

Altruism and voluntary provision of public goods

Leanne Ma

Department of Economics, University of Melbourne

Katerina Sherstyuk

Department of Economics, University of Hawaii

Malcolm Dowling

Department of Economics, University of Melbourne

Oliver Hill

Department of Psychology, Virginia State University

Abstract

We study how people's predisposition towards altruism affects their behavior in a voluntary contributions public good experiment. We investigate whether a high level of contributions can be sustained in groups of subjects who have been pre-selected on the basis of their altruistic inclinations. In the first stage of the experiment, each subject responds to a psychology questionnaire that measures various dimensions of one's personality. The subjects are then matched in groups according to their altruism scores, and engage in a voluntary contributions game. We consider whether the levels and dynamics of group contributions differ significantly between the groups with altruists and non-altruists. We find that subjects' altruism has only a weak positive effect on group behavior in the public good game.

Dowling, Ma and Sherstyuk gratefully acknowledge the financial support by the Australian Research Council. We would like to thank Jim Dang and Quy Tran for their IT support. Ma thanks Yanson Ching for his help with the data analysis.

Citation: Ma, Leanne, Katerina Sherstyuk, Malcolm Dowling, and Oliver Hill, (2002) "Altruism and voluntary provision of public goods." *Economics Bulletin*, Vol. 3, No. 31 pp. 1–8

Submitted: August 12, 2002. **Accepted:** December 18, 2002.

URL: <http://www.economicbulletin.com/2002/volume3/EB-02C90002A.pdf>

1. Introduction

We study how people's predisposition towards altruism,¹ as measured by tools developed by psychologists, affects people's behavior in a voluntary contributions public good experiment. The voluntary contribution mechanism (VCM) has been widely used by economists to study the provision of public goods. Each participant in a typical VCM experiment is given a number of tokens which they have to divide between a public and a private good. The parameter profile is set so that it is Pareto optimal for all players to contribute everything to the public good, but the dominant strategy for each player is to free-ride and contribute nothing toward the public good provision. Previous experimental results indicate that the strong free-rider hypothesis is commonly rejected by experimental evidence; yet the level of contributions declines with repetition (Davis and Holt, 1993; Ledyard, 1995). A large portion of cooperative behavior cannot be explained by people's confusion with the game and should be attributed to their taste for cooperation (Andreoni, 1995; Palfrey and Prisbrey, 1997). Andreoni (1995) further suggests that the decline in contributions in the later periods of experiments is due to people's frustrated attempt at cooperation, rather than learning the free-riding incentives.

We investigate whether a high level of contributions can be sustained in groups of subjects who have been pre-selected on the basis of their altruistic inclinations. A number of recent studies consider the underlying preferences or values that might lead an individual to be more or less likely to contribute (Offerman et al., 1996; Roelofs and Sigler, 1998). These studies do not consider behavior in groups of subjects with similar value orientations. This is the task we undertake in our paper. In the first stage of our experiment, each subject responds to a psychology questionnaire that measures various dimensions of one's personality. The subjects are then matched in groups according to their altruism scores, and engage in a voluntary contributions mechanism (VCM) game. We consider whether the levels and dynamics of group contributions differ significantly between the groups of altruists and non-altruists.

2. Experimental Design

Five sessions, with 15 subjects each, were conducted at the University of Melbourne. Each session consisted of two parts, both computerized.² In the first part, the participants completed the Personal Meaningful Profile (PMP) questionnaire developed by Wong (1998). The questionnaire is composed of 57 questions that measure one's personality along several dimensions; each question is measured on 7-point scale, from 1 (not at all) to 7 (a great deal). The following nine questions were used to calculate each person's score for relationship, which was used as a proxy for altruism:

- 10 I care about other people
- 18 I relate well to others
- 27 I have a number of good friends
- 28 I am trusted by others
- 32 I am highly regarded by others

¹ Here we do not distinguish between "altruism" (utility-interdependency) and "warm-glow" (utility from the act of contributing). We use the term altruism to denote people's general taste for cooperation, referred to as "kindness" by Andreoni (1995).

² We are grateful to Jim Dang for developing a computerized version of the PMP questionnaire. The Arizona Science Laboratory software was used to conduct the VCM game.

- 41 I am altruistic and helpful
- 42 I am liked by others
- 45 I bring happiness to others
- 50 I contribute to the well being of others

The PMP is a relatively new instrument, but it has been shown to be high in both reliability and validity (Wong, 1998). For the relationship sub-scale used in this study, the reliability coefficient (Cronbach's Alpha) is .81. While no validity studies have been done on the sub-scales independently, the relationship sub-scale is high in content validity for altruism. The instrument allows for an unobtrusive assessment of altruism, as well as other personality factors that are potentially relevant to selfless actions.

In the second part of the experiment, the subjects in each session were matched into three groups of five based on their altruism scores, and participated in 20 periods of a standard VCM game. No explanation was given on how the subjects were matched in groups, and no communication was allowed. The three-group design was employed to increase the difference in scores between altruistic and non-altruistic groups and to improve score homogeneity within groups.³ In each period of VCM each participant had to allocate 50 tokens between a private and a public fund. The marginal per capita return (MPCR) was set at 0.4.⁴ The average total pay out per participant was \$19 (Australian dollars).

3. Results

Among the 75 participants, the individual altruism scores ranged from 36 to 63, with a mean of 49.04, and a standard deviation of 5.71. Individual contributions to the public fund ranged from 0 to 100%, with a mean per period per subject of 39.5%, and a standard deviation of 34.8%. Figure 1 and table 1 summarize the group data. The most “altruistic” groups are indexed by “A”, intermediate score groups are indexed by “B”, and the least “altruistic” groups are indexed by “C”.

First note that the levels and dynamics of VCM games were consistent with previous experimental evidence. Average group contributions ranged between 17.7% to 63.9%, with the mean of 39.5%. Also in accordance with previous findings, group contributions declined from the first ten to the last ten periods in 13 out of 15 groups.

Consider the relationship between the “altruism” scores and levels of contribution in VCM. From figure 1 and the summary row of table 1, we observe that, overall, the average contributions of “altruistic” groups “A” are above the average contributions of “non-altruistic” groups “C” (45.3% and 38.7% of endowments, respectively). However, this relationship is not consistent across all sessions: while in sessions 1-3 the “altruists” contributed on average more than “non-altruists”, the opposite is true for sessions 4 and 5.

³ We initially conducted three 10-person sessions dividing the subjects into two groups. We observed no differences in the contributions of higher-score and lower-score groups; see Ma et al. (2000).

⁴ See Ledyard (1995) for a detailed explanation of MPCR.

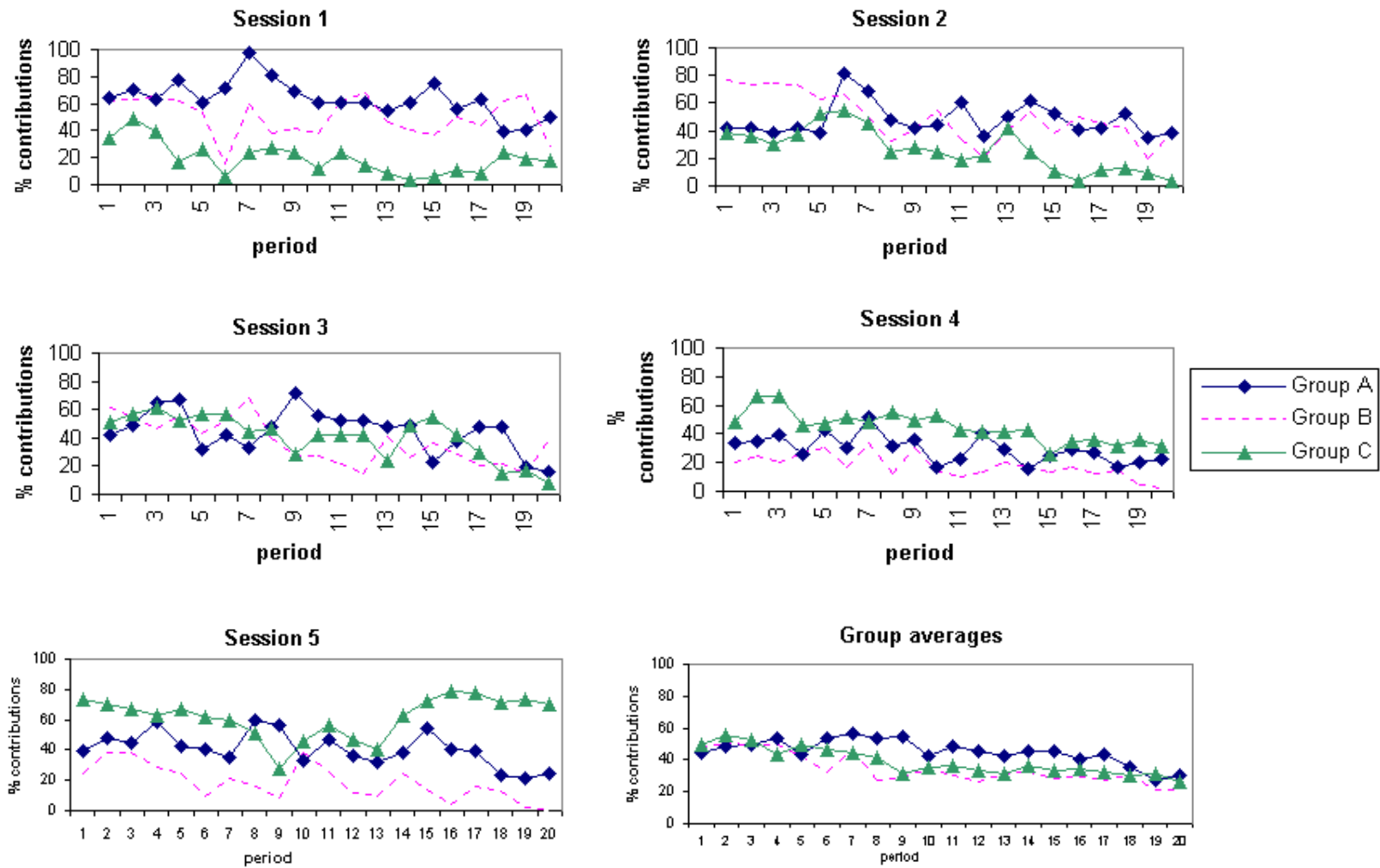


Figure 1. Dynamics of group averages.

Table 1. Summary of experimental results

	Session score			Group score			Group contribution, %				
	Mean score	Min score	Max score	Mean score	Min score	Max score	Mean contr.	First period	First 10 periods	Last 10 periods	Rate of change
Group 1A				56.8	52	63	63.9	64.8	71.7	56.1	-0.76
Group 1B	51.53	39	63	52.4	49	55	50.2	62	50	50.4	-1.83
Group 1C				45.4	39	48	19.7	34.4	25.8	13.6	-0.86
Group 2A				50.8	48	55	47.8	41.6	48.6	47	-0.15
Group 2B	46.8	42	55	46.4	45	48	48.9	76.8	60.4	37.2	-2.04
Group 2C				43.2	42	44	26.5	38.8	37.2	15.8	-1.83
Group 3A				51.8	48	58	44.8	42.4	50.5	39.2	-1.36
Group 3B	44.8	36	58	43.4	42	45	37	61.2	47.6	26.4	-1.16
Group 3C				39.2	36	41	41	50.1	49.5	32.4	-2.25
Group 4A				56.2	55	58	29.4	33.6	34.1	24.6	-0.61
Group 4B	52.2	38	58	52	50	54	17.7	20	23	12.4	-0.93
Group 4C				48.4	38.4	49	45	48.8	53.2	36.7	-0.91
Group 5A				56	52	62	40.8	39.2	45.8	35.7	-0.76
Group 5B	49.87	39	62	49.6	47	51	18.3	24.4	24.7	12	-1.28
Group 5C				44	39	46	61.6	73.2	58.6	64.6	-0.17
Group A pooled				54.3	48	63	45.3	44.3	50.1	40.5	-0.73
Group B pooled	49.04	36	63	48.8	42	55	34.4	48.9	41.1	27.7	-1.45
Group C pooled				44	36	49	38.7	49.1	44.9	32.6	-1.2

Note: In session 1, due to a subject assignment error, the minimal score is group 1A was below the maximal score in group 1B. Still, importantly, the gap in scores between the “A” and the “C” group remained positive.

According to the Mann-Whitney test, the average contributions in the “A” groups were higher than in the “C” groups at the significance level of 27.4% only (one-sided).⁵ We also note that, surprisingly, in three out of five sessions (sessions 3-5), the first period contribution of the “non-altruistic” group was higher than that of the “altruistic” group.

Although the groups were ranked by their scores within each session, a perfect ranking of “altruistic” and “non-altruistic” groups could not be guaranteed across sessions: for example, the mean score of the “intermediate” group 1B was higher than the mean score of the “altruistic” group 3A. To address this problem, we considered correlation between the group scores and group contributions, with each group taken as an independent observation (15 observations total). The results are presented in table 2. Generally there is a weak positive correlation between both average and maximum scores and contributions, except for the first period contributions. However, none of the correlation coefficients are statistically significant according to the *t*-test.

⁵ An alternative test is to compare the group contributions in 5 top ranking by score groups (across sessions) with those in 5 lowest ranking groups. According to the Mann-Whitney test, the null hypothesis of no differences is sustained at 42.1% significance level (one-sided).

Table 2. Correlation between group scores and average per person contribution in a group

Number of obs:15	Average contribution	1 st period contribution	First ten periods contribution	Last ten periods contribution	Per period rate of change
Average group score	0.112	-0.244	0.037	0.169	0.421
Min. group score	-0.004	-0.262	-0.059	0.043	0.268
Max. group score	0.208	-0.186	0.135	0.257	0.420

Table 3. Correlation between individual scores and contributions

Number of obs: 75	Average contribution	1 st period contribution	First ten periods contribution	Last ten periods contribution	Per period rate of change
Individual score	0.07	-0.097	-0.004	0.138	0.155

Correlation was generated for the individual scores as well. As can be seen from table 3 the relationship here is also extremely weak.

We next turn to the relationship between the altruism scores and the dynamics of group contributions. The average per period rates of change in contributions and the corresponding correlation coefficients are displayed in the last columns of tables 1-3. Consistently with our conjecture, we observe that, overall, the contributions in “altruistic” groups declined slower than those in “non-altruistic” groups; the rate of change in contributions was 0.73 percentage points per period in groups “A”, as compared to 1.20 percentage points in groups “C”. The correlation coefficients between the rate of change in contributions and the average and maximal group scores are 0.421 and 0.420, respectively (table 2); both are significant at 10% level according to the *t*-test (one-sided). The Mann-Whitney test shows that the rate of contributions decline in altruistic A-groups was lower than in non-altruistic C-groups at 11.1% level (one-sided). We conclude that the relationship between the scores and the rates of contribution change was noticeable overall, but there was still a significant heterogeneity in this respect across sessions.

4. Discussion

The results show that there is only a weak relationship between people’s altruistic predisposition, as measured by the PMP questionnaire, and their behavior in public good VCM games. We find that overall “altruistic” groups displayed a higher level of contributions than “non-altruistic” groups; however, the difference between the two types of groups was not statistically significant. “Altruistic” groups exhibited a slower rate of decrease in contributions than “non-altruistic” groups. Still, contributions of all groups declined with repetition. In contrast with our conjecture, we find that higher altruism did not result in higher contributions in the first period of the VCM; this may be due to subjects’ initial confusion with the game. The results suggest that, at least for inexperienced subjects, the underlying values do not affect the level of contributions as such, but they may influence the contribution dynamics.

There may be several reasons why altruism, as measured by the PMP questionnaire, did not prove significant in explaining behavior in the VCM game. First, this may be due to insufficient variance in altruism scores between “altruistic” and “non-altruistic” groups. Further research is necessary to investigate whether increasing the gap in altruism scores between altruist and non-altruist groups would result in a stronger relationship between underlying values and behavior in the VCM game. Second, it is possible that direct screening instruments, such as the PMP questionnaire that we use, are less effective in measuring people’s values than alternative indirect instruments. Offerman et al. (1996) use an incentive compatible instrument to measure subjects’ value orientations, and find significant differences in the behavior of subjects with different values in step-level public goods experiments.⁶ Finally, people’s altruism, as opposed to reciprocity or taste for fairness, may not play a large role in voluntary contributions games. Psychology research shows that personality measures have at best low correlation with behavior in particular tasks, unless the personality measures are tailored to this task (e.g., Mischel, 1990).

It would be interesting to compare the behavior of subjects sorted on the basis of altruism as measured in this study, with the behavior of subjects sorted on the basis of some other individual difference measure. This could be a measure of trust, taste for fairness, belief in reciprocity, or actual past behavior. Fehr and Schmidt (1999) and Bolton and Ockenfels (2000) show that fairness and reciprocity can be used to explain behavior in public good and other games. Gunnthorsdottir et al. (1999) demonstrate that subjects may be effectively sorted into cooperators and free-riders on the basis of their first period contributions in the VCM. In contrast, our results show no correlation between individuals’ altruism scores and their first-period contributions. Gunnthorsdottir et al. further report that sorting subjects in groups based on their past contributions improves group contribution dynamics. These authors interpret cooperation as coming from self-interested reciprocity rather than altruism. It is then quite possible that contributions in public good experiments are driven by self-interest at least as much as by underlying taste for cooperation. Comparing behavior of subjects sorted into groups on the basis of altruism scores with those sorted on the basis of first-period contributions within one study would shed further light on this issue.

References

- Andreoni, J. (1995) “Cooperation in public-goods experiments: Kindness or confusion?” *American Economic Review* **85**, 891-904.
- Bolton, G., and A. Ockenfels (2000) “ERC: A theory of equity, reciprocity and competition” *American Economic Review* **90**, 166-193.
- Burks, S., J. Carpenter, and E. Verhoogen (2002) “Playing both roles in the trust game” *Journal of Economic Behavior and Organization*, forthcoming.
- Davis, D., and C. Holt (1993) *Experimental Economics*, Princeton University Press.
- Fehr, E., and K. Schmidt (1999) “A theory of fairness, competition and cooperation” *Quarterly Journal of Economics* **114**, 817-868.

⁶ Burks et al. (2002) report that in a trust game experiment, indirect measures of trust are better predictors of trust behavior than subjects’ direct self-assessment on trust.

Gunthorsdottir, A., D. Houser, K. McCabe and H. Ameden (1999) "Excluding free-riders improves reciprocity and promotes the private provision of public goods" University of Arizona Department of Economics Working Paper 99-02.

Ledyard, J. (1995) "Public goods: A survey of experimental research" in *Handbook of Experiment Economics* by J. Kagel and A. Roth, Eds., Princeton University Press.

Ma, L., K. Sherstyuk, M. Dowling and O. Hill (2000) "Altruism and voluntary provision of public goods" University of Hawaii Department of Economics Working paper 00-13.

Mischel, W. (1990) "Personality dispositions revisited and revised: A view after three decades" in *Handbook of Personality: Theory and Research* by L. Pervin, Ed., New York: Guilford Press, 111-134.

Offerman, T., J. Sonnemans, and A. Schram (1996) "Value orientations, expectations and voluntary contributions in public goods" *Economic Journal* **106**, 817-845.

Palfrey, T., and J. Prisbrey (1997) "Anomalous behavior in public goods experiments: How much and why?" *American Economic Review* **87**, 829-846.

Roelofs, M., and T. Sigler (1998) "Individualism, collectivism and the public good: The use of survey evidence from an economic experiment" Mimeo, Western Washington University.

Wong, P. (1998) "Implicit Theories of Meaningful Life and the Development of the Personal Meaningful Profile" in *The human quest for meaning: A handbook of psychological research and clinical applications* by P. Wong and P. Fry, Eds., Englewood Cliffs, NJ: Lawrence Erlbaum Associates, 111- 140.