E C O N O M I C S B U L L E T I N

Further investigations of framing effects on cooperative choices in a provision point mechanism

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Abstract

We investigate whether framing effects of voluntary contributions are significant in a provision point mechanism. Our results show that framing significantly affects individuals of the same type: cooperative individuals appear to be more cooperative in the public bads game than in the public goods game, whereas individualistic subjects appear to be less cooperative in the public bads game than in the public goods game. At the aggregate level of pooling all individuals, the data suggests that framing effects are negligible, which is in contrast with the established result.

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1 Introduction

This paper addresses framing effects of voluntary contributions. Past literature finds that framing effects are significant in a standard voluntary contributions mechanism (VCM), and their degree depends on the types of individuals based on value orientations (See, Andreoni (1995); Park (2000)). One distinct research on framing effects is Sonnemans et al. (1998) that employ a provision point mechanism (PPM).[1] They show that framing effects are present in such a setting as well.

However, framing effects seem not to be well-established in the PPM yet. This is because the existing results might be compounded by strategic effects that are potentially caused by the experimental design.[2] Sonnemans et al. (1998) employ a partner design of keeping the same group members for the entire rounds, and ask questions during experiments such as "how much influence she thinks her choice has on her own and other members?"[3] These designs invalidate the Nash equilibria in a static game as a guidance for prediction. They in fact require us to derive many subgame perfect equilibria and induce strategic effects. Thus, it is difficult to distinguish whether the resulting outcomes obtained by Sonnemans et al. (1998) are solely derived from framing effects or from interplays between framing and strategic effects (see Andreoni (1988); Park (2000)).[4]

Given this state of affairs, the purpose of this paper is to examine robustness of framing effects in the PPM (See Cox et al. (2008) for more detailed analysis on people's preferences on cooperation). The distinct features of our experiment are (i) a random change of partners in each round (stranger design) and (ii) to ask no questions during experiments. These changes in experimental designs aim at controlling strategic effects and are parallel to those employed by Andreoni (1995) and Park (2000). Therefore, our experiment focuses upon testing framing effects and the results can be directly compared to these previous works.

We hypothesize that framing effects are not significant in the PPM when strategic effects are controlled. This hypothesis is motivated by recent evidences that people's social preferences may possess not only self-interest motivations but also efficiency concerns (Hichri (2004), Brekke et al. (2003) and Engelmann and Strobel (2004)). If the efficiency concerns are important to some extent, there is no wonder that framing effects are mitigated by the existence of a socially efficient equilibrium that is created by an addition of a provision point. Although there is no systematic way to estimate the degree of efficiency concerns, an alternative method called value orientations theory can be applied as an approximation (Liebrand (1984)). In this paper, we also apply this theory and explore the difference of cooperative behaviors for each preference of individuals.

Our experimental evidences might suggest an interesting policy implication especially for

[1] In this paper, we consistently use the term "provision point mechanisms" to refer to voluntary contributions mechanisms in which a public good is provided if total contribution exceeds some threshold, following the term given by Davis and Holt (1992). Sonnemans et al. (1998) and others adopt the terminology, a step-level public good, to represent an identical class of contribution mechanisms.

[2] In this paper, we use the term "strategic effects" to refer to the effects that are beyond characterization of the equilibrium in public goods/bad games such as reputational effects (Andreoni (1988) and Park (2000)).

[3] Andreoni (1995) and Park (2000) use a stranger design in which group members are randomly regrouped in each round and do not ask any question to subjects during experiments.

[4] Andreoni (1988) shows there exist the significant strategic effects of a partner design. Park (2000) also points out that strategic effects could be confounding factors for testing framing effects.

public bads prevention. Rondeau et al. (2005) demonstrate that higher efficiency is achieved through voluntary contributions in a single shot application of the PPM than in that of the VCM on average. Given this evidence and the significance of framing effects observed in the VCM, we could claim the following: creating a provision point would yield more social welfare gain in public bads prevention than in public goods provision if the hypothesis in this study is supported.

2 Experimental design

At the beginning of experiments, each participant was informed that the experiment consists of two stages. In the first stage, a value orientation experiment was conducted and a framing experiment was followed in the second stage.

With a value orientation experiment, we categorize subjects into five types depending on each subject's social goal: 1. Competitors—those who want to be better off than others; 2. Individualistic—those who want to do best for themselves; 3. Cooperative—those who try the best for both themselves and others; 4. Altruistic—those who want to do best for others; and 5. Aggressive—those who want to do worst for others. This experiment follows Park (2000) and therefore we omit further explanations.

In the second stage, two treatments of public goods and bads settings were conducted to test the effects of framing. Each participant was randomly assigned to a group of five people for 10 rounds of the experiment and allocated to either goods or bads experiments. In each round, each subject was asked to make a choice between Yellow and Blue where she did not know the identity of group members but she knew that group members were shuffled in each round. After each round, subjects were informed about the number of Yellow choices in their group and the resulting payoff.

The left sub-table in table 1 summarizes the game of public goods provision. Subjects determined whether to contribute 60 cents (Yellow) or not (Blue). If more than three members in a group give 60 cents (Yellow), everybody received a group-revenue of 245 cents, otherwise a group revenue is 60.

The right sub-table in table 1 summarizes the game of public bads prevention. The choice has to be made on whether to take 60 cents (Yellow) or not (Blue). If two or fewer members in a group took 60 cents, everybody received a group revenue of 185 cents.

The incentives in the two treatments are identical, and the experimental design is the same as the one in Sonnemans et al. (1998) except that a stranger design was employed, and no questionnaire was asked during experiments.

In the games, there are two pure Nash equilibria: (i) one asymmetric Nash equilibrium in which exactly three players cooperate and (ii) one symmetric Nash equilibrium in which all players do not cooperate. Since we employ the stranger design, these Nash equilibria could be considered as a prediction of group decisions. It must also be noted that social efficiency is achieved only when the group contributions reach the threshold of public goods provision or of public bads prevention.

The experiments were conducted in the computerized experimental lab of Yokohama National University. Subjects were volunteers from undergraduate students in various fields except economics. We recruited 40 subjects in each condition of public goods and bads settings for a total of 80 subjects. The data were collected in two separate sessions in each of

which 40 subjects were recruited, randomly divided into two rooms of 20 each, and assigned to numbered desks. In each session, a value orientation experiment was first conducted, and a different condition of framing experiments was followed. Each session lasted about one hour. The average earning per subject was approximately $15, whose calculation is based on the sum of experimental earnings from 10 rounds of the experiment.[5]

3 Results

We first report the result of value orientations. Out of 80 subjects, 57 were classified as individualistic (71.2%): 27 in the goods setting and 30 in the bads setting. Nineteen subjects were classified as cooperative (24%): 10 in the good setting and 9 in the bads setting. Four subjects (3 in the goods setting and 1 in the bads setting) were classified as competitive.[6] This distribution is similar in each of goods and bads setting as well as to the ones in the past literature. Most subjects are either classified as individualistic or cooperative, and thus our analysis focuses on these two types in what follows.

We now present the percentage of cooperative choices of subjects with different value orientations in each of the two treatments. Table 2 shows the percentage of cooperative choices with each value orientation and treatment. In the goods setting, the percentage of cooperative choices is 38.6%, and its difference between cooperative and individualistic is negligible (See table 2 and $38.9 - 38.0 = 0.9\%$ difference). In the bads setting, the percentage of cooperative choices is 35.5%, and its difference between cooperative and individualistic is significant (See table 2 and $55.5 - 27.3 = 28.2\%$ difference). From this result, we could say that the rate of cooperative choices between the two treatments seems not to be different, while it is significantly different per value orientation especially in the bads setting. To confirm this observation, we will run a series of statistical testings in what follows.

Figure 1 displays the percentage of cooperative choices per period for both of the treatments. The slight difference appears to exist: cooperative choices are made more often in the goods setting than in the bads setting, but its degree seems to be small. We apply a Mann-Whitney test using the percentage of cooperative choices per round as observation. Our results cannot reject the null hypothesis that the distributions are the same in both of the treatments even at the level of 10%.[7] This statistical result suggests that framing effects are not significant, which is in contrast with the findings of Sonnemans et al. (1998) that show the existence of framing effects.

Here we additionally note a few points in our results that differ from those in Sonnemans et al. (1998). First, the percentage of cooperative choices (38.6%) for the goods setting in our results is lower than that of 51.1% in their results (See table 2 for our results in the

[5]There is some recent evidence from dictator games that the richer you are, the more altruistic you are, holding everything else equal. In our experiments, we do not consider this possibility following the previous works of framing effects, that is, subjects' social preferences change over the course of the experiments (See, e.g., Andreoni (1995), Park (2000) and Sonnemans et al. (1998)). For the conclusions drawn in this study to be valid it is assumed that the type of individuals in cooperative or individualistic is undisturbed and unconditional social preference. To account for the aforementioned possibility, some new design in the experiments must be introduced.

[6]We did not find any random player in our subject pool, whose consistency measure is below 33% (See Park (2000)).

[7]The test procedure follows Park (2000).

goods setting). Second, for the bads setting, we do not observe any decay in the percentage of cooperative choices in later periods, that have been observed in Sonnemans et al. (1998). Given these differences, we could say that whether or not to control strategic effects through employing stranger designs as well as no questionnaires affect outcomes in the PPM.

Figure 2 presents the cooperative choices per value orientation for each treatment over rounds. It is interesting to note that the trends are dissimilar between goods and bads setting. The difference between cooperative and individualistic in the bads setting seems to be more obvious than that in the goods setting. To confirm this, we apply a Mann-Whitney test by taking the percentage of cooperative choices per round as observation. It is not statistically significant for the goods setting ($z = 0.530$), while it is statistically significant for the bads setting at the 1% level ($z = 3.194$). This result obtained under PPM is in line with those obtained by Park (2000), which shows that the difference in contribution rate between individualistic and cooperative under negative frames is more distinct than that under positive frames.

We finally turn to the framing effects on the two different value orientations. Figure 3 presents the percentage of cooperative choices per treatment for each value orientation. For individualistic case, the percentage in the goods setting are always above that in the bads setting over all of the rounds (See the left in figure 3). In other words, individualistic subjects consistently exhibit the framing effects even though its difference is only 0.9% on average (See the left in figure 3 and table 2). On the other hand, for cooperative case, there is a surprising result: a cooperative type of subjects chooses the cooperative choices more often in the bads setting than in the goods setting, and its difference per treatment is 28.2% on the average, although a clear trend all over rounds is not found (See the right in figure 3 and table 2). A Mann-Whitney test confirms that the difference is statistically significant at the 1% level ($z = 2.671$) for individualistic (see table 3). For cooperative case, it is not significant at the 1% level, but significant at the 5% level ($z = 2.050$).

4 Discussion and conclusion

We have examined the robustness of framing effects in the PPM by controlling strategic effects. For this purpose, we employed the stranger design and did not implement questionnaire during the experiments, which enables us to make a direct comparison with the important works such as Andreoni (1995) and Park (2000). We found the framing effects are not so obvious as previously thought in the PPM, which is in sharp contrast with the one established by Sonnemans et al. (1998). Furthermore, we have analyzed the sources of cooperative choices with respect to the value orientations. The results are summarized in table 3.

In general, we found the qualitatively similar results with Park (2000) on the cooperative choices and the value orientations. One distinction is that more people cooperate in the bads setting than in the goods setting for "cooperative" subjects. This is the main reason why framing effects are not significant in our study. In Park (2000), this effect is not present so that framing effects are significant in the VCM.

Unfortunately, we cannot provide a logical argument for this effect yet. However we conjecture some possibilities; (i) a cooperative type of individuals may feel more obliged to achieve efficient outcomes in the bads setting, (ii) some other concepts in game theory such

as tit-for-tat strategies under randomly matched opponents could potentially rationalize the results in our experiment. In any event, further analysis on the cause of this observation must be carried out with a new design and would be left for future research.

We also admit that new experiments with continuous contributions in the PPM must be carried out to generalize our results. However, we are hopeful that this research sheds light on the possibility of positive effects on social welfare in public bads prevention by creating a provision point.

Table 1: Public goods (left) and bads (right)

Goods

Individual earning with yellow choice: -60
with blue choice: 0

Group Revenue

# of yellow choices	0	1	2	3	4	5
Group Revenue	60	60	60	245	245	245

Bads

Individual earning with yellow choice: 60
with blue choice: 0

Group Revenue

# of yellow choices	0	1	2	3	4	5
Group Revenue	185	185	185	0	0	0

Table 2: Percentage of cooperative choices per value orientation

	% in public good	% in public bad
Individualistic (27/30)	38.0%	27.3%
Cooperative (10/9)	38.9%	55.5%
All(40/40)	38.6%	35.5%

Table 3: Summary of results

Overall	Goods vs. Bads		z=1.220
Per condition	Goods	Ind. vs. Coop.	z=0.530
	Bads	Ind. vs. Coop.	z=3.194**
Per orientation	Individualistic	Goods vs. Bads	z=2.671**
	Cooperative	Goods vs. Bads	z=2.050*

Note: *Significant at 5% level, **Significant at 1% level. Ind. and Coop. stand for individualistic and cooperative, respectively.

Figure 1: Percentage of cooperative choices by period for goods and bads

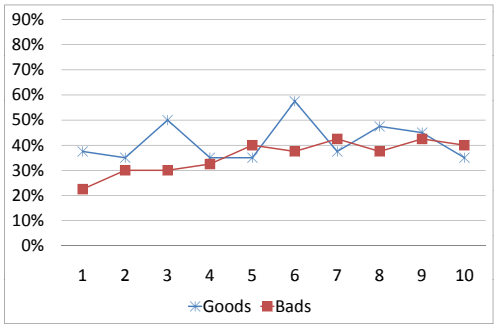
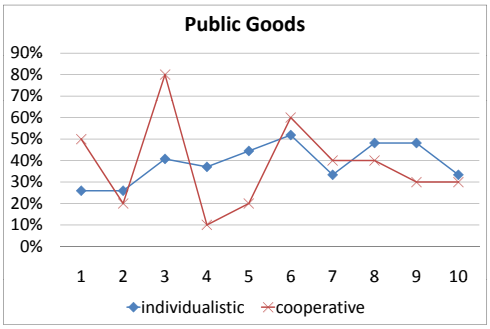


Figure 2: Percentage of cooperative choices per orientation in public goods (left) and bads (right)



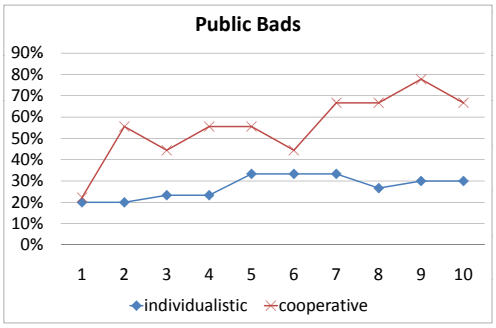
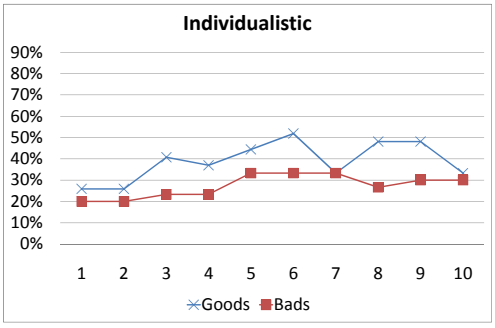
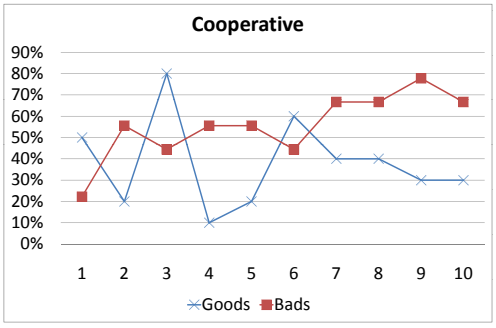


Figure 3: Percentage of cooperative choices per treatment for individualistic (left) and cooperative (right)





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Appendix: Experiment instruction

With respect to experiment 1, we closely follow the procedure and instruction by Park (2000). Therefore, we only summarize the instructions for experiment 2 below.

The instructions were originally written in Japanese. At the start of experiment 2, the instructions are handed out on paper. The following is the translation.

Welcome to experiment 2 in the economics of decision-making. In the course of the experiment, you will have opportunities to earn money. Any money earned during this experiment is yours to keep. It is therefore important that you read these instructions carefully. Please do not communicate with other participants during the experiment.

Experiment 2 will take 10 rounds. During the whole experiment, you are part of a group which consists of five people. Members of this group are randomly assigned where the identity of your group members are unknown to you. After each round, you will be **randomly reassigned** to a **new group** of five people.

In each round, you and everyone else in your group will be asked to choose between Yellow and Blue. You must make this decision without knowing what the others in your group are deciding, and click the button of "Yellow" or "Blue" on your computer screen.

The public good frame The individual earning related to Yellow is −60 cents, while the individual earning related to Blue is 0. Each group-member will get a payoff dependent on the number of Yellow choices in your group: the GROUP-REVENUE is determined as follows:

Number of Yellow choices	0	1	2	3	4	5
Group Revenue	0	0	0	245	245	245

A payoff in each round is the sum of your individual earning and group revenue. More concretely, if you choose Blue, your payoff will be equal to the GROUP-REVENUE. If you choose Yellow, your payoff will be equal to the GROUP-REVENUE minus the 60 cents.

The public bad frame The individual earning related to Yellow is 60 cents, while the individual earning related to Blue is 0. Each group-member will get a payoff dependent on the number of Yellow choices in your group: the GROUP-REVENUE is determined as follows:

Number of Yellow choices	0	1	2	3	4	5
Group Revenue	185	185	185	0	0	0

A payoff in each round is the sum of your individual earning and group revenue. More concretely, if you choose Blue, your payoff will be equal to the GROUP-REVENUE. If you choose Yellow, your payoff will be equal to the GROUP-REVENUE plus the 60 cents.

Both frames proceed as follows: After all the members make decisions in each round, the number of Yellow choices in your group and your payoff are announced and recorded. At the end of experiment 2, you will be paid the total of your earnings from all the 10 rounds.