

Public Goods Game: Communication Effects

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Abstract

A. This paper discusses the results obtained in an iterated public goods game. Two treatments, 5 periods each, were ran. The first treatment had a MPCR of 0.25 and the second had a MPCR of 0.5. After the 3rd period of both treatments, participants were given the opportunity to communicate. The expectation was that communication would result in increased cooperation. Sure enough, average cooperation peaked significantly during the 4th period of both treatments.

I. INTRODUCTION

Public goods are goods that are non-excludable and non-rival. These goods present an inherent problem because there is an incentive to "free ride", using the good without paying for it. Since there are incentives to simply use the good and not pay for it, the provision of a public good is normally socially sub-optimal. The goal of this experiment is to estimate the average contribution towards a public good, and observe if communication leads to higher rates of contribution, as we hypothesize it will.

II. RUNNING THE EXPERIMENT

The experiment consisted of two treatments, with each treatment lasting five rounds. Before the first round players were given four playing cards, two red cards and two black cards. At the beginning of each round, each player anonymously submitted two cards of their choice to the testers, who placed those two cards in a communal stack. For every red card submitted to the stack, all players received an additional payoff of \$1. If players

chose to keep one of both of their red cards they personally received an additional payoff of \$4, meaning the MPCR for this treatment was 0.25. After each round, the players were informed of the total contribution for that round and were returned the same two cards they submitted, so players always began each round with two red and two black cards.

After five rounds we began the second treatment, which was another five round treatment of the same game with a variation in the payoffs. In the second treatment red cards submitted to the stack had the same payoff of \$1 to all participants, but the value of red cards kept dropped to \$2. This meant that the MPCR in the second treatment doubled to 0.5. After the third round of each treatment, we gave the players an opportunity to speak to their fellow participants regarding the game, and everyone who chose to speak encouraged others to submit red cards to the communal stack of cards.

III. RESULTS

In general, the data from the experiment replicates previous findings in public good games. Important differences were that the initial con-

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tribution rate was lower than typically observed and cooperative decay was not as dramatic. These differences are hypothesized to be due to our participants being composed of solely economics undergraduate students.

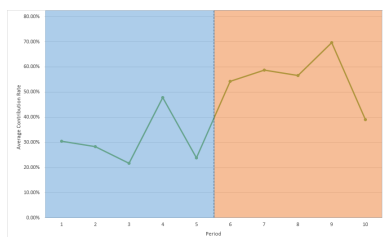


Figure 1: Average Contribution Rate Time Series (Blue=0.25 MPCR, Orange=0.5 MPCR)

Changing the MPCR has a strong effect as can be observed in the above figure (Figure 1)¹, that average contribution level is consistently higher in the second treatment. Given the two MPCR levels, the trend follows each other quite well. An important thing to notice is that the speeches allowed after periods 3 and 8 has a strong effect in encouraging contributions. there is a sharp spike in the contribution level which leads to the highest level of contribution for both treatments (Figure 2). However, this effect is short lasting, and contribution levels drop sharply during the last period of each treatment, periods 5 and 10 respectively.

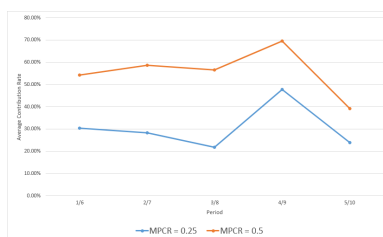


Figure 2: Contribution Rates with Varying MPCR

The results agree with our hypothesis that allowing participants to give speeches leads to higher contribution rates. The average cooperation rates also seem to agree with the results published in "Isaac, Walker, and Williams

(1992)". We can't definitively say this as they used different MPCR and N values in their treatments. However, we can say that raising the MPCR from 0.25 to 0.5 significantly increased the average contribution, which agrees with their:

Observation 1. Lowering the MPCR from 0.75 to 0.3 appears to increase significantly the incidence of free riding behaviour

The following tables (Figures 3 & 4) show the number of red cards collected, number of black cards collected, and the average contribution rates per period. These tables are given to help illuminate the results plotted in Figures 1 & 2.

Period	1	2	3	4	5
Red Cards	14	13	10	22	11
Black Cards	32	33	36	24	35
Average Contribution	30.43%	28.26%	21.74%	47.83%	23.913%

Figure 3: Contribution, MPCR=0.25

Period	6	7	8	9	10
Red Cards	25	27	26	32	18
Black Cards	21	19	20	14	28
Average Contribution	54.35%	58.70%	56.52%	69.57%	39.13%

Figure 4: Contribution, MPCR=0.5

IV. FUTURE EXPERIMENT

I. Introduction

After conducting our experiment on public goods and contribution rates, we became more curious about what kind of factors might cause individuals to contribute at different rates. One area that piqued our interest the most, was to look at differences between assigned endowments and earned ones. We wanted to know, would individuals who had to work for a high endowment rate be less generous in their contributions to the public good than those who were assigned a high endowment? Furthermore, we want to know the motivating factors behind the contribution to public goods; and if the answer to the previous question is yes,

¹All figures provided in large format at the end of the paper

we also want to know what the implications are on the theory that one of the main driving factors behind contributions to public goods games is kindness.

II. Hypothesis

We hypothesize that people who work to earn their higher endowment will in fact be less willing to contribute towards the public good than those who are assigned their high endowment. We also then believe, given that the first hypothesis is correct, that kindness is not the motivating factor behind contributions and there could instead be another non-confusion factor, likely a strong belief in equity. As seen in past experiments like the modified dictator game used in "List (2007)", people try to act equitably until you make a wider spectrum of actions feel equitable, where people then get increasingly more selfish, we believe that earning a high endowment would create the same effect.

III. Experimental Design

To test out our hypothesis, we would set up two treatment groups comprised of different people in a computer lab as follows:

Treatment 1: Half of the participants would be randomly assigned a low endowment of \$5, while the other half of the participants would be randomly assigned a high endowment of \$10.

Treatment 2: Like before, half of the participants would be randomly assigned a low endowment of \$5, while the other half of the participants would be asked to complete a series of logic based problems in which they would earn the high endowment of \$10 for completing.

In both treatment groups, those who had been assigned the low endowment of \$5 would be told that they received an endowment of \$5 and nothing else. In treatment 1, the participants who were assigned the \$10 endowment would be told they were assigned the higher endowment while others were assigned lower, while those in treatment 2 would be told that they were earning the higher endowment and

that others had been assigned the lower endowment. For the participants who are selected to earn the high endowment, they will be asked to complete a series of logic based questions. Examples of the question asked will be similar to those often attached to other economics experiments run at UC Santa Barbara, such as:

There are 20 machines that can make 20 widgets in 20 minutes, how many minutes would it take for 100 machines to produce 100 widgets
And: a baseball bat and ball combine to cost \$1.10, the bat costs a dollar more than the ball, how much does the ball cost?

The key with these questions, is that we do not care if they get the answers right or wrong, but for subjects to feel like they earned their high endowment. Any questions too simple or trivial, and participants may not feel as though they have really earned the endowment, which is critical. And we do not want to have all participants competing against each other for the high endowment, because then there could be an issue with selection bias and the earned high endowment sample may no longer be random.

This experiment will be run as a one-shot game, to limit the effects and any confounding variables of coordination between players or cooperative decay. However, to avoid any potential confusion amongst subjects, there will be a practice round for everybody with equal endowments to help them learn how to play. The subjects will be told that it is purely a practice round.

To ensure our results aren't influenced by anything out of the ordinary, the MPCR will be set at .4 across both treatments, as that is often the standard MPCR used in public good experiments. In addition to that each group will consist of 10 participants, with 5 having the low endowment and 5 having the high endowment broken down as stated above. We will run at minimum 10 trials of both groups, so at least a total of 200 people will participate in our study.

IV. Analysis

While we will of course tally all of the contribution rates across all participants in both treatments, we will primarily be focusing our analysis on the data we get in the differences in contribution rates amongst those who earned the high endowment and those who were randomly assigned the high endowment. Analyzing these results should be relatively easy, as we can strictly just look at the percentage contribution rate in treatment 1 of the high endowment participants and subtract the percentage contribution rate of the earned high endowment participants in treatment 2.

It is important to note that our study differs from "Houser and Kurzban (2002)", which aimed to separate kindness from confusion. Our study aims to separate people's preferences for equity from kindness. By earning the high endowment, we theorize that inequity is less of a concern for individuals as they feel it is money that is rightfully theirs to keep as opposed to when they have been randomly assigned a high endowment.

V. CONCLUSION

Through our experiment, our group was able to observe and analyze the fascinating and socially relevant phenomenon of public goods. By running an experiment in which social optimality was obtained through cooperation but individual payoffs were maximized by non-cooperation, we were able to simulate a sce-

nario faced by many individuals when deciding whether or not to contribute to a public good. Looking at the results, the most telling statistic is that contribution levels were higher in the second treatment across every round. This is hardly shocking, as contribution level are expected to be higher in a treatment with a higher MPCR. In both treatments contribution levels peaked in the fourth round, which suggests that the communication between subjects encouraged cooperation. However both treatments also experienced a massive drop in contribution in the fifth and final round.

To further analyze the nuances of public good games, our group thought of a modification to the standard public good experiment in which some subjects would be assigned higher initial endowments than others. This would be done in two treatments, one treatment with higher endowments assigned randomly and one treatment with higher endowments earned through completion of a short quiz. We would then compare the public good contribution rate of the subjects with higher endowments across the two treatments in order to see if the process of earning a higher endowment has any effect on a subject's willingness to contribute. By creating, conducting and analyzing public goods experiments, economists can begin to understand what motivates people to contribute to public goods. Understanding such motivations can be crucial when it comes to reaching socially optimal levels of public good contribution in the real world.

VI. FIGURES

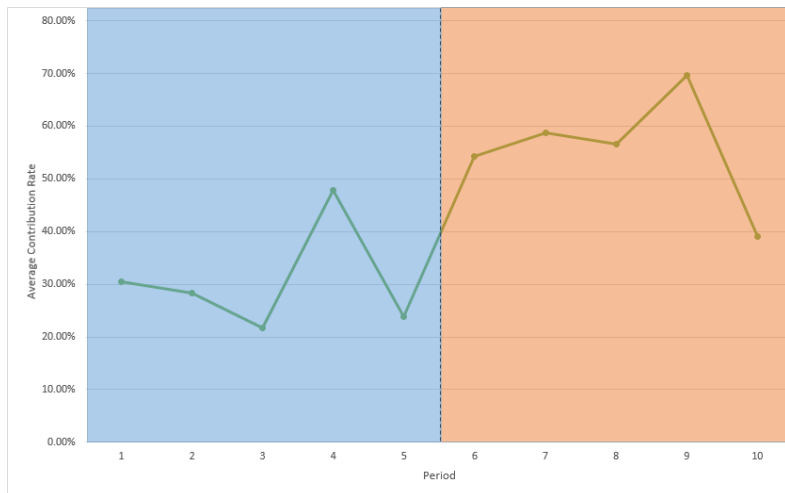


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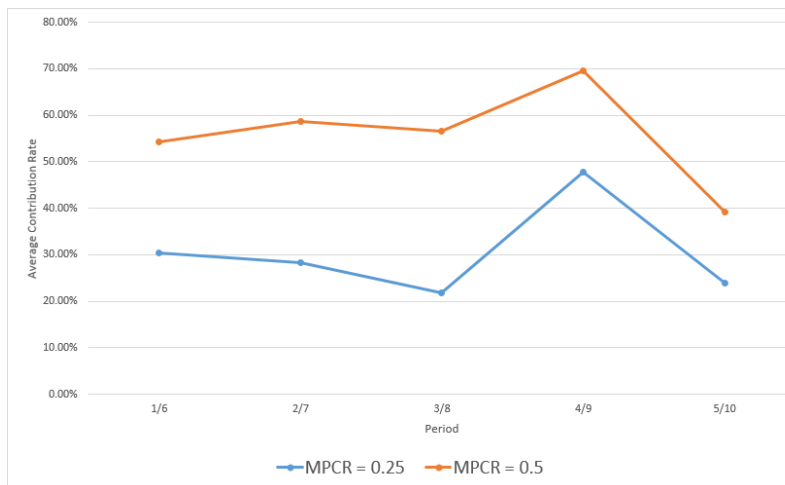


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Figure 4: *Contribution, MPCR=0.5*