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Cooperators and reciprocators: A within-subject analysis of pro-social behavior

Aurelie Dariel [a,b], Nikos Nikiforakis [c,*]

[a] Department of Economics, University of Bern, Schanzeneckstrasse 1, P.O. Box 8573, CH-3001 Bern, Switzerland
[b] Department of Economics, Maastricht University, P.O. Box 616, 6200 MD Maastricht, The Netherlands
[c] Department of Economics, New York University Abu Dhabi, P.O. Box 129188, Abu Dhabi, United Arab Emirates

HIGHLIGHTS

- We present a within-subject analysis of pro-social behavior.
- Subjects play a public-good and a gift-exchange game.
- Cooperators reciprocate higher wages, but not non-cooperators.

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ABSTRACT

We perform a within-subject analysis of pro-social behavior in the public-good and gift-exchange game. We find that participants classified as cooperators in the public-good game tend to reciprocate higher wages in the gift-exchange game with higher levels of effort. Non-cooperators do not exhibit such tendency. Both types offer similar wages.

1. Introduction

Behavioral economists have developed models of social preferences to provide a parsimonious explanation for the pro-social behavior observed in a wide range of games (e.g., Charness and Rabin, 2002; Fehr and Schmidt, 1999). Although these models have been used extensively by experimental economists to obtain theoretical predictions for their studies, there is hardly any evidence about the correlation of pro-social behavior across strategically different games at the individual level. Our study contributes to filling this gap in the literature.

We utilize a within-subject design to compare behavior in two of the most widely-studied games in the literature: the linear public-good game and the gift-exchange game. The games share an important property. They are both social dilemmas with a unique, inefficient Nash equilibrium under the standard assumptions. At the same time, they are strategically different. The public-good game is a simultaneous-move game, whereas the gift-exchange game is a sequential-move game. Therefore, they seem a natural starting point for a within-subject comparison of pro-social behavior.

Our goal is to investigate whether individuals who behave pro-socially in one game are also more likely to behave pro-socially in the other. The aforementioned models of social preferences assume this to be the case. For example, individuals who dislike inequality in earnings or care strongly for the welfare of the worse-off member in their group should be willing to reciprocate high wages in the gift-exchange game and to contribute to the public good if others do the same, all else equal. If we fail to find a correlation of pro-social behavior at the individual level, this will raise questions about whether social preferences are the cause of deviations from the standard predictions.

* Corresponding author. Tel.: +971 26284882.
E-mail addresses: aurelie.dariel@vwi.unibe.ch (A. Dariel), nikos.nikiforakis@nyu.edu (N. Nikiforakis).

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Despite the importance of such an analysis, there is only one study comparing pro-social behavior across strategically different games. Blanco et al. (2011) use four one-shot games (a modified dictator game, an ultimatum game, a two-person public-good game and a sequential prisoner's dilemma). The authors estimate individual Fehr–Schmidt utility functions and test their predictive power. While Blanco et al. find significant correlations of pro-social behavior across games, they also report a multiplicity of motives driving this behavior which cannot be easily accounted by a single behavioral model. For this reason, in our analysis below, we restrict ourselves to reporting correlations across games without focusing on a specific model. Our study complements that of Blanco et al. by using different games and protocols.

2. The experiment

A total of 96 students participated in the experiment (48 students in Maastricht and 48 in Bern University) that was conducted using z-tree (Fischbacher, 2007). Each of the eight experimental sessions consisted of 12 participants, and lasted between 70 and 90 min. Participants earned on average approximately 20 Euros. The instructions informed subjects that the experiment consisted of two parts, but they were unaware of the content of the second part until the first part was completed. Instructions are available at the corresponding author's website.

2.1. Part 1: the public-good game

In this part, subjects played a one-shot public good-game. The payoff of individual i was given by $\pi_i = 20 - g_i + 0.5\sum_{j=1}^{3} g_j$, where $g_i \in \{0, 1, \ldots, 20\}$ is i's contribution to the public account, and 0.5 is the marginal return from the public account. Subjects' contributions to the public account were elicited using the method of Fischbacher et al. (2001, FGF). In particular, participants had to decide on (i) an *unconditional contribution* to the public account and (ii) a *conditional contribution* for each possible (rounded) average contribution of the other two group members $(0, 1, \ldots, 20)$.

All decisions were incentive compatible. After all individuals made their decisions, the computer selected randomly two subjects in each group and their unconditional contribution was implemented. The contribution of the third group member was chosen based on their conditional contribution and the average unconditional contribution of the other two group members. Subjects did not receive feedback about the choices of the other group members until the end of the second part.

We chose to use the FGF method as it allows for a straightforward comparison of pro-social behavior in the public-good and the gift-exchange game. Unlike the unconditional contribution and similar to the second mover's decision in the gift-exchange game (see below), the conditional contribution is essentially belief-free. Therefore, this method provides ideal conditions for finding a correlation of pro-social behavior at the individual level.

2.2. Part 2: the gift-exchange game

In the second part, participants played a gift-exchange game for ten periods with random matching. In each period, the first mover (FM) had to decide a wage $w \in \{0, 5, 10, 15, \ldots, 100\}$ to offer to the second mover (SM), who upon seeing the wage, had to choose a level of effort $e \in \{1, 2, 3, \ldots, 10\}$. The cost of effort $c(e)$ is given in Table 1. FM's payoff was given by $\pi_{FM} = 10e - w + 50$, and SM's by $\pi_{SM} = w - c(e) + 20$. Roles remained fixed throughout this part.

There are several reasons for using a finitely-repeated rather than a one-shot gift-exchange game. One is that it allows learning about the incentives in the game. Assuming that pro-social behavior is driven by social preferences, this should reduce errors and increase the chance of finding significant correlations across the two games. Another reason is that the repeated interactions allow participants to learn from others' choices which should minimize the likelihood of a consensus effect (see Altmann et al., 2008; Blanco et al., 2011), that is, that pro-social individuals have overall more "optimistic" beliefs about the willingness of others to reciprocate high wages. Finally, this design allows us to examine at the individual level how individuals react to increases in wages.

Table 1
Cost of effort.

e	1	2	3	4	5	6	7	8	9	10
$c(e)$	0	1	2	4	6	8	10	12	15	18

3. Results

We first explore the relation between choices in the public-good game and SMs' behavior in the gift-exchange game. Based on models of social preferences, we anticipate that cooperative subjects in the public-good game will be more reciprocal on average than others. For our analysis, we classify subjects as *cooperators* or *non-cooperators*.[1] A cooperator is an individual who is willing to contribute more, the more other group members contribute.

Result 1. *Cooperators reciprocate higher wages with higher levels of effort in the gift-exchange game. The same does not apply for non-cooperators.*

Support: Over the ten periods of the gift-exchange game, subjects classified as cooperators received an average wage of 15.7 and exerted an average effort of 2.0. Non-cooperators received an average wage of 12.1 and chose an effort of 1.5. The differences are rather small, but the averages mask considerable variation in behavior. This can be seen in Table 2 which presents the results from a random-effects regression analysis with robust standard errors. The dependent variable is the effort exerted by the SM, while the independent variable of interest is the wage the SM received. Model 1 indicates that cooperators reciprocate higher wages with higher effort (p-value < 0.001). Model 2 illustrates that the relationship between effort and wage is much weaker and statistically insignificant for non-cooperators (p-value $= 0.329$). Model 3 shows that the difference in the responsiveness to higher wages across types is marginally insignificant at the 10-percent level (p-value $= 0.112$). This may seem surprising at first. As it turns out, the majority of observations involves $w \leq 20$. When $w \leq 20$, however, as effort increases so does inequality to the disadvantage of the SM. Thus, even pro-social SMs would be expected to choose $e = 1$. If we exclude observations with $w \leq 20$, in Model 4, we find that the difference in the responsiveness to higher wages across types is highly significant (p-value < 0.001). Finally, Models 5 and 6 replicate the findings in Models 1 and 2 using a Tobit specification and show that our conclusions are unaffected. Further analysis (not presented here) shows that Result 1 is robust if we focus on behavior only in period 1.[2]

[1] Following FGF, participants who have a positive Spearman-rank correlation – with respect to the contribution of others – that is significant at the 1-percent level are classified as "conditional cooperators". For brevity, we refer to them as *cooperators*. We pool *selfish* and *other* types in one category as there are few non-cooperators amongst second movers (cooperators: 39, selfish: 6; other: 3). Pooling the two types together, if anything, is expected to reduce the likelihood of finding significant differences between cooperators and non-cooperators.

[2] For completeness, we report that there is no significant correlation between effort in the gift-exchange game and the *unconditional* contribution in the public-good game (random-effects regressions: p-value > 0.50).