any undergraduate or graduate students could sign up. There were 60, 54, and 60 subjects in probabilistic dictator, disadvantaged majority, and VOI treatments, respectively. Most participants (157/174 = 90.23%) returned for their second session. All sessions lasted less than thirty minutes, and the average payment in probabilistic dictator, VOI, and disadvantaged majority treatments was NT$200, NT$200 and NT$166.67, respectively, including a NT$100 show up fee. (The contemporary minimum hourly wage was NT$120, and the NT$/US$ exchange rate was: NT$31 = US$1).

III. Theoretical predictions

Since advantaged players, disadvantaged players and subjects behind the VOI were given different available options, we will analyze their decisions separately. Showing details of theoretical derivations in Appendix B, we provide intuitive explanations in this section.

III. A. Advantaged Players

Saito (2013) studies the probabilistic game with the expected inequality-averse (EIA) model. Following his approach, we derive theoretical predictions of advantaged Player 1's behaviors in the probabilistic dictator treatment. (The predictions for Player 1 in the disadvantaged majority treatment will be analyzed by the end of this part.) For subject who is Player 1, her utility function is:

$$V_i(p_1) = \delta_i [200p_1 - \beta_i (200p_1 - 200\,(1-p_1))] + (1-\delta_i)\,[p_1 (200-\beta_i \times 200) + (1-p_1)\,(0-\alpha_1 \times 200)] \quad (1)$$

where p_1 is Player 1's winning probability. According to Fehr and Schmidt (1999), α_i and β_i are inequality aversion parameters for feelings of envy and guilt, respectively, with the presumptions $\alpha_i \geq \beta_i$ and $0 \leq \beta_i < 1$.

The first part of the utility function, $200p_i - \beta_i (200p_i - 200\,(1-p_i))$, weighted by δ_i with the assumption $0 \leq \delta_i \leq 1$, is Player 1's expected payoff minus the disutility of having a higher expected payoff than Player 2. This term estimates ex-ante (or expected) inequality aversion. Saito uses it to capture the preference for "equality of opportunity". As discussed in Introduction, people can directly apply the excusable thought to equality of opportunity. They then have no preference for ex ante equality, implying that δ_i is close to zero. Hence, we have the following Hypothesis 1 to be tested experimentally:

Hypothesis 1: If the advantaged Player 1 practiced excusable selfishness by applying the excusable thought to equality of opportunity, her preference for an equal chance to win a lottery, δ_i, should be close to zero. On the contrary, if Player 1 did not perform excusable selfishness, δ_i is greater than zero.

The second part of the utility function, $p_1 (200-\beta_i \times 200) + (1-p_1)\,(0-\alpha_1 \times 200)$, weighted by $(1-\delta_i)$, consists of two sub-terms. The first and second sub-terms specify Player 1's expected payoff with social preferences components, when she turns out to be the winner and loser, respectively. Saito uses them to illustrate the preference for "equality of outcome" or ex post income inequality aversion.

As both ex ante and ex post parts have elements of social preferences, with some mathematical reasoning, we can derive that Player 1 with weaker feeling of envy and stronger feeling of guilt are more likely to transfer winning probabilities. (Formal proof can be found in Appendix B.) Hence, Hypothesis 2 to be tested experimentally is:

Hypothesis 2: If the advantaged Player 1 did not practice excusable selfishness by amplifying envy and downplaying guilt, the likelihood for her to transfer some winning probabilities to the disadvantaged player increases with the baseline guilt (β_i) and decreases with the baseline envy (α_i). On the contrary, if Player 1 performed excusable selfishness, the above links collapse.

The predictions for Player 1 in the disadvantaged majority treatment can be obtained with the same method. (Player 1's utility function can be found in Appendix B.) Assuming all players have the level-o thinking, the above two hypotheses are predicted by Saito's model.

III. B. Disadvantaged players

Analyzing disadvantaged players' behaviors with Saito's model, we can find that they, in the probabilistic dictator and disadvantaged majority treatment, should always allocate equal winning probabilities among all by raising their chances to 50% and 33.33%, respectively. (Formal proof can also be found in Appendix B.) Because, by assumption, envy is always greater than guilt, disadvantaged players' ex-ante and ex-post utilities are both higher, when they are given a more equal chance to win.

III. C. VOI treatment

In the VOI treatment, a risk neutral subject with β_i>0, that is, all subjects, should choose an equal chance. The role uncertainty prohibits any profits from allocating unequal opportunities between two players. (Formal proof can also be found in Appendix B.)

Note that the above predictions for disadvantaged players and subjects behind the VOI are still valid, even when they perform excusable selfishness. Excusable selfishness does not change the fact that disadvantaged players' envy is greater than guilt. Nor does it affect the role uncertainty behind the VOI. In the next section, their behaviors will be analyzed statistically.

IV. Results

IV. A. Result 1: Excusable selfishness of the advantaged players

As shown in Figure 1, most advantaged Player 1 in the probabilistic dictator (22/30 = 73.33%) and the disadvantaged majority (17/18 = 94.44%) treatments chose to maximize their probabilities. This could be attributed to subjects' practice of excusable selfishness. To analyze the existence of excusable selfishness, we test Hypotheses 1 and 2.

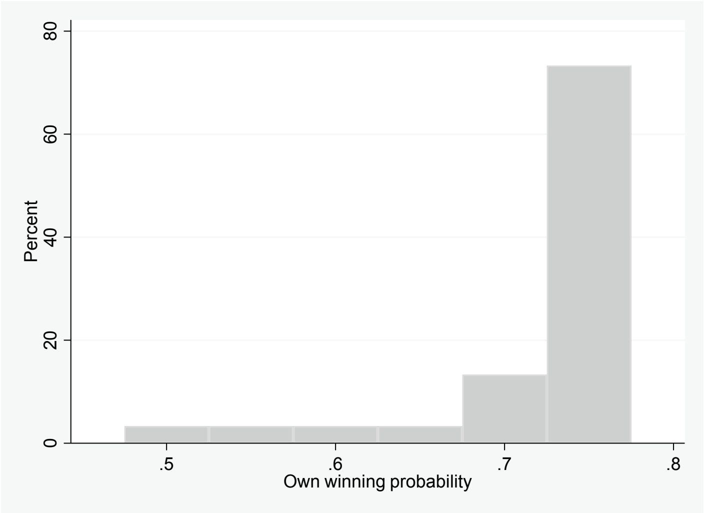

Fig. 1(a) Frequency distribution of advantaged player's choice in the probabilistic dictator treatment

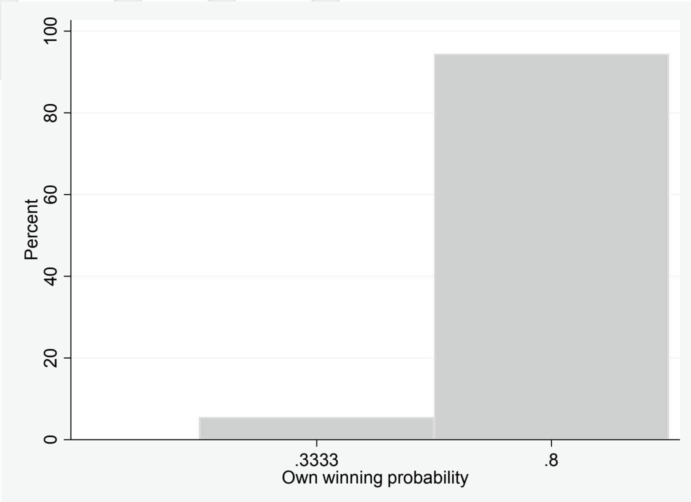

Fig. 1(b) Frequency distribution of advantaged player's choice in the disadvantaged majority treatment

IV. A. (A) Testing Hypothesis 2

We start by a simple non-parametric analysis testing Hypothesis 2, in which we check the link between baseline social preferences and the likelihood of giving some winning probabilities away. The probit model is appropriate for this investigation, since it is a standard approach to estimate the impact of explanatory variables on the likelihood for an event to happen. The dependent variable is whether Player 1 transferred some probabilities. If she did not, it equals 0; otherwise, it equals 1.

Model 1 in Table 1 is the probit regression. There is no evidence that baseline envy and guilt are correlated with the likelihood of sharing chances, as coefficients of α_i and β_i are not significant. [8] Coefficients of δ_i, which is collected by the survey,

[8] We calculated a subject's feelings of envy and guilt according to her frequency of choosing the equal option. (For options in experiments eliciting envy and guilt, see Figure A3 and A5 in Appendix A. Because the 11th decision problem in A5 is irrelevant, we excluded it in estimation. The purpose of showing it is to list all possible income distributions.)

and other explanatory variables are not significant, either. [9] It seems that subjects did not apply their baseline values of α_i, β_i, δ_i, and risk attitude to the probabilistic dictator game, suggesting the practice of excusable selfishness.

One may argue that α_i and β_i could have an effect on the amount of transferred chances. Hence, we conduct a robust check in Model 2, with probabilities given away by Player 1 as the dependent variable. The maximum chances that the advantaged player could transfer were 25% and 46.67% in the probabilistic dictator and the disadvantaged majority treatments, respectively. We therefore normalized transferred probabilities to the range of [0, 1]. Model 2 is the least-squares regression. [10] Results suggest that baseline α_i and β_i are not associated with the amount of transferred opportunities.

Table 1 Explaining behaviors of advantaged players

	Model 1 **Probit**	**Model 2** **Least-squares**	**Model 3** **Tobit**
Gender (Female=1)	-0.4937 (-0.76)	-0.0790 (-0.70)	-0.0790 (-0.77)
Importance of equal chance (δ_i)	0.1923 (0.78)	0.0140 (0.33)	0.0140 (0.36)
α_i	-0.0389 (-0.68)	-0.0085 (-0.84)	-0.0085 (-0.92)
β_i	-0.0089 (-0.13)	-0.0075 (-0.58)	-0.0075 (-0.64)
Risk loving	-0.2503 (-1.46)	-0.0455* (-1.71)	-0.0455* (-1.88)
Preference for winning	-0.0114 (-0.77)	-0.0027 (-1.12)	-0.0027 (-1.23)

9 To avoid collinearity, we did not include both risk attitude and loss aversion. We did not find any more interesting results when the risk attitude is replaced by loss aversion.

10 We also ran OLS models for the two treatments separately, without normalizing the dependent variable. We did not find any more interesting results.

Constant	-0.1029	0.3830	0.3830
	(-0.08)	(1.65)	(1.81)
Pseudo R-squared	0.0756		0.8994
Adjusted R-squared		-0.0360	
Observations	42	42	42

Z-statistics or t-statistics in parentheses. ***, **, * denote significance at the 1, 5 and 10 percent level, respectively.

Another suitable model could be the Tobit regression, since Player 1 might want to choose a 100% winning probability, but the maximum available option is 75%. Therefore, we conduct another robust check in Model 3 with the Tobit model. Results confirm that baseline social preferences are not related to the amount of transferred probabilities.

IV. A. (B) Testing Hypothesis 1

As stated in Hypothesis 1, advantaged players could also carry out excusable selfishness by giving very little weight to the preference for ex-ante equality (δ_i). From Models 1-3, it seems that Player 1 did not apply survey values of δ_i to probabilistic games directly. Hence, we should estimate δ_i according to their choices in those games. Recall that Player 1, in the probabilistic dictator treatment, chose one alternative between the following six distributions of winning probabilities: (75%, 25%), (70%, 30%), (65%, 35%), (60%, 40%), (55%, 45%), and (50%, 50%). Assuming a subject would pick an alternative maximizing her utility, we can evaluate δ_i with the following conditional logit model, in which we denote

i: index of subjects;

j: index of alternatives $j \in \{1,2,3,...,6\}$.

The model specifies the likelihood of subject i choosing alternative j as $i_{ij} = \frac{\exp(U_{ij})}{\Sigma_{j=1}^{9} \exp(U_{ij})}$, where U_{ij} is the utility of subject i's preference over alternative j. Following the model of Saito (2013), U_{ij} can be written as:

$$U_{ij}(p_{1j}) = \delta_i [200p_{1j} - \beta_i (200p_{1j} - 200(1-p_{1j}))] + (1-\delta_i)[p_{1j}(200 - \beta_i \times 200) + (1-p_{1j})(0 - \alpha_i \times 200)],$$

where p_{1j} is player 1's winning probability when she chooses alternative j.

Results are shown in Model 4 of Table 2. The coefficient of the utility of ex-ante equality is significant but the sign is negative. By contrast, the coefficient of the utility of equality of outcomes is positive and significant.

Table 2 Advantaged players' weights on ex-ante and ex-post utility

	Model 4 **Probabilistic dictator treatment**	**Model 5** **Disadvantaged majority treatment**
Ex-ante utility	-0.0059** (-2.14)	0.0447 (0.01)
Ex-post utility	0.0096*** (2.83)	-0.0274 (-0.00)
Log likelihood	-37.1086	-2.7034
Observations	150	34

Z-statistics in parentheses. ***, **, * denote significance at the 1, 5 and 10 percent level, respectively.

There are also advantaged players in the disadvantaged majority treatment, in which Player 1 only had two options. Hence, we estimated δ_i separately with another conditional logit regression in Model 5. The utility of ex-ante equality is not a significant explanatory variable.

These results suggest that subjects could perform excusable selfishness by giving no weight or even negative weight to the preference for ex-ante equality. Note that we implemented baseline social preferences in conditional logit models. Since subjects could amplify envy and deemphasize guilt, we probably should also evaluate envy and guilt. However, due to nonlinearity of the utility function, we cannot estimate δ_i, α_i and β_i simultaneously. [11]

To sum up, there is evidence supporting excusable selfishness of advantaged players. This could be carried out either by giving no weight to the preference for ex-ante equality, or by adjusting baseline social preferences.

IV. B. Most disadvantaged players chose equality of opportunity

Of all disadvantaged players, 83.33% (25/30) and 94.44% (34/36) in the probabilistic dictator and disadvantaged majority treatments, respectively, allocated equal winning chances. This is consistent with the theoretical prediction, suggesting that Saito's theory is good at explaining behaviors of disadvantaged players, especially when, as discussed by the end of Section III, excusable selfishness does not alter subjects' choices.

IV. C. Many chose equality of opportunity behind the VOI

About 36.67% (22/60) subjects selected an equal distribution of opportunities in the VOI treatment (see Figure 2). Comparing to other treatments, there are only 3.33% (1/30) and 5.56% (1/18) advantaged players choosing an equal chance in the probabilistic dictator and disadvantaged majority treatments, respectively. As Rawls believes, the VOI could promote fair equality of opportunity (1971, Sections 12-14).

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[11] For instance, a simpler form of the utility function is: $200\,[\delta_i\,(\alpha_i+\beta_i)-\beta_i]+200p_{1i}\,[1-(1-\delta_i)(\alpha_i+\beta_i)]$, with which we can only evaluate some nonlinear combinations of δ_i, α_i and β_i.

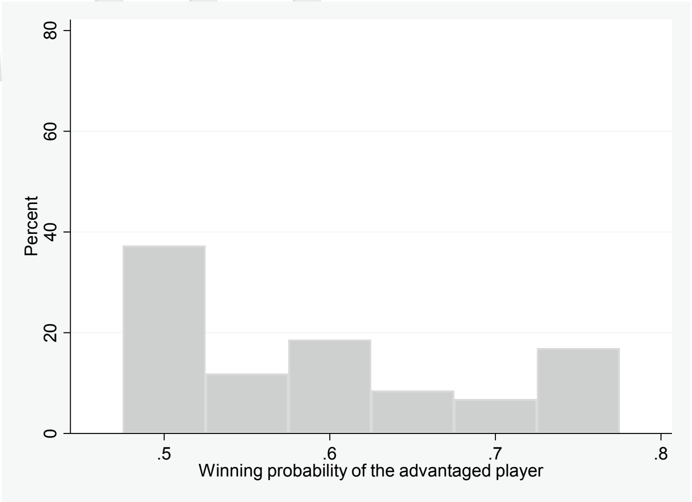

Fig. 2 Frequency distribution of choices in the VOI treatment

However, equality of opportunity could also be motivated by infinite risk aversion behind the VOI. Therefore, as shown in Table 3, we include risk parameter in Model 6. The dependent variable is the difference of winning chances between the two players. As analyzed in Section III. C., baseline envy and guilt are not related to the dependent variable, not necessarily due to excusable selfishness, but because of role uncertainty. There are two significant explanatory variables. First, the more risk loving a subject was, the more unequal distribution she picked, suggesting that the stronger preference for equality of opportunity in the VOI treatment could just be a phenomena of extreme risk aversion. Second, the preference for ex-ante equality (δ_i), elicited by the survey, has a negative and significant impact on the dependent variable. Comparing to results in Models 1-3, δ_i now finally has a significant effect with a correct direction. According to the survey question, this means that the more subjects thought that everyone should be treated equally and every person in the world should be treated equally, the more equal chances they gave. The survey value of δ_i seems to be a good indicator for equality of opportunity as it is a predictor for the relevant preference. Results also suggest that equality of opportunity was not only motivated by infinite risk aversion. Moreover, it seems that subjects did not practice excusable selfishness behind the VOI, whereas advantaged players changed their survey values of δ_i in non-VOI treatments.

Table 3 Explaining behaviors of the VOI treatment

	Model 6
Gender (Female=1)	0.4179
	(0.14)
Importance of equal chance	-4.1564***
(δ_i)	(-3.33)
α_i	0.2218
	(0.84)
β_i	0.5241
	(1.28)
Risk loving	1.2456*
	(1.90)
Preference for winning	0.0338
	(0.58)
Constant	21.0314**
	(2.48)
Adjusted R-squared	0.1856
Observations	55

Z-statistics in parentheses. ***, **, * denote significance at the 1, 5 and 10 percent level, respectively.

V. Conclusion and discussion

Although scholars have explained experimental findings that most subjects maximized own chances to win a lottery by the little concern for ex ante equality, they have not offered the psychological motive for the weak preference. Rawls (1971/1999) argues that the “social lottery” and the “natural lottery” are unfair, because they arbitrarily determine one’s income according to social classes of one’s parents or inborn talents. He then goes on to suggest that people may respond to the unjust lottery system with "excusable envy".

If Rawls is correct, we can derive the following two predictions, according to the theory of Saito (2013). First, they have little preferences for an equal expected payoff. Second, the link between the likelihood of sharing winning probabilities and baseline social preferences collapses. As Saito directly applies values of social preferences estimated by ultimatum and dictator games to his model, we also elicited baseline guilt and envy with these two games.

This lab experimental study tested the existence of excusable selfishness. We found evidence supporting excusable selfishness, as the above two predictions were observed.

The main contribution of our paper is to provide the first psychological explanation for why most people maximize their chances to win a lottery. Our results also support Rawlsian thought that an equal chance to win a lottery is not a form of equality of opportunity.

Our experimental evidence suggests that many people adopted the utilitarian model of maximizing self-interests and do not followed Saito's model. Indeed, when subjects amplified envy, downplayed guilt and ignored ex ant fairness, Saito's model collapses to utilitarianism. One might find it bothering that we began at analyzing their behaviors with Saito's model but ended up with a utilitarian one. However, this happens because many previous studies have claimed that equally lucky to win a lottery is a concept of equality of opportunity, so it is most natural for us to begin at the relevant model. Nevertheless, since the experimental results reject the model, we then concluded that many might behave according to the utilitarianism.

Although our results do not support the equally lucky view modeled by Saito, his theory is still useful when it is applied to other two concepts. For instance, if everyone is equally educated and evaluated, a job candidate can only assume that she and other applicants share an equal chance to earn the job. In this case, Saito's model can analyze the equally evaluated and educated views of equality of opportunity

Our study might also help researchers in choosing how to implement equality of opportunity in experiments. To create equal opportunity, Eisenkopf, Fischbacher and Föllmi-Heusi (2013) use the equal access to education, Krawczyk (2010) adopts the equally evaluated concept, and Miao and Zhong (2013) simply impose an equal chance to win a lottery. It seems that Krawczyk, and Eisenkopf and his coauthors might apply a more prevalent concept of equality of opportunity in experiments.

There are, of course, limitations of our studies. First, the regression results only showed correlations between dependent and independent variables, so we cannot really say that we explain the behaviors of maximizing winning probabilities, as our empirical models cannot identify the causal effect. Second, the VOI treatment might not be Rawlsian original thought of VOI, in which people do not know their social status, preferences, etc. Because we recruited students to conduct experiments, few of them might know each other in a session, although we tried to avoid it by sending invitations to students from all departments. Moreover, the pure students sample raises the issue of external validity, since we cannot apply results to the real world constructed by many non-students parties. Finally, due to the between-subjects design, sample sizes of some treatments are small and we can only provide small incentive in this short experiment.

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Appendix A

English Translation of Experimental Instructions

Experiment 1

Welcome to the experiment.

You will receive a NT$100 show up fee for participating in this experiment. If you fully understand the instruction and make your decision carefully, you could earn additional payoffs from the experiment. Therefore, it is very important for you to read the instructions carefully. Your additional earnings are determined by your decision, other participants' decisions, and random procedures. If you have any questions about the instructions, please raise your hand and we will come to you and explain them.

During the entire experiment, please do not talk to other participants, and do not use your mobile phone or any other computer programs. If you violate the above rules, you will be asked to leave the experiment without receiving any payment.

The entire experiment covers two sessions. You will participate in Experiment 1 today. Experiment 2 will be conducted two weeks later. The instructions for Experiment 2 will be announced when you participate in Experiment 2. Please do come back for Experiment 2. It takes about 30 minutes to complete Experiment 1. At the end of the experiment, every participant will be paid in private. You are not obligated to tell others how much you earned from the experiment.

(Henceforth, words in italic type are for the purpose of providing more information to readers. They did not appear in the experimental instruction.)

(From this point on, instructions for the three treatments are quite different. We first show the instruction for the probabilistic dictator treatment.)

This is a one round experiment with four stages. The details of each stage are described below.

Stage 1:

All participants are randomly divided into groups of two. You and the other player in your group are randomly assigned as either Player 1 or Player 2. If you are Player 1, the other player is Player 2; if you are Player 2, the other player is Player 1. During or after the experiment, each participant does not know who else is in the same group. One of the two players in a group can earn NT$200. The initial winning probabilities for Player 1 and Player 2 are 75% and 25%, respectively.

For example, in Figure A1, the computer randomly assigns you as Player 2, and you have a 25% chance to win 200 NT dollars.

Stage 2:

Player 1 and Player 2 must choose one of the following six options.

Option 1: Stick to the original probabilities (Player 2: 25%; Player 1: 75%)

Option 2: Change to the following probabilities (Player 2: 30%; Player 1: 70%)

Option 3: Change to the following probabilities (Player 2: 35%; Player 1: 65%)

Option 4: Change to the following probabilities (Player 2: 40%; Player 1: 60%)

Option 5: Change to the following probabilities (Player 2: 45%; Player 1: 55%)

Option 6: Change to the following probabilities (Player 2: 50%; Player 1: 50%)

Figure A2 is the screen shot of this stage.

Stage 3:

The computer randomly appoints one player's choice as the decisive probabilities to allocate the final distribution of winning probabilities.

For example, as shown in Figure A3, the computer randomly appoints your choice as the decisive probabilities. Hence, the computer will pick a winner randomly in the next stage according to your choice.

Stage 4:

According to the decisive probabilities, the computer picks a winner randomly.

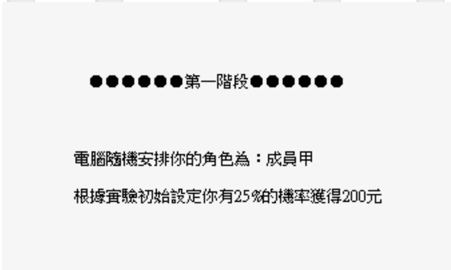


Figure A1

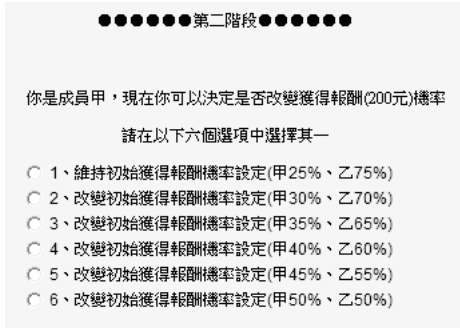


Figure A2

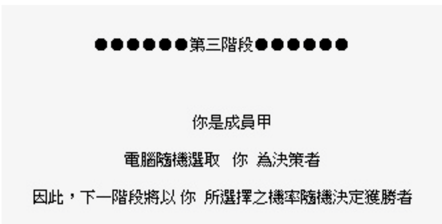


Figure A3

Example:

Stage 1: The computer randomly assigns you as Player 1 and the other player as Player 2.

Stage 2: You (Player 1) choose Option 6: Change to the following probabilities (Player 2: 50%; Player 1: 50%). The other player (Player 2) chooses Option 1: Stick to the original probabilities (Player 2: 25%; Player 1: 75%).

Stage 3: The computer randomly appoints Player 2's choice as the decisive probabilities. Thus, the final distribution of winning probabilities is: Player 2: 25%; Player 1: 75%.

Stage 4: According to the decisive probabilities, (Player 2: 25%; Player 1: 75%), the computer picks a winner randomly. It turns out that Player 2 is the winner. Hence, the other player (Player 2) earns NT$300 (200 + 100 show up fee), and you earn NT$100 show up fee.

If you have any questions about the instructions, please raise your hand and we will come to you to explain them.

(The instructions of the VOI treatment are different from that of other treatments with the following part.)

This is a one round experiment with four stages. The details of each stage are described below.

Stage 1:

All participants are randomly divided into groups of two. At this stage, you do not know who is Player 1 or Player 2. One of the two players in a group can earn NT$200. The initial winning probabilities for Player 1 and Player 2 are 75% and 25%, respectively.

Figure A1 is the screen shot of this stage.

Stage 2:

Without knowing who is Player 1 or Player 2, you and the other player must choose one of the following six options.

Option 1: Stick to the original probabilities (Player 2: 25%; Player 1: 75%)

Option 2: Change to the following probabilities (Player 2: 30%; Player 1: 70%)

Option 3: Change to the following probabilities (Player 2: 35%; Player 1: 65%)

Option 4: Change to the following probabilities (Player 2: 40%; Player 1: 60%)

Option 5: Change to the following probabilities (Player 2: 45%; Player 1: 55%)

Option 6: Change to the following probabilities (Player 2: 50%; Player 1: 50%)

Figure A2 shows the screen shoot of this stage.

Stage 3:

The computer randomly assigns you as Player 1 or Player 2. If you are Player 1, the other player is Player 2; if you are Player 2, the other player is Player 1.The computer then randomly appoints one player's choice as the decisive probabilities to allocate the final distribution of winning probabilities.

For example, as shown in Figure A3, the computer randomly assigns you as

Player 1 and randomly appoints your choice as the decisive probabilities. Then, the computer will pick a winner randomly in the next stage according to your chosen probabilities.

Stage 4:

According to the decisive probabilities, the computer picks a winner randomly.

Example:

Stage 1: The computer randomly assigns another participant as the other player in your group.

Stage 2: Without knowing who is Player 1 or Player 2, you and your group member both choose Option 1: Stick to the original probabilities (Player 2: 25%; Player 1: 75%).

Stage 3: The computer randomly assigns you as Player 1 and the other player as Player 2. The computer then randomly appoints Player 2's choice as the decisive probabilities. Thus, the final distribution of winning probabilities is: Player 2: 25%; Player 1: 75%.

Stage 4: According to the decisive probabilities, (Player 2: 25%; Player 1: 75%), the computer picks a winner randomly. It turns out that Player 2 is the winner. Hence, the other player (Player 2) earns NT$300 (200 + 100 show up fee), and you earn NT$100 show up fee.

If you have any questions about the instruction, please raise your hand and we will come to you to explain it.

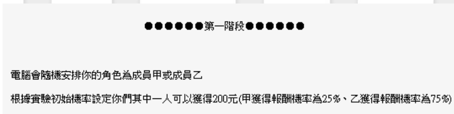


Figure A1

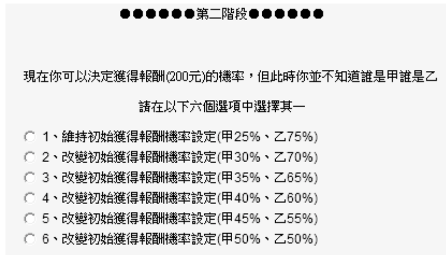


Figure A2

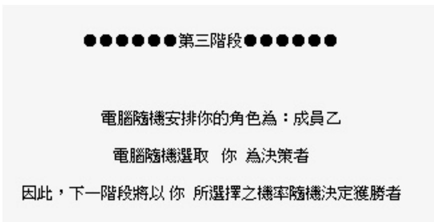


Figure A3

(The instructions of the disadvantaged majority treatment are different from that of other treatments with the following part.)

This is a one round experiment with four stages. The details of each stage are described below.

Stage 1:

All participants are randomly divided into groups of three. Each group has a Player 1, a Player 2 and a Player 3. A role is randomly assigned to each group member. During or after the experiment, every participant does not know who else is in the same group. One of the three players in a group can earn NT$200 dollars. The initial winning probabilities for Player 1, Player 2, and Player 3 are 80%, 10%, and 10%, respectively.

For example, in Figure A1, the computer randomly assigns you as Player 3, and you have a 10% chance to win NT$200.

Stage 2:

Each player must choose one of the following two options.

Option 1: Stick to the original probabilities (Player 3: 10%; Player 2: 10%; Player 1: 80%)

Option 2: Change to the following probabilities (Player 3: 33.33%; Player 2: 33.33%; Player 1: 33.33%)

Figure A2 is the screen shot of this stage.

Stage 3:

The final allocation of winning probabilities for each group is decided by the majority rule.

For example, as shown in Figure A3, you are Player 3 and you choose Option 2. One of the other two players in your group also chooses Option 2. Since two of the three players in your group choose Option 2, the final allocation of winning probabilities is: Player 3: 33.33%; Player 2: 33.33%; Player 1: 33.33%.

Stage 4:

According to the final allocation of winning probabilities, the computer picks a winner randomly.

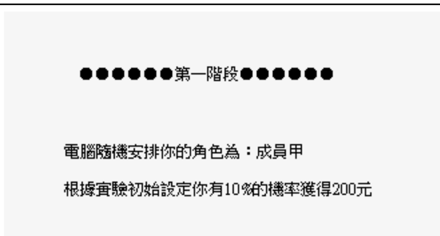


Figure A1

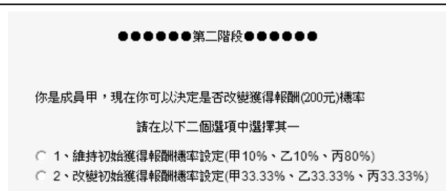


Figure A2

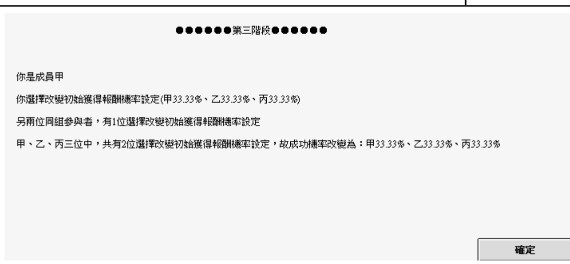


Figure A3

If you have any questions about the instructions, please raise your hand and we will come to you and explain them.

Experiment 2

Welcome to the experiment.

You will receive a NT$100 show up fee for participating in this experiment. If you fully understand the instructions and make your decision carefully, you could earn additional payoffs from the experiment. Therefore, it is very important for you to read the instructions carefully. Your additional earnings are determined by your decision, other participants' decisions, and random procedures. If you have any questions about the instruction, please raise your hand and we will come to you and explain them.

During the entire experiment, please do not talk to other participants, and do not use your mobile phone or any other computer programs. If you violate the above rules, you will be asked to leave the experiment without receiving any payment.

It takes about 30 minutes to complete the experiment. At the end of the experiment, every participant will be paid in private. You are not obligated to tell others how much you earned from the experiment.

There are 5 parts in this experiment. At the end of the experiment, the computer will randomly choose three parts. The sum of payoffs of these three parts will be your final earnings. Please make your decision in each part carefully. The details of each part are described below.

Part 1

The payoffs in Part 1 are denominated as ESC (Experimental Standard Currency), where 5 ESC equals NT$1.

<u>Stage 1</u>:

All participants are randomly divided into groups of two. Each participant does not know who is the other player in your group.

Stage 2:

As shown in Figure A1.1, there are 10 decision problems. In each decision problem, you have to choose between the Left alternative and the Right alternative. When you complete these 10 decision problems, please click "OK".

For example, in Decision 1, please select between the Left alternative, (500, 500), and the Right alternative (550, 450). The first number in the parenthesis represents your payoff, and the second number in the parenthesis represents the payoff of the other player. Thus, the Left alternative means that both you and the other player receive 500 ESC. The Right alternative means that you receive 550 ESC, and the other player receives 450 ESC.

Stage 3:

When all participants complete these 10 decision problems, the computer randomly chooses one decision problem as the determinative decision. The computer also randomly picks one player in your group as the decisive person. Each player in your group is paid according to the decisive person's choice in the determinative decision.

Example 1:

The computer randomly chooses Decision 1, in which the Left alternative is (500, 500) and the Right alternative is (550, 450), as the determinative decision. Then the computer randomly picks you as the decisive person. Assume that in Decision 1, you choose the Left alternative. Your payoff is thus 500 ESC and the other player's payoff is also 500 ESC. On the contrary, if you choose the Right alternative in Decision 1, your payoff is 550 ESC, and the other player's payoff is 450 ESC.

Example 2:

The computer randomly chooses Decision 3, in which the Left alternative is (500, 500) and the Right alternative is (650, 350), as the determinative decision. Then the computer randomly picks the other player as the decisive person. Assume that in

Decision 3, the other player chooses the Left alternative. The other player's payoff is thus 500 ESC, and your payoff is also 500 ESC. On the contrary, if the other player chooses the Right alternative in Decision 3, the other player's payoff is 650 ESC, and you payoff is 350 ESC.

Part 2

The payoffs in Part 2 are denominated as ESC (Experimental Standard Currency) and 5 ESC equals NT$1.

Stage 1:

As show in Figure A2.1, there are 10 decision problems. In each decision problem, you have to choose between alternative A and alternative B. When you complete these 10 decision problems, please click "OK".

For example, in Decision 1, alternative A shows that you have a 1/10 chance to receive 330 ESC and a 9/10 chance to receive 270 ESC. In alternative B, you have a 1/10 chance to receive 640 ESC and a 9/10 chance to receive 20 ESC.

Stage 2:

When all participants complete these 10 decision problems, the computer randomly chooses one decision problem as the determinative decision for each participant (See Figure A3.1). Then, the computer randomly picks a number between 1 and 10 to determine your payoff according to which alternative you have chosen.

Example:

The computer randomly chooses Decision 1 as the determinative decision. If you select alternative A in Decision 1, you have a 1/10 chance to earn 330 ESC and a 9/10 chance to earn 270 ESC. On the contrary, if you select alternative B in Decision 1, you have a 1/10 chance to earn 640 ESC and a 9/10 chance to earn 20 ESC.

Then the computer randomly picks a number between 1 and 10. It turns out to be 3. Assume that you select alternative A, you would get 270 ESC. On the contrary, if you select alternative B, you would get 20 ESC.

Part 3

Note that the payoffs in this part are denominated in New Taiwan dollars.

Stage 1:

All participants are randomly divided into groups of two. Each participant does not know who is the other player in your group.

Stage 2:

As show in Figure A4.1, there are 11 decision problems.

For each decision problem, you have to choose between the Left alternative and the Right alternative. When you complete these 10 decision problems, please click "OK".

For example, in Decision 1, please choose between the Left alternative, (0, 0), and the Right alternative (0, 100). The first number in the parenthesis represents your payoff and the second number in the parenthesis represents the payoff of the other player. The Left alternative means that you and the other player both receive nothing. The Right alternative means that you receive nothing, and the other player receives NT$100.

Stage 3:

When all participants complete these 11 decision problems, the computer randomly chooses one decision problem as the determinative decision. The computer also randomly picks one player in your group as the decisive person. Each player in your group is paid according to the decisive person's choice in the determinative decision.

Example 1:

The computer randomly chooses Decision 1, in which the Left alternative is (0, 0) and the Right alternative is (0, 100), as the determinative decision. Then the computer randomly picks you as the decisive person. Assume that in Decision 1, you choose the Left alternative. You and the other player thus both receive nothing. On the contrary, if you choose the Right alternative in Decision 1, your payoff is nothing and the other player's payoff is NT$ 100.

Example 2:

The computer randomly chooses Decision 3, in which the Left alternative is (15, 15) and the Right alternative is (15, 85), as the determinative decision. Then the computer randomly picks the other player as the decisive person. Assume that in Decision 3, the other player chooses the Left alternative. You and the other player thus both receive NT$15. On the contrary, if the other player chooses the Right alternative in Decision 3, your payoff is NT$15, and the other player's payoff is NT$85.

Part 4

Note that the payoffs in this part are denominated in New Taiwan dollars.

Stage 1:

As shown in Figure A5.1, there are 15 decision problems. In each decision problem, you have to choose between alternative A and alternative B. When you complete these 15 decision problems, please click "OK".

For example, in Decision 1, if you select alternative A, you have a 50% chance to earn NT$100 and a 50% chance to earn nothing. On the contrary, if you select alternative B, you receive NT$10 for sure.

Stage 2:

When all participants complete these 15 decision problems, the computer randomly chooses one decision problem as the determinative decision for each participant. Then the computer also randomly picks a number between 1 and 10 to determine your payoff according to which alternative you have chosen.

Example:

Assume that the computer randomly chooses Decision 3 as the determinative decision. Then the computer picks a number between 1 and 10. It turns out to be 2. If you select alternative A in Decision 3, you earn NT$100. On the contrary, if you select alternative B in Decision 3, you receive NT$20.

Part 5

Note that the payoffs in this part are denominated in New Taiwan dollars.

Stage 1:

As show in Figure A6.1, all participants are randomly divided into groups of two. Each participant does not know who is the other player in your group. Everyone has NT$100 endowment to invest to become the winner. However, there is no reward when you win. The amount THAT you do not invest is your payoff in this part.

Your winning probability is calculated by $\frac{A}{A+B}$, where A represents the amount of your investment, and B represents the amount of the other player's investment.

Stage 2:

In this stage, the computer will announce your winning probability.

Stage 3:

According to the winning probability, the computer randomly picks the winner and announces your payoff.

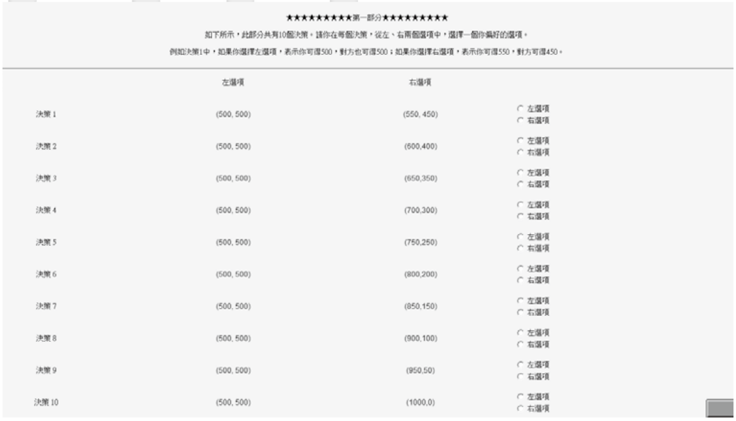
Example:

Assume that you invest NT$10 dollars and the other player in your group invests NT$15. Your winning probability is $\frac{10}{10+15}$ =40%, and the other player's winning probability is $\frac{10}{10+15}$=60%. According to the winning probability, the computer picks you as the winner through a random procedure. Your payoff in this part is 100 -10 = NT$90.

Total payoff in this experiment:

Show up fee NT$100 + the sum of payoffs in three randomly selected parts

If you have any questions about the instructions, please raise your hand and we will come to you and explain them.



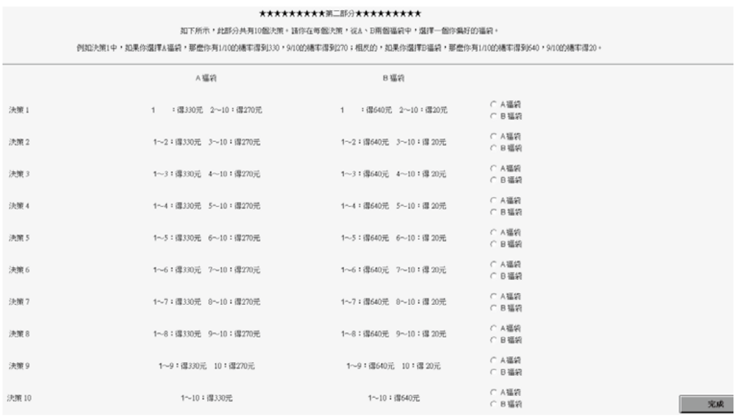
★★★★★★★★★★第一部分★★★★★★★★★★

如下所示，此部分共有10個決策。請你在每個決策，從左、右兩個選項中，選擇一個你偏好的選項。

例如決策1中，如果你選擇左選項，表示你可得500，對方也可得500；如果你選擇右選項，表示你可得550，對方可得450。

	左選項	右選項	
決策 1	(500, 500)	(550, 450)	○ 左選項 ○ 右選項
決策 2	(500, 500)	(600,400)	○ 左選項 ○ 右選項
決策 3	(500, 500)	(650,350)	○ 左選項 ○ 右選項
決策 4	(500, 500)	(700,300)	○ 左選項 ○ 右選項
決策 5	(500, 500)	(750,250)	○ 左選項 ○ 右選項
決策 6	(500, 500)	(800,200)	○ 左選項 ○ 右選項
決策 7	(500, 500)	(850,150)	○ 左選項 ○ 右選項
決策 8	(500, 500)	(900,100)	○ 左選項 ○ 右選項
決策 9	(500, 500)	(950,50)	○ 左選項 ○ 右選項
決策 10	(500, 500)	(1000,0)	○ 左選項 ○ 右選項

Figure A1.1



★★★★★★★★★★第二部分★★★★★★★★★★

如下所示，此部分共有10個決策。請你在每個決策，從A、B兩個福袋中，選擇一個你偏好的福袋。

例如決策1中，如果你選擇A福袋，那麼你有1/10的機率得到330，9/10的機率得到270；相反的，如果你選擇B福袋，那麼你有1/10的機率得到640，9/10的機率得20。

	A 福袋	B 福袋	
決策 1	1 ：得330元 2~10：得270元	1 ：得640元 2~10：得20元	○ A 福袋 ○ B 福袋
決策 2	1~2：得330元 3~10：得270元	1~2：得640元 3~10：得 20元	○ A 福袋 ○ B 福袋
決策 3	1~3：得330元 4~10：得270元	1~3：得640元 4~10：得 20元	○ A 福袋 ○ B 福袋
決策 4	1~4：得330元 5~10：得270元	1~4：得640元 5~10：得 20元	○ A 福袋 ○ B 福袋
決策 5	1~5：得330元 6~10：得270元	1~5：得640元 6~10：得 20元	○ A 福袋 ○ B 福袋
決策 6	1~6：得330元 7~10：得270元	1~6：得640元 7~10：得 20元	○ A 福袋 ○ B 福袋
決策 7	1~7：得330元 8~10：得270元	1~7：得640元 8~10：得 20元	○ A 福袋 ○ B 福袋
決策 8	1~8：得330元 9~10：得270元	1~8：得640元 9~10：得 20元	○ A 福袋 ○ B 福袋
決策 9	1~9：得330元 10：得270元	1~9：得640元 10：得 20元	○ A 福袋 ○ B 福袋
決策 10	1~10：得330元	1~10：得640元	○ A 福袋 ○ B 福袋

完成

Figure A2.1

Figure A3.1

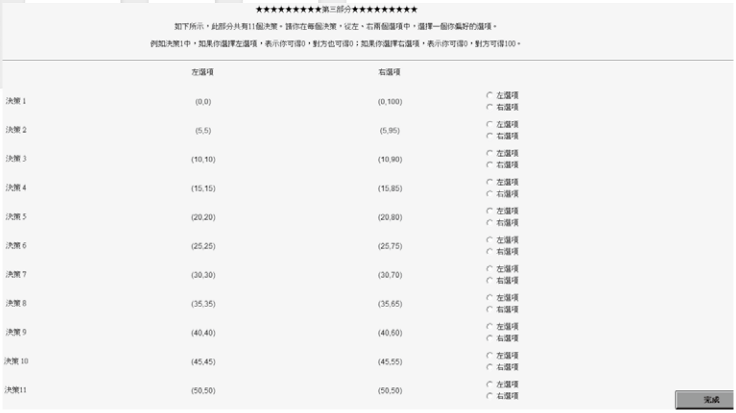


Figure A4.1

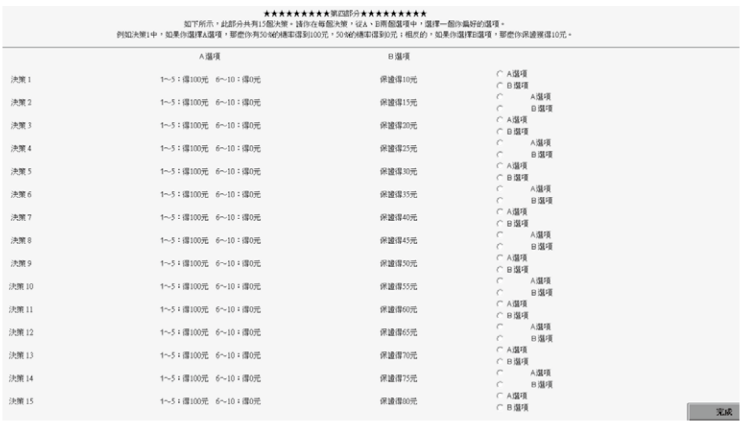


Figure A5.1

Figure A6.1

Appendix B

Theoretical Predictions of the Three Treatments

B1. Predictions of the random probabilistic treatment

To find out the condition for Player 1 to transfer some winning probabilities to Player 2 in the probabilistic game, we take the derivative of $V_i(p_1)$ with respect to p_1:

$$\frac{\partial v_i(p_1)}{\partial p_1}=200\,(1+\alpha_i-\beta_i-\delta_i\alpha_i-\delta_i\beta_i)\gtrless 0 \text{ if } \begin{matrix}\delta_i<\dfrac{1+\alpha_i-\beta_i}{\alpha_i+\beta_i}\\ \delta_i>\dfrac{1+\alpha_i-\beta_i}{\alpha_i+\beta_i}\end{matrix} \quad \text{(B1)}$$

From Eq. (B1), we find that Player 1's utility increases and decreases monotonically with his winning probability if $\delta_i<\frac{1+\alpha_i-\beta_i}{\alpha_i+\beta_i}$ and $\delta_i>\frac{1+\alpha_i-\beta_i}{\alpha_i+\beta_i}$, respectively. Player 1 will transfer a 25% winning probability to Player 2 and both will have a 50% chance to win if $\delta_i>\frac{1+\alpha_i-\beta_i}{\alpha_i+\beta_i}$. When $\delta_i=\frac{1+\alpha_i-\beta_i}{\alpha_i+\beta_i}$, Player 1 could pick any options. Hence, the condition for Player 1 to give some opportunities away is $\delta_i\geq\frac{1+\alpha_i-\beta_i}{\alpha_i+\beta_i}$. The smaller $\frac{1+\alpha_i-\beta_i}{\alpha_i+\beta_i}$ is, the more likely condition will be met. The value of $\frac{1+\alpha_i-\beta_i}{\alpha_i+\beta_i}$ is affected by and . Taking the derivative of $\frac{1+\alpha_i-\beta_i}{\alpha_i+\beta_i}$ with respect to α_i and β_i, we have:

$$\frac{\partial\,\frac{1+\alpha_i-\beta_i}{\alpha_i+\beta_i}}{\partial\alpha_i}=\frac{1+2\beta_i}{(\alpha_i+\beta_i)^2}>0,$$

$$\frac{\partial\,\frac{1+\alpha_i-\beta_i}{\alpha_i+\beta_i}}{\partial\beta_i}=\frac{1+2\alpha_i}{(\alpha_i+\beta_i)^2}>0,$$

Values of α_i and β_i have been commonly evaluated with dictator and ultimatum games in previous studies. Saito also applies those "baseline" values directly to his analysis. If people do consider the lottery as fair, they should not exaggerate the baseline envy and deemphasize the baseline guilt too much in the probabilistic dictator game. According the above analysis, we have the following hypothesis.

B.2 Predictions of the disadvantage majority treatment

There are 3 subjects in each group in the disadvantaged majority treatment. One subject is the advantaged member, Player 1, and another two are identical disadvantaged members, Player 2 and Player 3.

The utility function of the advantaged member, Player 1, is:

$$v(p_1) = \delta\,[200p_1 - 300p_1\beta_1 + 100\beta_1] + (1-\delta)\,[100p_1(2+\alpha_1-2\beta_1) - 100\alpha_1]$$

$$= 100(\delta\alpha_1 + \delta\beta_1 - \alpha_1) + 100p_1\,(2+\alpha_1-2\beta_1-\delta\alpha_1-\delta\beta_1) \qquad \text{(B1)}$$

Take derivative with respect to , we have:

$$\frac{\partial v_i\,(p_1)}{\partial p_1} = 100\,(2+\alpha_1-2\beta_1-\delta\alpha_1-\delta\beta_1) \gtrless 0 \text{ if } \begin{matrix} \delta < \dfrac{2+\alpha_1-2\beta_1}{\alpha_i+\beta_i} \\ \delta > \dfrac{2+\alpha_1-2\beta_i}{\alpha_1+\beta_1} \end{matrix} \qquad \text{(B1)}$$

From Eq. (B3), we know that Player 1's utility increases (decreases) monotonically with his winning probability if $\delta < \frac{2+\alpha_1-2\beta_1}{\alpha_1+\beta_2}$ ($\delta > \frac{2+\alpha_1-2\beta_i}{\alpha_1+\beta_1}$). Thus, for Player 1, he is willing to switch his initial advantageous winning probability, 80%, to the equal winning probability, $\frac{1}{3}$, if and only if $\delta > \frac{2+\alpha_1-2\beta_1}{\alpha_1+\beta_1}$.

Since the disadvantaged members, Player 2 and Plyaer3, are identical, they have the same following utility function:

$$v(p_j) = \delta\,[200p_j + 300p_j\alpha_j - 100\alpha_j] + (1-\delta)\,[100p_j(2+\alpha_j-2\beta_j) - 100\alpha_j]$$

$$= -100\alpha_j + 100p_j(2+\alpha_j-2\beta_j-2\delta\alpha_j+2\delta\beta_j),\ j=2,3 \qquad \text{(B4)}$$

Take derivative with respect to , we have:

$$\frac{\partial v(p_j)}{\partial p_j} = 100\,(2+\alpha_j+2\beta_j+2\delta\alpha_j+2\delta\beta_j) \gtrless 0 \text{ if } \begin{matrix} \delta > \dfrac{2\beta_j-\alpha_j-2}{2(\alpha_j+\beta_j)} \\ \delta < \dfrac{2\beta_j-\alpha_j-2}{2(\alpha_j+\beta_j)} \end{matrix} \qquad \text{(B1)}$$

From Eq. (B5), we know that the disadvantaged member's utility increases (decreases) monotonically with his winning probability if $\delta > \frac{2\beta_j - \alpha_j - 2}{2(\alpha_j + \beta_j)}$ ($\delta < \frac{2\beta_j - \alpha_j - 2}{2(\alpha_j + \beta_j)}$). Hence, for the disadvantaged members, they are willing to switch their initial disadvantageous winning probability, 10%, to the equal winning probability, $\frac{1}{3}$, if and only if $\delta > \frac{2\beta_j - \alpha_j - 2}{2(\alpha_j + \beta_j)}$. With the assumptions $\alpha_j > \beta_j$ and $0 < \beta_j < 1$, this condition implies that all disadvantaged members should prefer equal winning chance.

B3. Predictions of the VOI treatment

In the VOI treatment, subject faced role uncertainty. She was equally likely to become the advantaged member or the disadvantaged member. Hence, subject i's utility should be advantaged member's utility times 50%, plus disadvantage member's utility times 50%. Thus, subject i's preference function becomes:

$$v(p_i) = \delta\,[100\,(1+\alpha_i+\beta_i) - 200p_i\,(\alpha_i+\beta_i)] + (1-\delta)\,[100\,(1-\alpha_i-\beta_i)]$$

$$= 100(1-\alpha_i-\beta_i) + 200\delta\,(\alpha_i+\beta_i) - 200\delta p_i\,(\alpha_i+\beta_i) \quad \text{(B6)}$$

Take derivative with respect to , we have:

$$\frac{\partial v(p_i)}{\partial p_i} = -200\beta\,(\alpha_i+\beta_i) < 0 \quad \text{(B7)}$$

Since we have assumed that $\alpha_i > 0$ and $\beta_j < 0$, subject i's utility always decreases with her winning probability. Hence, all subjects behind the VOI should choose an equal winning chance.

有理由的自私：羅斯對人們最大化贏得彩卷機率之解釋

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中文摘要

在過往的實驗研究中，大部分受試者會最大化自己贏得彩卷的機率。學者以對機會公平的偏好微弱來解釋此結果。羅斯 (Rawls, 1971/1999) 提出另一種心理上的解釋：他認爲根據隨機的結果來分配所得是不公平的。被如此不公平對待時，人們會對可能的彩卷贏家產生「有理由的忌妒」，因此會最大化自己的機率。本研究以實驗方法驗證人們是否懷有「有理由的自私」。實驗結果證實了羅斯的想法，因爲大部分受試者不追求公平的預期報酬、違背了自己原本的社會偏好。此研究除了解釋爲何人們最大化自身贏得彩卷機率的心理，也對公平機率是一種機會上的平等概念提出質疑。

關鍵詞：機會上的平等、社會偏好、約翰羅斯、風險