

The Spite Dilemma Experiment in Korea*

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Abstract

This paper investigates a choice behavior of Korean for the provision of public goods by using the voluntary contribution mechanism in Saijo and Nakamura (1995). Together with the data from Saijo and Nakamura (1995) and Saijo et al. (2007), we conclude that while Japanese subjects are more likely to behave spitefully, Korean and Chinese subjects are more likely to act cooperatively. Next, we analyze the behavior of Korean subjects after categorizing by department. Subjects from the economics department follow a pattern of a contribution not much different from the theoretical expectation and subjects from the college of social sciences show a similar pattern. On the other hand, most subjects who act spitefully are from the department of agricultural economics.

JEL Classification: C91; H41; D70

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1 Introduction

It is well known that a subject makes a positive contribution in the public goods experiment when no contribution is predicted by economic theory. If the marginal

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return from one unit of a contribution to the public good is less than one, there is a tension between individual rationality to maximize an individual payoff and social efficiency to collect enough resources for the public project.

Saijo and Nakamura (1995) design the voluntary contribution mechanism in which the marginal return from a contribution is greater than one and the full contribution of an individual endowment is a unique dominant strategy. Even though individual rationality and social efficiency do not conflict to each other, they find that some Japanese subjects deviate from the theoretically predicted behavior which is necessary to maximize an individual payoff. They call this phenomenon as the “spite” dilemma. According to Cason et al. (2004), a spiteful strategy is to invest less than the full contribution which maximizes his individual payoff. Although a subject suffers a loss in his payoff when he reduces his contribution for the public good, other subjects suffer greater losses in the payoff than the subject.

After Saijo and Nakamura (1995), many experimental studies investigate how universal the spiteful behavior is. Brunton et al. (2001) and Saijo et al. (2007) conduct the same experiment for Canadian and Chinese subjects respectively, but they could not confirm the spite dilemma. Cason et al. (2002) and Cason et al. (2004) design a two-stage game where the first stage is for participation decision and the second is for contribution decision. Cason et al. (2004) observe that among Japanese subjects evolutionary stable strategies did not appear and this behavior pattern is due to spitefulness among subjects. On the other hand, Cason et al. (2002) compare the results between Japanese and American subjects and find that while American subjects are more likely to follow evolutionary stable strategies, Japanese subjects are more likely to behave spitefully.

In this paper, we conduct the public goods experiment with the same design and procedure as in Saijo and Nakamura (1995) and examine how the subjects in Korea behave compared with Japanese and Chinese subjects. The purpose of this paper is twofold. First, a comparison of behavior patterns among three countries will reveal how different the behavior patterns of the subjects in Korea, Japan, and China are even though they are close to each other geographically and similar

in culture. Since most experiments for the provision of the public goods have been conducted in Western countries, a comparative analysis for three countries will shed light to explain the choice behavior of Asian countries. Second, we investigate in a great detail the choice behavior of Korean subjects and discuss how the social context affects the individual behavior. Although the number of observation is not large enough when subjects are categorized by department, our result shows that subjects' major can affect the choice behavior.

The rest of the paper is organized as follows. In Section 2, we describe the experimental design and procedures. We report our statistical results in Section 3, and concluding remarks follow in Section 4.

2 Experimental design and procedures

We use the same experimental design as in Saijo and Nakamura (1995). Under the voluntary contribution mechanism, subject i faces a decision to split his initial endowment (w_i) into saving (x_i) and contribution (or investment) (y_i). Let $y = \sum y_k$, and g be the contribution function, which is assumed to be linear. Each subject consumes his saving and receives $g(y)$ from the contribution. Subject i 's utility function is

$$u(x_i, y) = x_i + \alpha y,$$

where α is the marginal return from one unit of a contribution. If $1 > \alpha > 0$, it is the low marginal return case represented by L and for any subject, no contribution in any period is the unique subgame perfect equilibrium. On the other hand, if $\alpha > 1$, it is the high marginal return case represented by H and contributing all endowments is the dominant strategy. For each subject, the initial endowment, w_i , is 10 and the number of subjects in a session, n , is 7.

The non-computerized laboratory experiment was conducted at Seoul National University (SNU). The format of our experiments is based on Saijo and Nakamura (1995). As in the experiments in China and Japan, the communication among the subjects was prohibited, and we declared that the experiments would be stopped if the communication among the subjects was observed. This never

happened in Korean experiment. It took approximately 70 minutes to conduct one session. The mean payoff per subject was \$15.35 (18,957 won with \$1=1,234.50 won).

Subjects are 56 undergraduate students at SNU recruited by the university internet board. Each subject participates only one session of the experiment. 8 groups are separated into two different sessions: (L,H) and (H,L). (L,H) represents a session in which the low marginal return case is carried out first and then the high marginal return case is done. (H,L) represents a session in the opposite order. Each session is repeated in four times.

3 Results

3.1 Cross-country analysis

We analyze the contribution pattern in Korea and compare it with the contribution patterns in Japan (Saijo and Nakamura, 1995) and China (Saijo et al., 2007). In both sessions of (L,H) and (H,L), Korean subjects contribute positive amounts in all marginal return cases. They start with approximately 35% of the endowment as a contribution in the initial period for the low marginal return case, and the amount of the contribution never falls below 20% of the endowment in all periods of the experiment. For the high marginal return case, 85% of the endowment is contributed on average per period. In addition, the level of the contribution is kept without much fluctuation in all periods. We conduct the multivariate analysis to check the time effect on the contribution. Since we find that there is no significant time trend, the contribution patterns in both marginal return cases are maintained constantly throughout the experiment.

Fig.1 and Fig.2 show an average contribution pattern of Korea, China, and Japan in the aggregate level. We can observe how differently subjects of three countries behave in the two marginal return cases. In (L,H) and (H,L) experiments, while Korean and Chinese subjects make a similar decision for the contribution in both marginal return cases, Japanese subjects behave differently. In particular, an average contribution of Japanese subjects in each period for both

marginal return cases are mostly lower than Chinese and Korean counterparts.

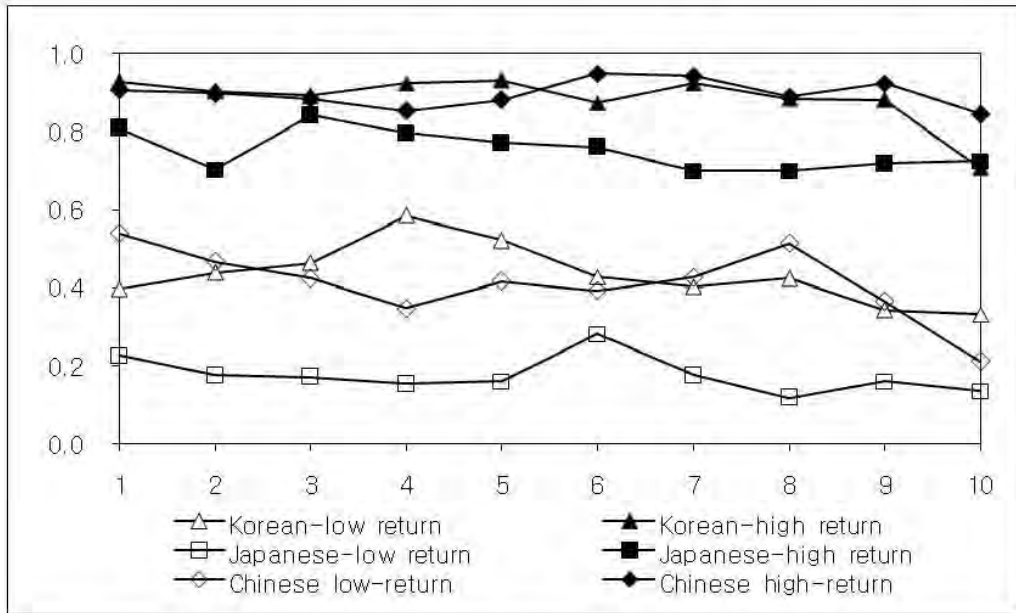


Fig. 1 Average contribution level in (L,H) session

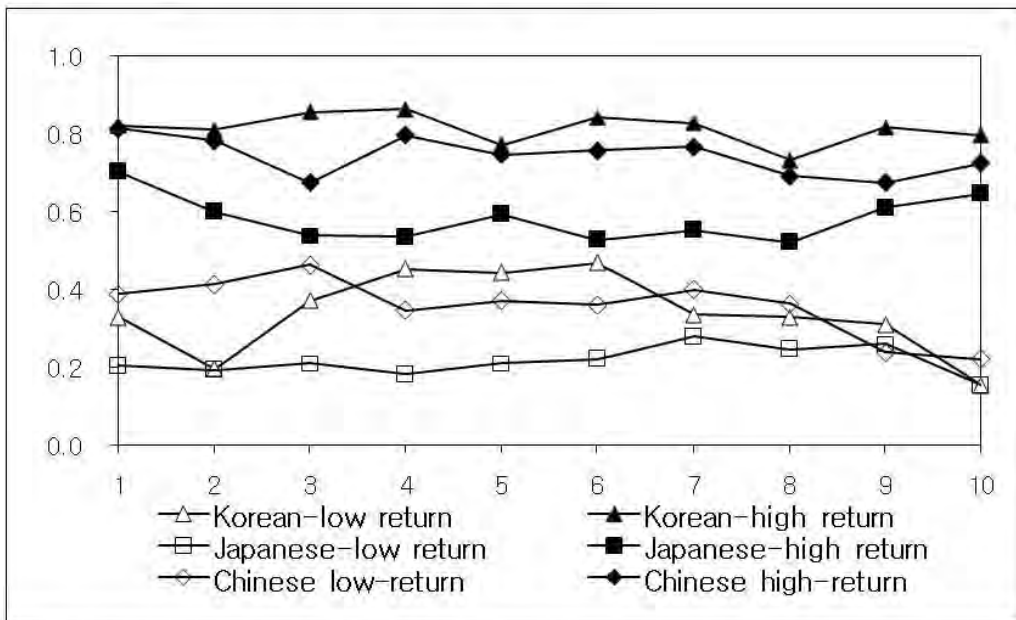


Fig. 2 Average contribution level in (H,L) session

To provide a statistical support for the observation, we conduct the nonpara-

metric Wilcoxon rank-sum test to compare the contribution patterns for each pair of countries. Table 1 indicates that Japanese subjects contribute in a different pattern from Korean and Chinese at 1% significant level except for one session.¹ Table 1 also indicates that Korean and Chinese subjects show no significant difference in most sessions.

	(L,H) sessions		(H,L) sessions	
	Low return	High return	Low return	High return
China - Japan	7.4412**	6.0688**	4.8634**	5.8236**
Korea - Japan	6.6697**	6.2785**	1.9489	8.4863**
Korea - China	0.3018	0.5717	-1.7710	2.6702**

Table. 1 Tests for differences in contributions (Wilcoxon rank-sum test)

**Significant at 1% level

Next, by conducting the fraction analysis as in Saijo and Nakamura (1995), we analyze how each subject of the three countries behaves in the two marginal return cases. Let a be the average contribution for the low marginal return case and b for the high marginal return case. Although the choices of two numbers 4 and 6 are arbitrary, we define four regions as

$$FP = \{(a, b) | 0 \leq a < 4 \text{ and } 6 < b \leq 10\}$$

$$AP = \{(a, b) | 4 \leq a < 10 \text{ and } 6 < b \leq 10\}$$

$$FS = \{(a, b) | 0 \leq a < 4 \text{ and } 0 \leq b \leq 6\}$$

$$AS = \{(a, b) | 4 \leq a < 10 \text{ and } 0 \leq b \leq 6\}$$

where FP stands for the free-riding and pay-riding region, which is the theoretically expected region, AP for the altruistic and pay-riding region, FS for the free-riding and spiteful region, and AS for the altruistic and spiteful region. As shown

¹Since the p-value of the low marginal return case between Korea and Japan in (H,L) session is 0.0513, it is significant at 10% level.

in Fig.3 and Fig.4, we can observe that subjects in Korea and China are more likely to be located in FP and AP regions, while subjects in Japan are more likely to be located in FP and FS regions.² In particular, Korean and Chinese subjects are more frequently located in AP region and more Japanese subjects are located in FS region. This implies that while subjects in Korea and China are more likely to cooperate in the low marginal return case, subjects in Japan are more likely to behave spitefully in the high marginal return case. To support the finding, we conduct a number of proportion tests and Table 2 indicates that Japanese subjects have a tendency to behave spitefully compared with Korean and Chinese subjects.

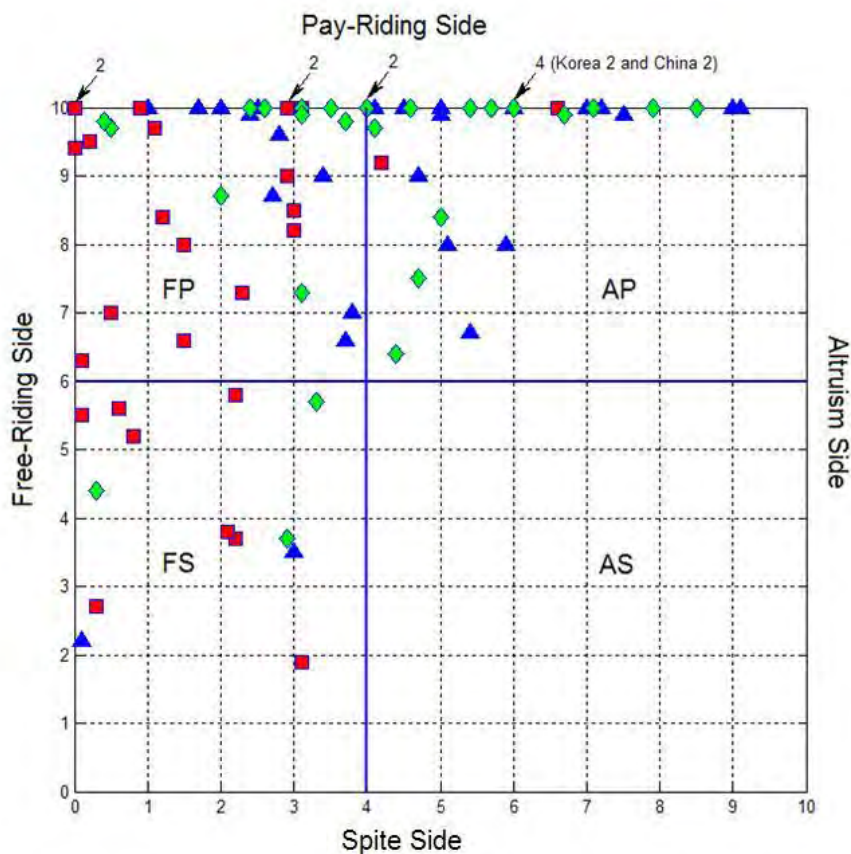


Fig. 3 Mean contribution distribution in (L,H): ▲ indicates Korean subjects, ■ indicates Japanese subjects, and ◆ indicates Chinese subjects.

²In Fig.3, numbers above the arrow indicate the number of subjects located in the same spot.

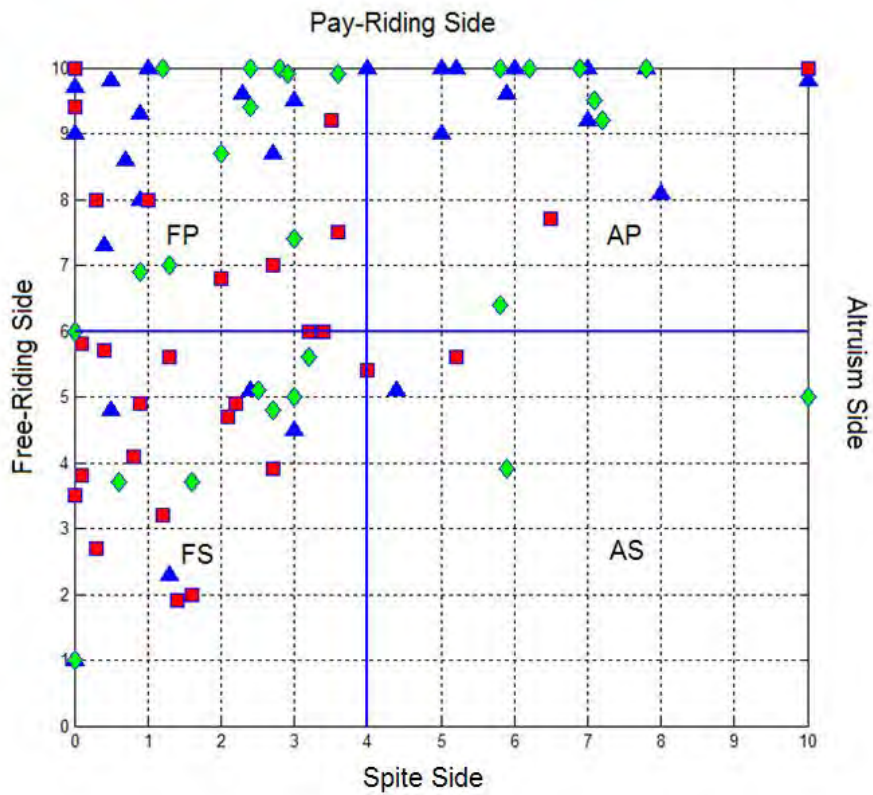


Fig. 4 Mean contribution distribution in (H,L) : \blacktriangle indicates Korean subjects, \blacksquare indicates Japanese subjects, and \blacklozenge indicates Chinese subjects.

This result is quite striking since the three countries are close to each other geographically and similar in culture. Although it is difficult to say that the behavior pattern from the limited subjects' pool can fully represent the characteristics of each country, the differences in the experiment can be considered as an evidence showing that we should take the social context into account when analyzing the human behavior.

	A vs. B	(L,H) sessions	(H,L) sessions
(1) $P_{AP,A} = P_{AP,B}$ ^a vs. $P_{AP,A} > P_{AP,B}$	China vs. Japan	3.7782**	1.8193**
	Korea vs. Japan	3.7782**	2.8486**
	Korea vs. China	0	1.1445
(2) $P_{FS,A} = P_{FS,B}$ vs. $P_{FS,A} < P_{FS,B}$	China vs. Japan	-1.6817*	-2.1602*
	Korea vs. Japan	-2.0935*	-1.3372
	Korea vs. China	-0.4686	0.8467
(3) $P_{AP+FP,A} = P_{AP+FP,B}$ vs. $P_{AP+FP,A} > P_{AP+FP,B}$	China vs. Japan	1.6817*	2.1381*
	Korea vs. Japan	2.0935*	3.2404**
	Korea vs. China	0.4686	1.1832
(4) $P_{FS+FP,A} = P_{FS+FP,B}$ vs. $P_{FS+FP,A} < P_{FS+FP,B}$	China vs. Japan	-3.7782**	-1.9543*
	Korea vs. Japan	-3.7782**	-2.3664
	Korea vs. China	0	-0.8281

Table 2. Proportion tests

^a $P_{i,j}$ =proportions of subjects of country j in region i

**Significant at 1% level, *Significant at 5% level

3.2 The choice behavior in Korea

To investigate how social context or individual identity of subjects has effects on the contribution patterns, we analyze the data of Korean subjects in a grater detail. We categorize Korean subjects according to their departments where they belong to, i.e., economics (10), social sciences excluding economics (10), human sciences (4), natural sciences (3), engineering (11), agricultural and life sciences (9) which contains agricultural economics (7), arts (3), education (3), and ecology (3).³ Even though the total number of subjects is not large enough to provide statistically significant results, we can find some interesting features from this categorization.

First, subjects from the economics department show the most familiar pattern of a contribution, not much different from the theoretical prediction. Fig.5 shows

³Numbers in the parenthesis indicate the number of subjects in each category summed up for two experiments.

the average contribution level in both experiments.

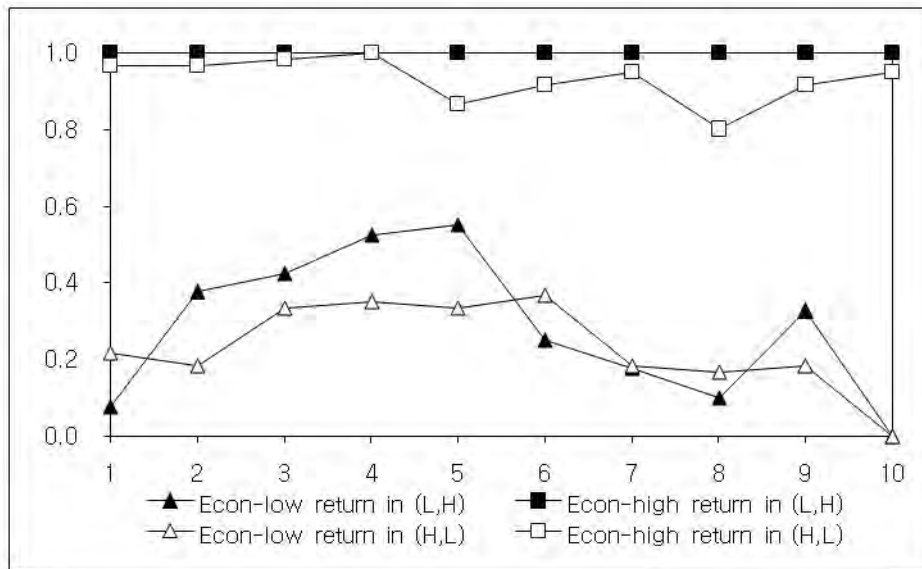


Fig. 5 Average contribution level of Economics subjects

In the high marginal return case, all subjects from the economics department in (L,H) contribute their endowments fully to the public good for all periods and in (H,L), they choose almost full contribution in the initial period and keep their level constant throughout all periods. More interesting feature is found in the low marginal return case. Although the average level of a contribution is approximately 15% in the initial period, they never make a positive contribution in the last period without any exception. This pattern happens only for the subjects from the economics department and it might imply that they understand the structure of the experiment where the last period is a one-shot game and the optimal strategy is free-riding. The contribution level for the subjects from the college of social science is close to the subjects from the economics department.

Another conspicuous feature is found from the subjects majoring in agricultural economics, college of agricultural and life science. Even though the department of agricultural economics belongs to a different college from the department of economics in SNU, it requires at least five economics classes to attend in its cur-

riculum. However, the contribution pattern of the subjects from the agricultural economics is quite different from the contribution pattern of the subjects from the college of social sciences including economics. Fig. 6 shows the results from the fraction analysis for the subjects of the three categories.

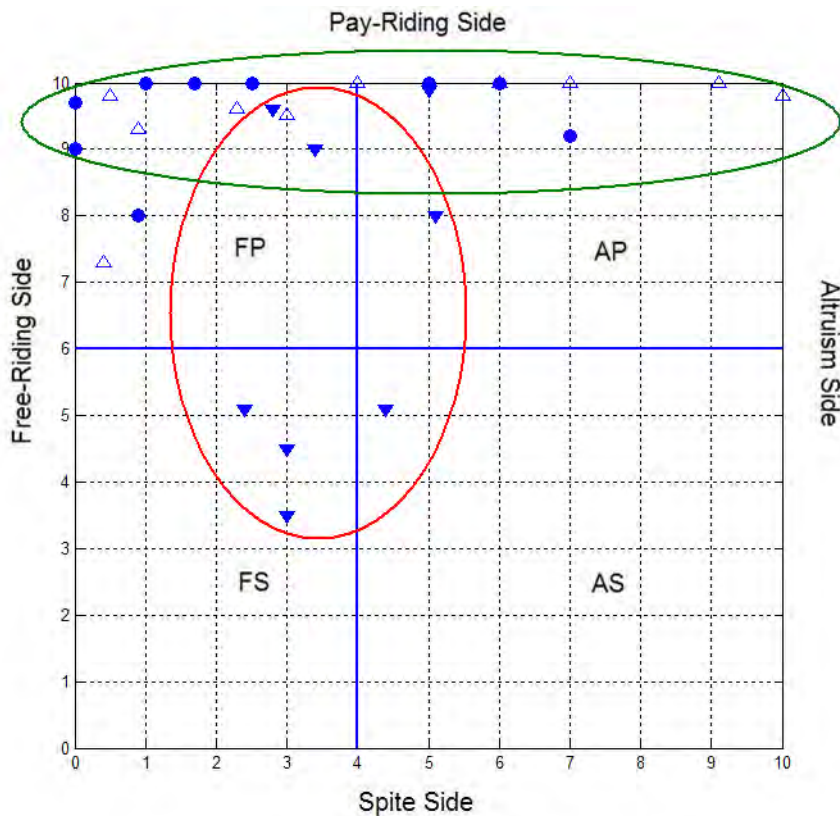


Fig. 6 Mean contribution distribution: ● indicates economics major, △ indicates subject in college of social science except economics, and ▼ indicates agricultural and life science major.

While all subjects from the college of social sciences (including economics) never behave spitefully in any session, most subjects who behave spitefully are from the department of agricultural economics. Table 3 also indicates that the subjects from the department of agricultural economics make the lowest and the most spiteful contribution level among all categories in (H,L).

	(H,L) session						
	Economics	Social	Human	Natural	Engineering	Agricultural Economics	Education
Mean Contribution	9.3167	9.4125	7.6667	5	10	4.9500	6.8000
Number of Spiteful	0 (6) ^a	0 (8)	1 (3)	1 (2)	0 (2)	4 (4)	1 (3)

Table. 3 Average contribution level and number of spiteful subjects

^aNumbers in the parenthesis indicate the number of subjects in the (H,L) session.

This is interesting because the subjects from the college of social sciences (including the department of economics) and the department of agricultural economics are very likely to be exposed to economics classes among all categories and it is natural to expect for them to show a similar behavioral pattern. Despite the number of subjects is not large enough to draw a statistically significant conclusion, these findings might imply that the social context or the individual identity of subjects can have an effect on the behavioral pattern.

4 Concluding remarks

We conduct the public goods experiment under the voluntary contribution mechanism in Korea. Together with the data from previous experiments conducted in Saijo and Nakamura (1995) and Saijo et al. (2007), we conclude that whereas Japanese subjects are more likely behave spitefully, Korean and Chinese subjects are more likely to act cooperatively. In addition, subjects from the economics department follow a pattern of a contribution not much different from the theoretical prediction and most subjects who act spitefully are from the department of agricultural economics. These findings reveal that even though subjects have many common characteristics, other differences in the social context such as nationality or major can be a driving force to lead to a different behavioral pattern. However,

it is still unclear why subjects behave spitefully and how the social context affects the human behavior. Using a different experiment design and subjects' pool, we need to investigate the motivation for the spiteful behavior in our future research.

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