Can Prosocial Behaviors Be Nurtured? Experimental Evidence from the Scholarship Program Reform by Korea University[*]

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Abstract

By enlarging the standard viewpoint of economic research that individuals' preferences are exogenously given and/or shaped by exogenous environments, we probe whether and to what extent an artificial policy intervention requiring adult individuals to engage in certain social activities can nurture their pro-social attitudes. In particular, we exploit the novel experience of Korea University's scholarship program obligating its recipients to teach children in low-income families. A hybrid approach, randomized laboratory experiment and structural estimation, is taken to disentangle the nurturing, self-selection, and screening effects. The estimated model provides a strong evidence for the nurturing hypothesis, 'social engagement enhances pro-social attitudes.'

Key Words: Pro-social Attitudes, Social Work-based Scholarship
JEL Classification: C91, D64, I22

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1 Introduction

The long tradition of economic research assumes that individuals' preferences and attitudes are exogenously given and/or shaped by exogenous environment.[1] Following this tradition, the recent development of behavior and experiment economics has made a considerable progress in identifying and quantifying the impact of socio-economic shocks (Camerer and Fehr (2004) and Malmendier and Nagel (2011)), social turmoils (Voors, Nillesen, Verwimp, Bulte, Lensink, and Van Soest (2012)), or natural disasters (Callen (2015) and Sawada and Oum (2015)) on individuals' preferences. Yet, the existing literature has so far paid little attention to the possibility of endogenously 'carving' individuals' preferences through a carefully-designed policy intervention, which is widely discussed in the outside of economics such as education, psychology, politics, public media and so on.[2] Motivated by the gap, this paper explores whether and to what extent adult individuals' pro-social attitudes can be nurtured through social engagement induced by an artificially designed policy intervention. More specifically, we exploit the novel experience of Korea University's social work-based scholarship program which obligates its adult recipients to engage in social activities.

Scholarship programs especially in higher education, whether they are funded by either tax or tuition, are just redistribution policies for the purpose of facilitating human capital investment. Given the existence of the market-based approach sharing the identical purpose, for example, student loans, such direct intervention by the government or universities is hardly justified, unless the scholarship program is expected to recoup a high social return that is not obtainable through the market mechanism.[3] This consideration, together with the social perception such that each individual's pro-social attitude yields a substantial gap between its social and individual returns, has led some universities in South Korea to design seemingly more purposive scholarship programs that explicitly obligate "social work." In particular, Korea University introduced the alternative scholarship program that pays its recipients 4 million KRW and obligates them to teach the 4th through 12th grade students in low income families. In spite of its premeditative intention, the social work-based scholarship program however remains subject to debate on whether it enhances pro-social attitudes of its recipients or it just redistributes the resources in a distortionary fashion.

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[1]Regarding the latter view point, a breakthrough was made by Becker and Mulligan (1997), which interprets time preference of each individual as an endogenous outcome of her or his 'future-oriented' investment. Their paper, by mapping exogenous environment into preferences, raises an interesting hypothesis that 'wealth causes patience.' Fehr and Hoff (2011) also point out that the standard view in economics that the preferences remain unchanged regardless of the changes in socio-economic environment contrasts sharply with the conception of other social sciences. Along the same line, Kim, Choi, Lee, Lee, and Choi (2016) show that the North Korean refugees who have already grown up in North Korea are less self-interested compared to those who have grown up in South Koreans.

[2]For example, the economics literature based on the median voter theorem proposed by Hotelling (1929) and expounded by Downs (1957) assumes that the candidates in election try to appeal to more voters having fixed preferences by adjusting their campaigns. However, we often observe that those politicians attempt to make more voters conservative or progressive by playing aggressive campaign strategies. While they are predicted to converge by the economic theory, the campaign strategies persistently remain detached from each other in reality.

[3]Typically, the medical and law schools collect higher tuition but grant less scholarships. But every year applicants for those schools are overflowed and the students in those schools rely on their private funding source including student loan in expectation of higher private return near future.

Reflecting the aforementioned debate, the economic experiment of this paper is designed to disentangle the effect of nurturing pro-social attitudes from other effects such as self-selection and screening effects of the scholarship program. At the beginning of academic year, eligible students in Korea university get the information regarding the scholarship program through their email and portal account. Students who are interested in the scholarship program apply (self-selection) and are interviewed by the program committee (screening). Then, successful candidates, after taking some training sessions, start teaching children at the local children center for low income families.[4] To decompose each effect on each subject's altruistic, reciprocal, and cooperative attitudes, we adopt a hybrid approach with randomized controlled trial and structural estimation. First, we invite all participants of our experiment in the computer lab of Korea University, and implement the dictator, ultimatum, and public goods provision games. Then, we build up and estimate a structural model on those subjects' underlying preferences. In most economic experiments, the research budget is not unlimited, which may cause the truncation issue in each subject's answer. In our sample, a nonnegligible number of subjects indeed donate or contribute all initial stake 5,000 KRW (roughly 4.5 USD) in each game. Given the considerable mass at the cap, we estimate the underlying preferences rather than the relationship among the observed (but truncated) behaviors and conduct counterfactual simulation by providing an extended choice set.

The estimated model predicts that altruistic and reciprocal behaviors are significantly enhanced among the actual recipients group who have already served and received the scholarship. If the recipients were randomly selected by the scholarship program and taught children in the low income families, they would donate further relative to the other groups by 616.62 KRW for poor college students and by 1,276.34 KRW for children in low income families. (To be written later)

While the previous literature on the conventional students aid programs has evaluated them in terms of their recipients' private return obtained by facilitating their human capital investment,[5] this paper evaluates Korea University's new social-work based program in terms of social return by promoting its recipients' pro-social attitudes. To our best knowledge, this paper is the first study emphasizing the social return of a scholarship program as one of the redistribution policies and exploring the possibility that it promotes its adult recipients' pro-social attitudes by providing them with the artificially-designed opportunity for social activities. In particular, both laboratory and simulation experiments of this paper provides a strong evidence that 'social engagement enhances pro-social attitudes.' It contrasts sharply with Carpenter and Myers (2010) which, by combining the data on volunteer firefighters with the data from their own experiment data implemented among those volunteer firefighters, emphasizes the self-selection hypothesis, 'pro-social attitudes induce social participation.'

The remainder of the paper is organized as follows. Section 2 presents research background and experiment design. Section 3 conducts regression analysis and Section 4 estimates a hybrid structural model. Section 5 concludes.

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[4]The local children center is somewhat between a private academy and a public after-school program which takes care of young children in low income families after school everyday. It is basically privately owned but heavily subsidized and controlled by the local government.

[5]Ichimura and Taber (2002) estimate the effect of tuition subsidy on various outcomes such as college attendance, years of schooling, wages and so on. Nielsen, Sørensen, and Taber (2010) estimate the effect of student aid on college enrollment.

2 Research Background and Design

2.1 Research Background

Past several years in South Korea, considerable debate has ensued within not only academic circles but also influential politicians regarding how to reform the tuition and scholarship programs of the universities that heavily rely on the government's subsidy. Traditionally, the universities in South Korea have implemented the two typical types of scholarship programs, the need-based and merit-based scholarships, to relax the budget constraint of the students in low income class and provide abler students with more incentives to study hard. As competition for the merit-based scholarships becomes tougher and tougher,[6] the merit-based scholarships face the serious skepticism that they just stimulate exhausting competition among college students, distort their course selection, and adversely affect those students in the low income families who have to earn their daily lives as well as tuition by themselves. By reflecting the concern on the exhausting competition for merit-based scholarships, Korea University abolished all merit-based scholarships in 2015 and reallocated 3.4 billion KRW from the merit-based scholarships to need-based scholarships (1.4 billion KRW), and other work- and program-based scholarships (2.0 billion KRW).[7] In accordance with the reform, the KU-Jump-Seongbuk scholarship[8] had been established in 2015 with financial support from the Korea University Alumni Fund after the 6-month trial phase in 2014. It has granted the scholarship of 4 million KRW(per person) by obligating all recipients to teach from 4th grade to 12th grade students in 'local children centers' eight hours per week for one academic year.

In Korea, the academic year starts from March 2nd, and the fall semester starts around September 1st. The KU-Jump-Seongbuk scholarship starts advertising, collecting applications and interviewing candidates in March. It sends the solicitation emails and postings. Students who are interested in the scholarship program apply by submitting a web-based application form which consists of fifteen very short-essay questions such as 'what makes you apply for the program,' 'Who you used to be,' 'Who you are,' 'Who you want to be,' and so on. Then, the short-listed applicants get interviewed by the teachers in the local children centers and Jump, and the successful candidates start teaching from late March after getting some training sessions from Jump. So far, it granted 46 students in 2015 and 50 students in 2016. In 2017, forty students are selected and doing their teaching obligation.

Apparently, the KU-Jump-Seongbuk scholarship program itself prevents its recipients from fully devoting themselves to their major. Eight hours per week for one academic year is non-negligible burden. It is still under debate whether or not the uni-

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[6]The college enrollment rate in South Korea is around eighty percent, which implies that roughly eighty percent of high school graduates enter 2-year or 4-year college.

[7]Refer to http://news.joins.com/article/21214977?cloc=joongang—article—clickraking

[8]As its name tells, the KU-Jump-Seongbuk scholarship is operated by three main subjects. "KU" represents Korea University which, as the supplier of teachers and mentors, provides the major portion of the scholarship fund and grants the scholarship recipients, "Seongbuk" represents the local government of Seongbuk ward area which, as the representative of the demand side, provides the local children centers for low income families to the program as well as some monetary and administrative supports, and "Jump" is the name of the social venture which, as the primary implementer, selects, trains, and manages those teachers and mentors.

versity should keep such scholarship programs. In light of this, we attempt to identify the nurturing effect of the program on the recipients' pro-social attitudes separately from the self-selection and screening effects.

2.2 Experiment Design

To disentangle the nurturing effect of the program into ex ante selection and ex post nurturing effects on pro-social attitudes, it is important to induce truthful revelation in the economic experiments by discouraging each participant's manipulation incentives. In particular, the key concern regarding our experiments is to measure each subject's honest pro-social attitude, regardless of her or his private experience and/or feeling on the KU-Jump-Seongbuk scholarship program. This concern led us to collect participants in two separate tracks: On the one hand, we posted a helpwanted advertisement on the official portal site of Korea University and the community website among Korea University students. After balancing out our sample, we eventually got 102 general participants (control group or Group 0). On the other hands, we asked Academy of Human Resource Development (AHRD) at Korea University to gently encourage all previous applicants for the KU-Jump-Seongbuk scholarship program to participate in our survey. They, using their student database, emailed all previous applicants for the KU-Jump-Seongbuk scholarship program to encourage their participation without telling them why and how they were selected. Although we were not able to get a direct access to each student's private information, we could identify who successfully got the scholarship and who failed in getting it, through the encouragement emails differentiated by Academy of Human Resource Development at Korea University. We eventually recruited 50 participants (the eliminated group or Group 1) who were eliminated after the interview and 33 participants (the recipients group or Group 3) who got the scholarship and served as teachers or mentors. In addition, we also conducted the 2nd round survey in the middle of the screening process in order to attract the students who passed the screening process but have not started teaching yet. We got 32 students in the 2nd round survey who were in the screening stage but only 9 out of 32 students eventually selected by the program (Group 2). The other 23 students were pooled into Group 1. We created multiple time slots for three days in each round and asked each participant to choose the preferred slot to come to the computer lab at Korea University.

The survey questionnaire consists of three parts. The first part asked about personal background such as academic grade, gender, year of admission to the university, military experience, volunteer experience, and time allocation on studying, working, volunteering, and others. Besides these personal characteristics, we asked individual preferences on difference types of scholarships including merit-, need- and program-based scholarships. Second, to see each individual's level of stress or self-esteem, we used psychological tests including Rosenberg test and SDQ test. Rosenberg test, widely used self-report instrument for evaluating individuals' self-esteem, consists 10 items, likert-type scale questions which ask the degree of agreement on the statement. It is usually regarded as low self-esteem when the score is below 15. Another test, SDQ test, is also self- report. In the test, the respondents' answers summarized as 4 scores on 4 dimensions of difficulty: emotional, conduct, hyperactivity, and peer problem. The total difficulty score, which is represented as SDQ score in the following analysis, show overall level of mental risk of respondents.

Third, we conduct economic experiments with dictator, ultimatum, and public goods provision games in order to measure pro-social attitudes of respondents. The dictator game follows standard rules in many experiment literatures: each subject was allocated 5,000 KRW and in a one shot allocation game, they divide 5,000 KRW into 2 parts for donation and ownership. Each subject was asked to donate the money for college students and younger kids in low income families. In the ultimatum game, a two-step game between two people, the proposer and the responder, the players bargain over a fixed amount of money. First stage, the proposer decides how much to allocate for herself/himself and for the responder. Next stage, the responder decides whether to accept or not the proposal. If it is accepted, the sharing rule in the proposal is implemented. We designed the ultimatum game into two part: one with other subject in our experiment, the other with a child from the local children center. In the public goods provision game, we asked the desired amount of donation to build public goods when they are allocated 5,000 KRW.

2.3 Descriptive Statistics

Table 1 presents descriptive statistics by group. The general participant group who have never applied for the scholarship is classified as Group 0, the applicant group who were eliminated in the screening process of the scholarship is Group 1, the candidate group who are selected by the program but have not started the service yet is Group 2, and the recipient group who have served already is Group 3. We compared differences in descriptive statistics across scholarship recipients and control groups in column 5 and 6 as well as tests of equality of means across all groups in the last column of Table 1. Overall, there are no significant differences by group. First, the sex ratio difference was statistically insignificant and female ratio was a little bigger in group 2 compare to other groups. However, T- test results among different groups do not show significant difference. In case of age, it seems that the students who applied the program are much younger than control group but not in significantly lower age. Compare to other groups, group3 who served social work are older. According to the psychological test score , Rosenberg test score and SDQ score(individual strengths and difficulties), it seems those who applied for the program, and succeeded to get benefit are in better stable mental state if we look at higher rosenberg score and lower sdq score. Rosenberg score represents self- esteem level of each respondents and if the score is higher, he or she might have greater self-esteem. However, comparison between different groups does not show statistical significance. T-test, F-test show, are not that significant. Therefore, it is hard to say there is systematic difference between the recipients, non- recipient groups based on T-statistics, F-test of several variables. However, the recipient, participated group show much higher academic record compare to ones who have not yet started. It seems that age or grade of those groups would be the factor of academic achievement since students tend to get higher grades when their graduation are near.

To see whether there is sampling error in the survey or selection bias especially on the choice of major, we checked the distribution of college major in each groups. Table 2 shows the distribution of college majors. If we compare group0,1,2,3 respectively, there could be considerable difference in the ratio of some majors (Life science, science) as the number of observations per group is small. However, when respondents who applied for the scholarship program of our interest were compared with those who did not, we found out there was no systemic difference in the ratios of college majors in each

Table 1: Descriptive Statistics : Personal Characteristics

		Group 0	Group 1	Group 2	Group 3
Female Ratio	mean	0.47	0.52	0.78	0.515
	sd	(0.5)	(0.5)	(0.44)	(0.51)
			Group Difference		
	(0 vs 1,2,3)	-0.073			
	(1 vs 2,3)		-0.051		
	(2 vs 3)			0.263	
Age	mean	23.11	22.62	22.33	22.45
	sd	(2.33)	(3.85)	(2.12)	(1.92)
			Group Difference		
	(0 vs 1,2,3)	0.575			
	(1 vs 2,3)		0.191		
	(2 vs 3)			-0.121	
GPA	mean	3.67	3.68	3.21	3.71
	sd	(0.48)	(0.38)	(0.82)	(0.452)
			Group Difference		
	(0 vs 1,2,3)	0.022			
	(1 vs 2,3)		0.06		
	(2 vs 3)			-0.5^{**}	
Rosenberg Score	mean	20.34	20.94	20.67	21.45
	sd	(4.89)	(5.65)	(3.97)	(5.71)
			Group Difference		
	(0 vs 1,2,3)	-0.755			
	(1 vs 2,3)		-0.346		
	(2 vs 3)			-0.788	
SDQ score	mean	10.68	10.66	8.78	11.18
	sd	(4.72)	(4.9)	(4.58)	(4.4)
			Group Difference		
	(0 vs 1,2,3)	0.013			
	(1 vs 2,3)		0.007		
	(2 vs 3)			-2.404	
Obs		102	50	9	33

$*p < 0.1, **p < 0.05, ***p < 0.01$ Standard deviations are reported in parentheses. Difference amounts represent the average difference between groups. Significance of the difference is tested via t- test

groups since the pearson chi square test of indipendence is not significant.

Table 3 shows descriptive statistics for experiment results. The table shows the different amounts of donation in the dictator, ultimatum, and public goods provision games for each group. The variable D1 represents the amount of money given to students in lower income class via scholarship foundation in dictator game. D2 is the amount of share the participants give to low income kids in dictator game. U1 is the amount of share the participants suggested to matched other player in ultimatum

Table 2: College Major Distribution in each groups

Group	Group 0	Group 1	Group 2	Group 3	Total
Econ	15 (0.15)	10 (0.20)	1 (0.11)	3 (0.09)	29 (0.15)
Edu	11 (0.11)	3 (0.06)	3 (0.33)	2 (0.06)	19 (0.10)
Lib	24 (0.24)	12 (0.24)	0 (0.00)	10 (0.30)	46 (0.23)
Life sci	18 (0.18)	7 (0.14)	2 (0.22)	4 (0.12)	31 (0.16)
Eng	7 (0.07)	3 (0.06)	0 (0.00)	5 (0.15)	15 (0.08)
Med	5 (0.05)	4 (0.08)	1 (0.11)	1 (0.03)	11 (0.06)
Sci	4 (0.04)	2 (0.04)	1 (0.11)	1 (0.03)	8 (0.04)
Social	18 (0.18)	9 (0.18)	1 (0.11)	7 (0.21)	35 (0.18)
Subtotal	102 (1.00)	50 (1.00)	9 (1.00)	33 (1.00)	194(1.00)
Pearson chi^2	0.644				

Econ : Economics , Business major, Edu: Education major, Lib : Liberal arts, Life sci: Life science, biology major, Eng: Engineering major, Med: Medical school, medical science, Sci: Science, Soc: Social studies(Policy, International Relation, psychology) , Gr 0-3 : Group 0-3

game. U2 is the amount of share they offered to the counterpart child in ultimatum game.

The amount in the table is the average of each group. In the table, differences of the averages between groups are summarized. The significance of the differences is tested by T-test and the significance is denoted as asterisks. The result shows stylized fact in ultimatum game **?** which is that people tend to avoid inequity and follow fair, cooperative allocation . Moreover, the game with low income kids shows effects on each participant's social attitude towards kids and it is slightly different from ultimatum , dictator game with other participants and students. The amount of donation to scholarship foundation from the first dictator game(D1) is significantly larger in Group 3, but not that different from group2. With poor kids in second dictator game(D2), the amoutn of given money by group 3 is much larger than group2. It means nurturing effect by social work which could be captured by the difference between group2 and group3 is not significantly large in dictator game 1, but it is evident in dictator game 2. In addition, compare to control group students (Group 0), Group 1,2,3 students who applied for the scholarship program (volunteer work based) show significantly larger amount of donation in both dictator games. It seems those who have application experience may have positive attitudes toward social work, which could be represented as selection effect. Interesting fact would be the difference in the amount of money between dictator game 1(D1; low income students) and ultimatum game 1(U1; other participants). Ultimatum game 1 shows stylized facts in experiment that people likely to avoid inequality and tend to pursue more egalitarian state. The amolunt they offered is around the half of the stake. Across the groups, the result is also quite different. For the group0, U1 seems to be larger than D1, but for the group3, D1 is much larger than U1. It seems social work experience might have affected attitude towards kids , which is represented as nurturing effect of social work. This result could be interpreted as an altruistic attitude that is nurtured by volunteer work. Surprisingly, ultimatum2 with low income kids shows result similar do dictator game. It represented as students tend to avoid self interested behavior when they allocate resources with poor kids. This

Table 3: Descriptive Statistics: Game Result

		Group 0	Group 1	Group 2	Group 3
D1	mean	1750	2440	2833.3	2681.818
	sd	(1470.42)	(1858.9)	(1767.77)	(1788.934)
			Group Difference		
	(0 vs 1,2,3)	-815.217***			
	(1 vs 2,3)		-274.29		
	(2 vs 3)			151.51	
D2	mean	2950.98	3120	3388.89	3772.73
	sd	(1695.23)	(1875.08)	(1654.12)	(1672.81)
			Group Difference		
	(0 vs 1,2,3)	-429.454*			
	(1 vs 2,3)		-570.48		
	(2 vs 3)			-383.838	
U1	mean	2279.41	2440	2611.11	2515.152
	sd	(766.16)	(989.79)	(781.74)	(896.9118)
			Group Difference		
	(0 vs 1,2,3)	-204.284*			
	(1 vs 2,3)		-95.71		
	(2 vs 3)			95.96	
U2	mean	3588.24	3620	3611.11	4045.46
	sd	(1199.03)	(1401.75)	(1386.9)	(1220.68)
			Group Difference		
	(0 vs 1,2,3)	-183.504			
	(1 vs 2,3)		-332.38		
	(2 vs 3)			-434.34	
P	mean	2852.94	2810	3000	3363.64
	sd	(1696.81)	(1845.82)	(1713.91)	(1443.05)
			Group Difference		
	(0 vs 1,2,3)	-174.233			
	(1 vs 2,3)		-475.714		
	(2 vs 3)			-363.63	
N		102	50	9	33

$*p < 0.05, **p < 0.01, ***p < 0.001$, Standard deviations are reported in parentheses. Difference amounts represent the average difference between groups. Significance of the difference is tested via t- test

tendency is strong especially in group3. it is plausible to assume volunteer experience might affect their altruistic attitude towards children. Public goods game results shows similar social attitudes by each groups that those who succeed in screening process of scholarship is are more sensitive towards common interests as group 2,3 donated larger amount compare to group 0,1. Overall, social engagement might have enhanced pro social attitude though the results are not statistically significant,

3 Regression Analysis

3.1 Selection and Nurturing Effects

We tried to analyze the selection process of receiving scholarship. During the process, a student need to apply for the program in order to be a candidate as a recipient at first. After screening process including interviews, a part of them selected as scholarship recipients. Group3, who already got the scholarship and served as teachers, and group2 who got the scholarship but have not yet started to volunteer work are defined as selected groups.

There could be possible two causes of the individuals' altruistic behavior which is captured by giving shares in dictator game. First, self-selection may be the main issue: the ones who are likely to care about others and prefer volunteer work might have applied the scholarship program. Second, nurturing effect could have been one of the main cause of the positive relationship: People who selected to serve as volunteer teachers could be greatly affected by the participation on the work.

As our samples have heterogeneous characteristics, we thought the choices of shares might depend those. From a regression analysis, we compared each group's proposed share of the recipients from the dictator game and whether other factors contribute to the giving amount. First, we analyzed overall relationship between personal characteristics and the amount of giving shares. The analysis result is summarized in table 4. The 1,3 column show the effect on the shares to scholarship foundation, and the 2,4 column show the effect on the shares to children foundation. All results show there is a significant positive relationship between group3 (who were successful in awarding scholarships and participated in the volunteer work) and donation level. Group 2 students who were also designated to get a scholarship but have not yet started volunteer work show positive relationship with the amount of donation to low income students in dictator game 1(D1) as well. Moreover, the results of donation to scholarship foundation (D1) which show positive effects of group 1 (who failed in scholarship screening process) may reflect the selection effect around the scholarship is contribute much to their altruistic behaviors. Which means, the students who have more interests in volunteer work may had applied for the scholarship program and they might have strong altruism toward low income students. However, the donation to children foundation(D2) does not clearly show selection effect except group 3.

Surprisingly, in ultimatum game and public good provision game, there is no significant group effect on the share of giving towards matched other player or child except for the group3's effect on second ultimatum game with low income child.

Table 4: Regression results

	D1	D2	D1	D2	P	P	U1	U2	U1	U2
sex	189.6	464.2	268.1	584.1*	-349.3	-495.8	-6.355	216.1	-33.94	191.7
	(0.75)	(1.80)	(1.12)	(2.34)	(-1.15)	(-1.81)	(-0.05)	(1.07)	(-0.27)	(1.02)
year	-41.55	-67.50	-20.76	-30.31	-22.23	-22.32	-29.01	-30.37	-56.27	-59.40
	(-0.58)	(-0.92)	(-0.31)	(-0.42)	(-0.29)	(-0.31)	(-0.77)	(-0.61)	(-1.43)	(-1.21)
sdq	43.00	77.68**	34.91	72.72**	49.39	54.13*	12.78	12.66	13.67	16.25
	(1.40)	(2.89)	(1.19)	(2.81)	(1.86)	(2.14)	(0.98)	(0.57)	(1.04)	(0.80)
Rosenberg	31.70	48.26	22.65	42.69	3.542	7.644	-0.469	8.934	-2.304	6.263
	(1.22)	(1.78)	(0.89)	(1.65)	(0.13)	(0.29)	(-0.04)	(0.51)	(-0.21)	(0.38)
acad_rec	149.1	43.87			-183.0		8.099	64.14		
	(0.57)	(0.16)			(-0.67)		(0.05)	(0.35)		
Group3	885.5*	874.5*	842.1*	783.4*	483.2	520.6	257.7	576.0*	238.9	492.9
	(2.38)	(2.50)	(2.38)	(2.36)	(1.38)	(1.58)	(1.34)	(2.12)	(1.34)	(1.91)
Group2	1531.7*	1116.4	1102.7*	489.4	322.1	349.9	372.0	46.35	282.8	-11.39
	(2.44)	(1.83)	(2.01)	(0.85)	(0.45)	(0.65)	(1.01)	(0.08)	(1.09)	(-0.02)
Group1	788.5*	211.4	637.7*	49.40	-53.99	-46.41	164.4	-9.509	109.2	-74.76
	(2.55)	(0.65)	(2.15)	(0.16)	(-0.16)	(-0.15)	(1.04)	(-0.04)	(0.69)	(-0.34)
_cons	-498.3	931.7	281.4	1170.8	3362.5*	2531.6**	2062.2**	2557.7**	2241.2***	2944.2***
	(-0.40)	(0.73)	(0.35)	(1.54)	(2.57)	(3.04)	(2.82)	(2.91)	(6.91)	(5.54)
N	182	182	194	182	182	194	182	182	194	194
$\hat{R2}$	0.1037	0.116	0.0752	0.0961	0.0444	0.0557	0.0256	0.0386	0.033	0.0352
Ftest: Group3 -Group2=0	0.4514	0.9603	0.8072	0.5382	0.8167	0.8278	0.7677	0.2874	0.8321	0.3066
Ftest: Group2 -Group1=0	0.3308	0.3688	0.5419	0.6777	0.6771	0.4995	0.6628	0.8049	0.642	0.8375
Ftest: Group0=Group1=0	0.012	0.4618	0.0316	0.7657	0.8693	0.8981	0.2774	0.9205	0.4099	0.9635

$*p < 0.05, **p < 0.01, ***p < 0.001$, T statistics are in parentheses, , year: (2017- the year the student enter university), group3 are the students who got the scholarship and served as teachers or mentors for about one year, group 2 are students who got the scholarship but have not have yet started. Group 1 are the students who failed in screening process. Question type 2 : dictator game with children foundation(D2) -Dictator game with scholarship fund(D1) - ultimatum game (player-child)(U) - public goods provision game(P) ,Question type 3 : U-D2-D1-P ,Question type 4: U-D2-D1-P

If there is nurturing effect of volunteer work, the dummy variable for group3 (recipient, participated group) should be significant but column 1,3 seems that only the amount of money they gave to children foundation in dictator game has positive nurturing effect but not that significant. In lower row of table 4, we compared given money in each ultimatum , dictator, game and could not find statistical difference between each groups by using F test. Especially on the difference which captures nurturing, selection effect, it is not large enough to say its significance.

We thought this result may from truncation of the data. As we provide limited choice sets which are in the range of 0 - 5000 KRW, the respondents only can choose one option in this range even if they want to donate more or less. As a consequence, the statistical difference of the donation amount might have been shrinked due to the limited of range in selection, which can be called as selection truncation problem. In figure 10-15, there are distributions of the amount of money given to the counterpart. The above graph in the figure represents overall distribution of money by each group while the graph below only shows the distribution of the money without maximum amount in the choice set. Surprisingly, the distribution of each group changes a lot without the ones who selected maximum amount except for the first ultimatum game with participants. The results raise question truncation issues since all the participants have to choose maximum amount in the choice set even if they want to give more.

4   Structural Approach

4.1   Primitives

Fehr and Schmidt (1999) suggest in their seminal work that individual i's fairness motive can be characterized by

$$u_i(x) = x - \alpha_i \frac{1}{n-1} \sum_{j \neq i} \max\{x_j - x_i, 0\} - \beta_i \frac{1}{n-1} \sum_{j \neq i} \max\{x_i - x_j, 0\}, \qquad (1)$$

where x_i is the payoff for subject $i \in I = \{2, 3, \cdots, n\}$. Individual specific parameter α_i captures the utility loss from disadvantageous inequality and β_i captures the loss from advantageous inequality. It is assumed that $\beta_i \in [0, 1)$ and $\alpha_i \geq \beta_i$. Following Bolton and Ockenfels (2000), we unify the two inequality aversion parameters by assuming a symmetric utility loss but introduces a random coefficient on material self-interest. More specifically, we posit that individual $i \in I = \{1, 2, \cdots, n\}$ in group $j \in J = \{0, 1, 2, 3\}$ chooses $x_i \in X = \{0, 500, \cdots, 5000\}$ in experiment $k \in K = \{1, 2\}$ to maximize her or his utility as follows.

$$\max_{x_i \in X} (\alpha_i + \delta_{jk} + \gamma_k)x_i - \beta_i \left[\frac{1}{n} \sum_{i' \in X} x_{i'} - x_i \right]^2, \text{ where } \alpha_i \sim \mathcal{N}(\mu_\alpha, \sigma_\alpha^2) \text{ and } \beta_i \sim \mathcal{N}(\mu_\beta, \sigma_\beta^2).$$

$$(2)$$

Coefficient δ_{jk} captures the average nurturing effect among those recipients who have served for the local community already. That is, if $j = 3$, $\delta_{jk} = \delta_k \neq 0$, otherwise $\delta_{jk} = 0$. If $k = 1$, $\gamma_k = 0$, otherwise $\gamma_k \neq 0$, which reflects stronger altruism for kids. Random coefficients, α_i and β_i, capture the individual specific self-interest and inequity aversion. Although Fehr and Schmidt (1999) and Bolton and Ockenfels (2000) explicitly assume that those coefficients are strictly positive, we allow them to be negative as well

in order to reconcile the observed outcome in our experiments. Note that if we assume that α_i and β_i are strictly positive as in Bolton and Ockenfels (2000), we cannot rationalize the observed donations more than a half portion of the stake.

Let $z_i \in Z = \{0, 0.1, \cdots, 1\}$ be the proportion of money that subject $i \in I$ keeps in her/his own pocket. In a two-player game, individual's motivation given in (2) can be reformulated as

$$\max_{z_i \in Z} \ (\alpha_i + \delta_{jk} + \gamma_k)z_i - \beta_i \left[\frac{1}{2} - z_i\right]^2, \tag{3}$$

which is similar to the ERC model in Bolton and Ockenfels (2000). It implies that

$$(\alpha_i + \delta_{jk} + \gamma_k)(z - z') + \beta_i \left[\left(\frac{1}{2} - z'\right)^2 - \left(\frac{1}{2} - z\right)^2\right] \geq 0, \quad \text{for any} \ \ z' \in Z. \tag{4}$$

Let $\alpha_{ijk} = \alpha_i + \delta_{jk} + \gamma_k$. The following proposition reveals that if $\alpha_{ijk} > 0$ and $\beta_i > 0$, subject $i \in I$ will never donates more than a half of the initial stake. Also, if $\alpha_{ijk} < 0$ and $\beta_i > 0$, she/he will never donate less than a half of the initial stake. It shows that why we need the random coefficient model.

Proposition 1 *First, suppose that $\beta_i > 0$.*

(i) $(\partial z_i)/(\partial \alpha_{ijk}) < 0$.

(ii) If $\alpha_{ijk} \gtreqqless 0$, $z_i \in \{z | z \gtreqqless \overline{s}/2\}$.

Second, suppose that $\beta_i \leq 0$.

(iii) If $\alpha_{ijk} > (<)0$, $z_i \in \{\overline{s}\}$ $(z_i \in \{0\})$.

When $\beta_i \leq 0$ and $\alpha_{ijk} = 0$, it's trivial.

Korea University distributes out the scholarship posting through individuals' portal account to all students. Then, students who are interested in submit their application and get an interview opportunity. In this process, selection may take place in two directions. First, among all students observing the posting, the students who were interested in teaching kids were more likely to apply for the scholarship. We approximate and estimate the self-selection process using a logit function such that

$$Pr(\text{apply}|\alpha_i) = \frac{1}{1 + \exp(-\psi_a \alpha_i)}, \tag{5}$$

which implies that if ψ_a is positive (negative), a person with a high α_i was less (more) likely to apply for the scholarship. Then, roughly only a half of those applicants were selected through the interview, which is captured by another logit function such that

$$Pr(\text{selected}|\alpha_i) = \frac{1}{1 + \exp(-\psi_s \alpha_i)}. \tag{6}$$

Successful candidates are supposed to teach children and teenagers in low income families for eight hours per week throughout two semesters. Since it has initiated from 2014, we have 3 cohorts who have already worked for those children and teenagers and one cohort who have been just selected (and eliminated) as of March 2017.[9] Eventually,

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[9]The academic year starts every March in South Korea.

Table 5: Altruism: Parameter Estimates

Parameter	Interpretation	Value
μ_α	mean of the self-interest parameter	0.396 (?)
μ_β	mean of the inequality aversion parameter	1.290 (?)
σ_β	$s.d.$ of the inequality aversion parameter	0.010 (?)
γ	overall altruism toward kids	-0.345 (?)
δ_1	nurturing effect toward other adults	-0.292 (?)
δ_2	nurturing effect toward other kids	-0.543 (?)
ψ_1	self-selection parameter	3.490 (?)
ψ_2	screening parameter	0.437 (?)

we can think of four different (conditional) probability mass functions of donations as well as other variables, conditioning on which group each subject is included in.

Let us denote by $f_{jk}(z)$ the mass of subjects in Group $j \in J$ who donate z-portion of the initial stake at experiment k. The log-likelihood ratio that each individual in Group $j \in J$ donates z-portion at experiment k is given by

$$\mathcal{L}_{jk}(z) = -\sum_{i \in I_j} \log[f_{jk}(z|\alpha_i, \beta_i)g_j(\alpha_i)], \tag{7}$$

where $g_0(\alpha_i) = 1$, $g_1(\alpha_i) = Pr(\text{apply}|\alpha_i)(1 - Pr(\text{selected}|\alpha_i))$, and $g_2(\alpha_i) = g_3(\alpha_i) = Pr(\text{apply}|\alpha_i)Pr(\text{selected}|\alpha_i)$. Then, the whole likelihood function is given by

$$\mathcal{L} = -\sum_{j \in J}\sum_{z \in Z}\sum_{i \in I_j} \log[f_{jk}(z|\alpha_i, \beta_i)g_j(\alpha_i)]. \tag{8}$$

Since the individual choice is robust to any multiplicative transformation of the utility function, we normalize σ_α to be 0.1. Then, we adjust parameter vector, $\Theta = (\mu_\alpha, \mu_\beta, \sigma_\beta, \delta_1, \delta_2, \gamma, \psi_a, \psi_s)$ to maximize the likelihood of each outcome by simulating the model using twenty million random numbers from the normal distribution.

4.2 Altruistic Behaviors

We measure individuals' altruism through the dictator games. Each subject is given 5,000 KRW at each game and asked to donate some portion of the initial stake for other poor college students and other children in low income families.[10] We randomly alter the order of the two games individual by individual. The (empirical) probability mass functions are presented as transparent bars in Figure 1.

In total, we have nine parameters to be estimated, $(\mu_\alpha, \sigma_\alpha, \mu_\beta, \sigma_\beta, \gamma, \delta_1, \delta_2, \psi_1, \psi_2)$. Out of those nine parameters, we normalize σ_α to be one, since the utility function is robust to scaling. The other parameter estimates through simulated maximum likelihood are presented in Table 7. Consistently with Fehr and Schmidt (1999) and Bolton and Ockenfels (2000), μ_α and μ_β are positive in our estimation. Moreover, the small standard deviation of β_i jointly implies that more than 99 percent of students will have certain degree of inequality aversion. The negative values of $\{\gamma, \delta_1, \delta_2\}$ predict

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[10]Their donations were sent to Seoul Scholarship Foundation and Unicef, respectively.

Table 6: Simulation : Dictator Game - Nurturing, Selection effect

	Group 0	Group 1	Group 2	Group 3
	with the cap of 5,000 KRW			
D1(with selection)	1886.31	2143.64	2220.48	2619.69
(with random assignment)	1886.31	-	-	2286.37
D2(with selection)	2396.17	2649.06	2726.63	3459.40
(with random assignment)	2396.17	-	-	3178.50
	with the cap of 25,000 KRW			
D1(with selection)	4099.96	4494.49	4612.73	5234.28
(with random assignment)	4099.96	-	-	4716.58
D2(with selection)	4887.15	5280.27	5404.06	6648.78
(with random assignment)	4887.15	-	-	6163.49

each individual to donate more (pursue less material self-interest) toward kids and after engaging in social services. In particular, the values of $(\mu_\alpha, \gamma, \delta_2)$ jointly conclude that most individuals would donate more than a half-portion of the initial stake toward kids in low income families, if they taught those kids. Comparing ψ_1 and ψ_2 reports that self-selection in the application stage works more stronger than screening in the interview stage.

Using the parameter estimates, we simulate each individual's decision again and plot the empirical and simulated probability mass functions of individuals' donations in Figure 1. The probability mass functions of Group 2 and 3 reveal a little larger discrepancies due to their small sample sizes. Overall, the simulated probability mass functions approximate its empirical counterparts well, which implies that (i) we do not lose much from the normality assumption, and (ii) instead we may lose a certain degree of precision by ignoring the truncation problem.

Table 6 calculates the conditional mean of donations based on the simulated (conditional) probability mass functions and conduct counterfactual experiments as well by relaxing the cap of each individual's donation. Panel (a) reports that the nurturing effects measured by the differentials between the amount of donations in Group 2 and 3 are roughly 399.21 KRW and 732.77 KRW, respectively in the simulated distributions with substantial masses at both end points. But the nurturing effect measured by the group average is adversely affected by the truncation problem. Especially many subjects actually donated all initial stake 5,000 KRW in the second dictator game. Thus, in panel (b), we conduct counterfactual simulations on what would happen if each subject could donate additionally upto 20,000 KRW from her/his own pocket. Panel (b) reports that the subjects in Group 3 would donate more by 621.55 KRW in the first game and 1244.62 KRW in the second game than those subjects in Group 2. This results clearly show that comparing group means under-estimates the nurturing effect in terms of altruism.

4.3 Reciprocal Behaviors

Individual's reciprocity is measured by the ultimatum game. Each subject plays the game as a proposer and receiver. A proposer is given 5,000 KRW as an initial stake.

(a) Group 0   (b) Group 1

(c) Group 2   (d) Group 3

Dictator Game #1

(e) Group 0   (f) Group 1
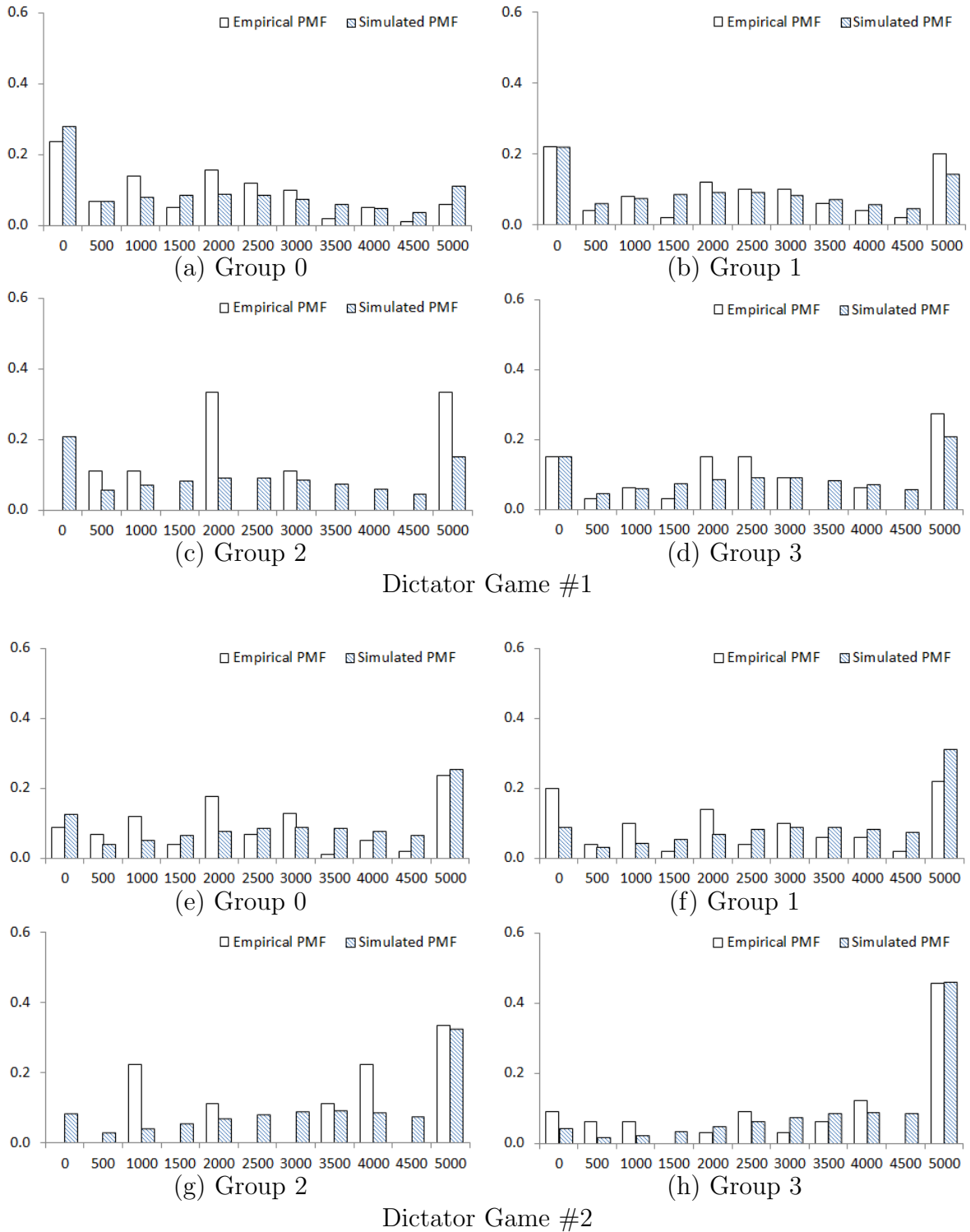
(g) Group 2   (h) Group 3

Dictator Game #2

Figure 1: Dictator Games: Empirical vs. Simulated Probability Mass Function
In each panel, the empirical PDF represents the probability mass function of each
individual's donation in our experiment and the simulated PDF is the probability
mass function of each individual's donation in our simulation.

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Table 7: Fairness and Reciprocality: Parameter Estimates

Parameter	Interpretation	Value
μ_α	mean of the self-interest parameter	0.269 (?)
μ_β	mean of the inequality aversion parameter	1.179 (?)
σ_β	s.d. of the inequality aversion parameter	0.325 (?)
γ	overall altruism toward kids	-0.371 (?)
δ_1	nurturing effect toward other adults	1.035(?)
δ_2	nurturing effect toward other kids	-0.136 (?)
ψ_1	self-selection parameter	-1.302(?)
ψ_2	screening parameter	-0.22(?)

She/he suggests a sharing rule with an unknown receiver from our subjects and from children in low income families. If the offer is rejected by the receiver, both parties get nothing. If it is accepted, the sharing rule is executed.

As before, we have nine parameters to be estimated, $(\mu_\alpha, \sigma_\alpha, \mu_\beta, \sigma_\beta, \gamma, \delta_1, \delta_2, \psi_1, \psi_2)$. Parameter μ_α is normalized like the former game. The estimated parameters are summarized in table 7. The parameters of μ_α is consistent with literature, and altruistic parameter γ, δ_2 show negative values which means that each individual are likely to donate more toward kids and after the social service. However, parameter δ_1 is positive which means participants do not show strong willingness to give money to other adults. Sum of parameters $(\mu_\alpha, \gamma, \delta_2)$ indicates that most individuals would donate more than half of their initial endowment toward kids if they serve social activities. The result of parameters $\psi_1.\psi_2$ show that self-selection affects more on ultimatum game than screening of applications.

To see whether our model fits the real experiment data, we simulated the decision process on ultimatum game with restrictions on the donation choices. The comparison between simulation and the empirical pdf is presented at figure2. Even though there are slight discrepancies between observed, simulated data, it seems it fits the empirical dataset quite well.

Using this model, we tried to disentangle the pure screening and nurturing effect of volunteer work on ultimatum game. We measured attitude toward inequality with the amount of money they gave to the counterpart in ultimatum game. U1 represents the amount given to other players who matched in the game, and U2 represents the money gave to matched child in second ultimatum game. Additionally, to analyze measurement error due to the restricted choice set, we expanded individual choice set to (0,25000) as a counterfactual example. Table 8 shows overall nurturing, selection effect of ultimatum games with and without truncation assumptions. The difference between the average given money to counterpart by group3 and simulated amount by control group represents nurturing effect since group 3 have altruism nurturing experience, volunteer act. We found out ultimatum game 1 with other players show similar results from traditional literatures but surprisingly, the second game results were quite different. The difference capturing nurturing effect is 65.68 in ultimatum game 2 and it is much bigger with children compare to game 1, 31.67. Moreover, the gap widens as the selection constraint relaxes to (0,25000). The nurturing effect in game 1 is increased to 319.2 and it is increased to 702.63 in game 2. It shows the money given

(a) Group 0 (b) Group 1

(c) Group 2 (d) Group 3

Ultimatum Game #1

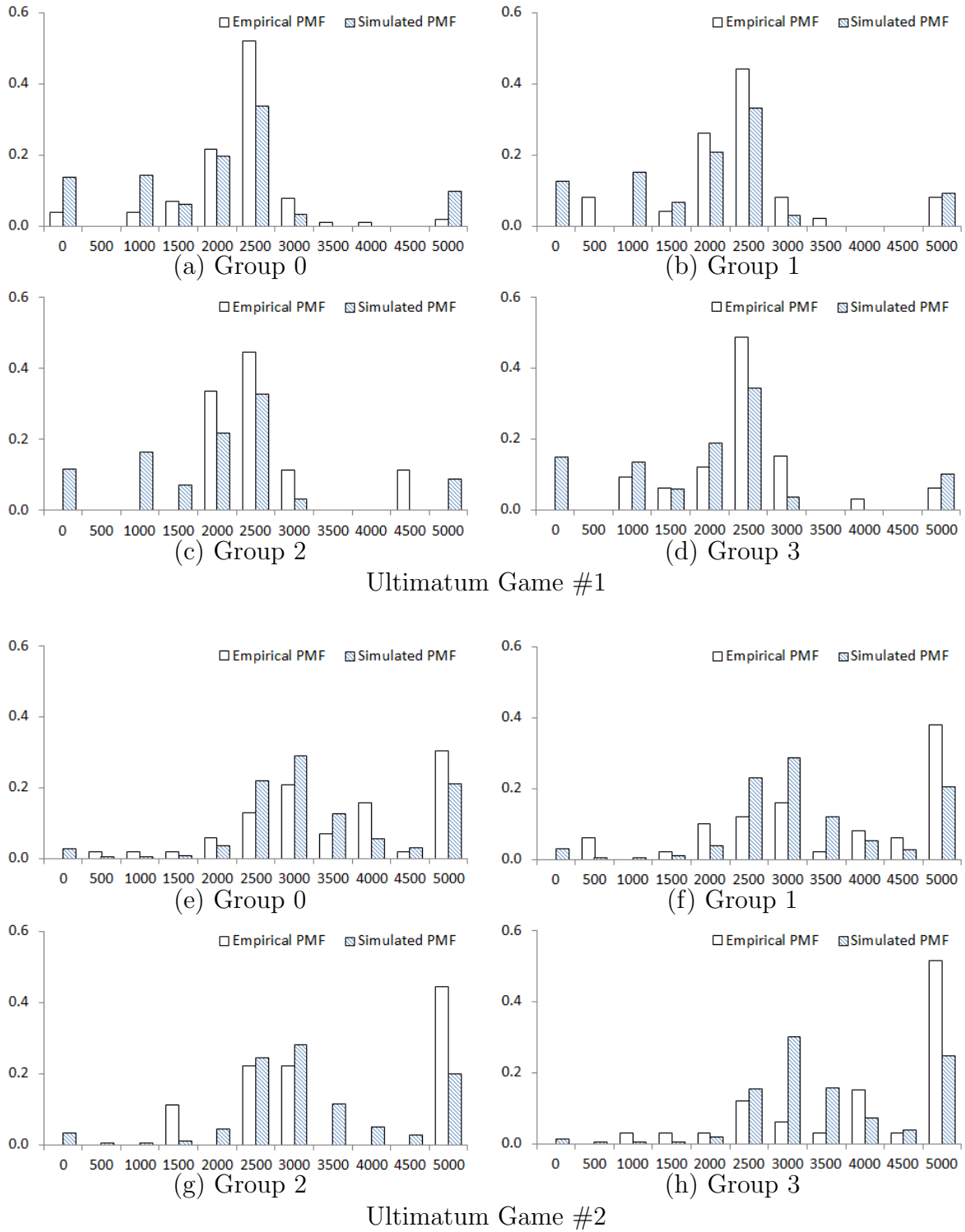(e) Group 0 (f) Group 1

(g) Group 2 (h) Group 3

Ultimatum Game #2

Figure 2: Ultimatum Games: Empirical vs. Simulated Probability Mass Function
In each panel, the empirical PDF represents the probability mass function of each
individual's donation in our experiment and the simulated PDF is the probability
mass function of each individual's donation in our simulation.

to matched child ultimatum game2 might have been considered as altruistic rather than self-interested. Nurturing effect is much bigger than selection effect which means those who get trained in altruistic activities show more contributions than who didn't. Also, the effect size by nurturing seems to be bigger than selection.

Table 8: Simulation : Ultimatum Game - Nurturing, Selection effect

	Group 0	Group 1	Group 2	Group 3
	with the cap of 5,000 KRW			
U1(with selection)	2392.81	2261.59	2410.91	2442.32
(with random assignment)	2392.81	-	-	2424.48
U2(with selection)	3574.52	3286.66	3613.32	3678.62
(with random assignment)	3574.52	-	-	3640.20
	with the cap of 25,000 KRW			
U1(with selection)	3403.99	3289.86	3410.70	3725.67
(with random assignment)	3403.99	-	-	3723.20
U2(with selection)	5843.10	5588.73	5858.44	6551.23
(with random assignment)	5843.10	-	-	6545.73

The comparison between group 0,1,2,3 on the amount money without truncation is presented at figure3. With expansion of selection range to (0,25000), the simulated density follows similar distribution in the literatures. If we see the distribution more carefully, the donation amount by group 2,3 seems to be on the right side of group 0,1.

4.4 Cooperative Behaviors

Cooperative behaviors are measured by the public goods provision game. We give each subject the initial stake of 5000 KRW and ask her/him to contribute some of the money for her/his subgroup with other three unknown subjects. Then, we provide a matching fund to make each subject's contribution double and evenly redistribute within each subgroup. This setting is different from the previous settings in the sense that the upper cap of money that each subject can hold depends on the others' contribution. This change derives the following expected utility function from (2).

$$\max_{z_i \in Z} \ (\alpha_i + \delta_{jk} + \gamma_k)(E_i(z^e) - z_i) - \beta_i[z^e - z_i]^2, \tag{9}$$

where $E_i(z^e)$ does depend on z^e but does not depend on z_i. We put an initial guess on z^e and update it by aggregating the amount of contributions in Group 0. Then, we apply the same belief to all subjects in our experiments. It is because each subject believes that she/he plays with a representative sample of students at Korea University. Indeed, group 0 is the representative sample so that her/his belief of z^e should be same whether she/he is included in group 0 or not.

The parameter estimates associated with the public goods provision game are presented in Table 9. As before, (μ_α, μ_β) are positive, and a small σ_β implies that more than 99 percent of β_i are positive. The large negative value of δ implies that engaging in the social activities reduces material self-interest. Also, one can see that selection takes place favoring less selfish students.

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Table 9: Cooperation: Parameter Estimates

Parameter	Interpretation	Value
μ_α	mean of the self-interest parameter	0.131 (?)
μ_β	mean of the inequality aversion parameter	0.834 (?)
σ_β	$s.d.$ of the inequality aversion parameter	0.169 (?)
δ	nurturing effect parameter	-0.721 (?)
ψ_1	self-selection parameter	9.164 (?)
ψ_2	screening parameter	2.335 (?)

Using these parameters, we simulate each individual's decisions and compare with observed choices. The choices by group 0 and 1 seem to be similar to empirical distribution. The discrepancy between the empirical and simulated probability mass functions in panel (c) and (d) is larger than previous two panels, as the number of observation in group 2 and 3 is too small.

On table 10, we calculated pure nurturing and selection effect in public goods game. Unlike the previous result, the size of nurturing effect is smaller than the selection effect.

Table 10: Simulation : Public Goods Provision Game - Nurturing, Selection effect

	with the cap of 5,000 KRW			
	Group0	Group1	Group2	Group3
Public Goods	2143.51	2581.32	2865.80	3305.55
	2143.51	-	-	3135.59
	with the cap of 25,000 KRW			
	Group0	Group1	Group2	Group3
Public Goods	11996.73	13213.27	13943.41	15848.06
	11996.73	-	-	14578.32

5   Conclusion

An extensive literature on development and behavior economics argues that individuals' active social engagement is social capital of the society and a foundation of 'good' society. But it was relatively silent on whether strong pro-social attitudes induce active social engagement or active social engagement enhances pro-social attitudes. More specifically, it has paid little attention to the possibility that pro-social attitudes can be nurtured through social participation even in adulthood.

To examine the possibility, this paper exploits the novel experience of Korea University's new social-work based program. Since the social-work based scholarship program officially launched in 2015 and a substantial portion of previous applicants for the program have already graduated, we could not get a large sample. Also, as usual in other experiment economics studies, a considerable mass of subjects donate or contribute all initial stake in each game. To overcome those two hurdles, we adopt a hybrid approach with both laboratory and simulation experiments. Our result indicates that
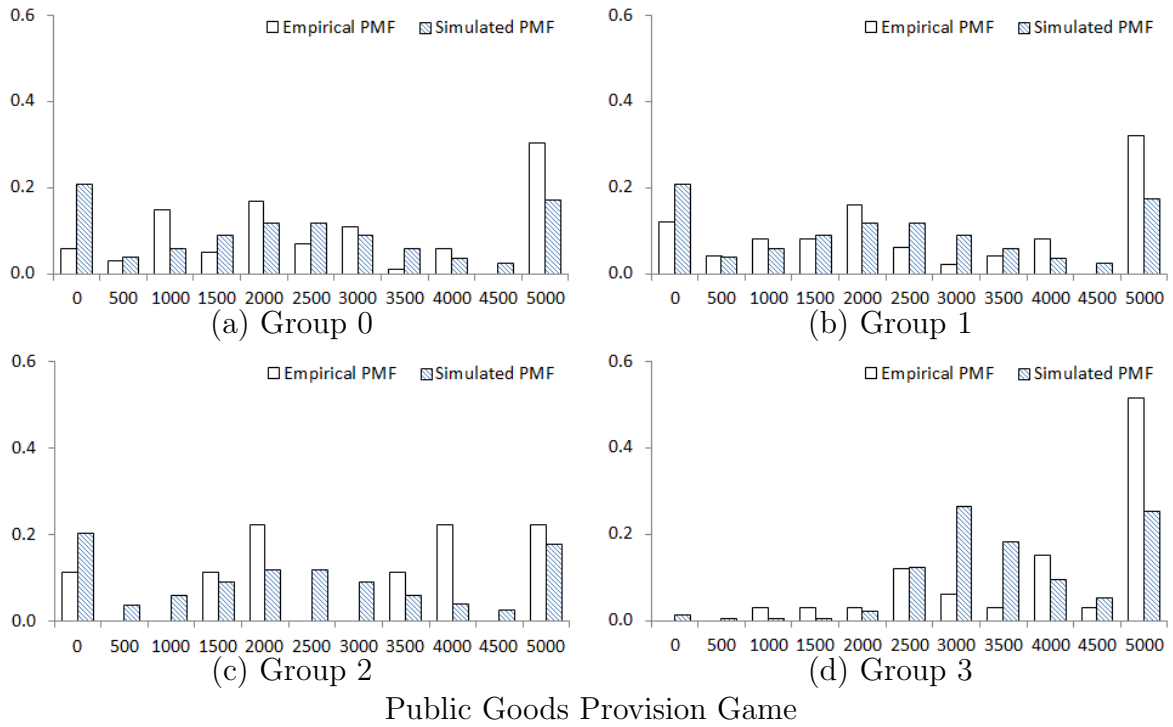
Figure 3: Public Goods Provision Game: Empirical vs. Simulated Probability Mass Function
In each panel, the empirical PDF represents the probability mass function of each individual's donation in our experiment and the simulated PDF is the probability mass function of each individual's donation in our simulation.

pro-social attitudes of the scholarship recipients are significantly enhanced through the artificially-designed opportunity for social activities.

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