Economics Letters 121 (2013) 202–205

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

# A note on reciprocity and modified dictator games

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## HIGHLIGHTS

- We study behavior in modified dictator games.
- In our experiment the payoff-relevant game is chosen randomly or by the recipient.
- We do not observe reciprocal behavior when recipients choose the game.

## ARTICLE INFO

*Article history:*
Received 3 April 2013
Received in revised form
21 July 2013
Accepted 2 August 2013
Available online 14 August 2013

*JEL classification:*
C70
C91
D63

*Keywords:*
Modified dictator games
Reciprocity
Laboratory experiments

## ABSTRACT

This note presents results from modified dictator games in which the payoff-relevant game is either chosen randomly or by the recipients. We do not observe reciprocal behavior when recipients choose the game: Dictators do not condition their donations on the game chosen by recipients.



## 1. Introduction

Numerous experimental studies of different games have observed behavior that can be regarded as reciprocal. High wages are rewarded with high effort in gift exchange games (Fehr et al., 1993), trusting behavior is not exploited in investment games (Berg et al., 1995) and unfair offers are rejected in ultimatum games (Güth et al., 1982). These now classic observations have lead to several theories that try to capture the underlying motivations of this behavior by assuming inequality aversion (e.g., Bolton and Ockenfels, 2000, Fehr and Schmidt, 1999) and reciprocity (e.g., Charness and Rabin, 2002, Dufwenberg and Kirchsteiger, 2004, Falk and Fischbacher, 2006).

However, the empirical evidence for reciprocal motivations is mixed. For example: On the one hand, Charness (2004) observes little negative reciprocity and no positive reciprocity in a gift-exchange experiment that compares randomly generated wages to wage offers made by the subjects acting as principals. On the other hand, Cox (2004) finds that 58% of the money returned in the investment game is due to positive reciprocity when comparing behavior in investment games to dictator games. See Fehr and Schmidt (2006) and Cooper and Kagel (in press) for recent surveys of related results.

In this paper, we study the role of intentions and reciprocal behavior in the modified dictator games introduced by Andreoni and Miller (2002). Using modified dictator games Andreoni and Miller (2002) show that giving in dictator games can be rationalized with well-behaved utility functions. After their introduction these games quickly became an established workhorse in the study of other-regarding behavior (see, e.g., Brosig et al., 2007, Fisman et al., 2007). We argue that modified dictator games also lend themselves to the study of reciprocal behavior. It is well known that donations in dictator games are a highly sensitive tool for identifying subtle influences on behavior: Donations are easily influenced by changing the formulation of the instructions (e.g., Hoffman et al., 1996, Brañas-Garza, 2007), by adding social cues to the

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0165-1765/$ – see front matter 
http://dx.doi.org/10.1016/j.econlet.2013.08.004

**Table 1**
Modified dictator games.

| Game | $\pi$ | Payoff distributions (in Euro-Cent) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 1 | $\pi^A$ | 500 | 575 | 650 | 725 | 800 | 875 | 950 | 1025 | 1100 | 1175 | 1250 |
| | $\pi^B$ | 500 | 450 | 400 | 350 | 300 | 250 | 200 | 150 | 100 | 50 | 0 |
| 2 | $\pi^A$ | 500 | 550 | 600 | 650 | 700 | 750 | 800 | 850 | 900 | 950 | 1000 |
| | $\pi^B$ | 500 | 450 | 400 | 350 | 300 | 250 | 200 | 150 | 100 | 50 | 0 |
| 3 | $\pi^A$ | 500 | 525 | 550 | 575 | 600 | 625 | 650 | 675 | 700 | 725 | 750 |
| | $\pi^B$ | 500 | 450 | 400 | 350 | 300 | 250 | 200 | 150 | 100 | 50 | 0 |

**Table 2**
Treatments.

| Treatment | Step 1 | Step 2 | Step 3 | Step 4 | Subjects |
|---|---|---|---|---|---|
| *Random* | Instructions | Dictators choose allocation.<br>Game is selected at random. | Recipients indicate expected allocation. | Result display and questionnaire | 42 |
| *Choice* | Instructions | Dictators choose allocation.<br>Recipients select game. | Dictators indicate expected game.<br>Recipients indicate expected allocation. | Result display and questionnaire | 46 |

instructions (e.g., Haley and Fessler, 2005, Rigdon et al., 2009), or by varying the social distance between dictators and recipients (e.g., Bohnet and Frey, 1999, Burnham, 2003). Based on the evidence, we expect that kind receiver behavior increases donations and unkind receiver behavior decreases donations if reciprocal motivations are present.

In the standard dictator game (Forsythe et al., 1994), the budget line has a slope of $-1$ because every cent the dictator gives to the recipient reduces his own payoff by exactly this cent. In the modified versions of the game the slope of the budget line (i.e., the price of keeping or giving away money) varies. Andreoni and Miller (2002) confronted subjects with nine or eleven dictator games differing in the amount of money available to share and the slope of the budget line. They randomly selected the payoff-relevant games. We make two main changes to their experimental setup. First, we limit ourselves to three dictator games: (i) a dictator game variant with a high price of giving away money and a maximum dictator payoff of 12.5 Euro, (ii) a standard dictator game with a maximum dictator payoff of 10 Euro and (iii) a dictator game variant with a low price of giving away money and a maximum dictator payoff of 7.5 Euro. Second, we introduce a treatment in which receivers choose the payoff relevant game. Although intentions cannot be observed directly, we conjecture that choosing the first game will be regarded as a kind move, choosing the third game as an unkind move. To test for an influence of intentions we compare behavior in this variation to the setting with randomly selected games.[2]

## 2. Experimental design

Half of the subjects in our experiment acted as dictators and the other half as recipients. Dictators chose a payoff distribution in three modified dictator games that differed in the price of giving $p$. Only one of these games was selected to be relevant for final payoffs. In each of the three games, starting with the initial endowment $(\pi^A, \pi^B) = (500, 500)$, the dictator (player A) could reduce the recipient's (player B's) payoff by $d\pi^B$ in order to increase his own payoff by $d\pi^A$ at a constant relative price of $p = |d\pi^A/d\pi^B|$, such that $\pi^A = 500 + p(500 - \pi^B)$.[3] Accordingly, the budget line has a slope of $-p$. The three games only differ with respect to this slope: $p = 3/2$ in game 1, $p = 1$ in game 2 and $p = 1/2$ in game 3. Except for the equal payoff distribution of the initial endowment, the dictator is assured a higher payoff than the recipient in all other attainable payoff distributions. Table 1 presents the three resulting modified dictator games.

In the spirit of Selten's strategy method (Selten, 1967) dictators made their choices in all of the three games. Only at the end of the experiment did they learn about the selected game. Depending on the treatment, the payoff-relevant game was selected at random (*Random*) or by the recipient (*Choice*). In the former treatment each game was equally likely. In the latter treatment recipients were ignorant of the dictator's choice when selecting the game. All players were informed about the procedure in their respective treatment. Additionally, we asked recipients about the expected donation and dictators in the *Choice* treatment about the expected choice of game. The two treatments and the order of events are summarized in Table 2.

We ran the experiment in three sessions. In each session both treatments were conducted at the same time in separate rooms of the laboratory. After their arrival all subjects randomly drew a ball from an urn indicating their seat in one of the two rooms. This draw also determined whether they would act as a receiver or a dictator. The experiment was conducted using zTree (Fischbacher, 2007) and subjects were recruited with Orsee (Greiner, 2004). We paid subjects their earnings from the selected game plus a 5 Euro show-up fee using a double-blind procedure similar to that employed in Ockenfels and Weimann (1999) and Brosig-Koch et al. (2011).

## 3. Results

First of all, game 2 in the *Random* treatment resembles a standard dictator game with the restriction that dictators can give at most half of their endowment. The results are in line with previous dictator game studies: Dictators keep on average 8.36 of their 10 Euro, but most do not behave completely selfish. Only 38% of dictators keep the whole pie and 5% share the endowment equally.[4]

How does behavior change when we modify the standard game and change the price of giving? When giving becomes more expensive in game 1, dictators keep more for themselves (9.82

[2] The first to test for the role of intentions using a random device was Blount (1995). Since then this approach has commonly been applied in experiments (see, e.g., Offerman, 2002, Charness, 2004, Falk et al., 2008).

[3] Accordingly, the game was framed as a take game and dictators were asked by how much they "want to reduce the payment to player B". See the online Appendix for screenshots of the instructions and the games.

[4] Comparing these observations to the results of a recent meta-study by Engel (2011), our subjects appear to be slightly more selfish. Based on 131 dictator game studies Engel reports an average donation of 72%. He observes that 36% of subjects donate nothing and 22% donate half of the pie or more.

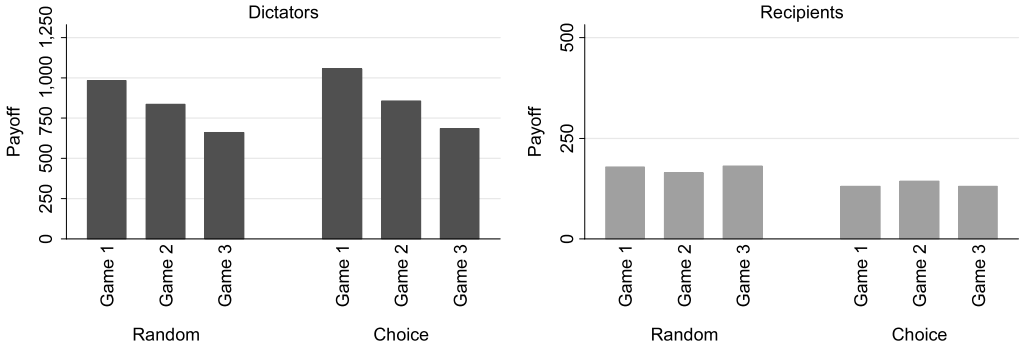


**Fig. 1.** Payoff distributions.

Euro); when giving becomes cheaper in game 3, they keep less (6.60 Euro). Applying two-tailed Wilcoxon tests to compare dictator payoffs between games, these differences are revealed to be significant ($p < 0.001$). However, there is no tendency to equalize payoffs. Instead dictators claim all efficiency gains from games 1 and 2 for themselves: The amount left to recipients is approximately the same in all three games (1.75 Euro on average, $p \geq 0.663$).

How does behavior change when recipients choose the payoff-relevant game in the *Choice* treatment? Based on Fig. 1 the answer appears to be little. Now, dictators keep 10.54 Euro in game 1, 8.57 Euro in game 2 and 6.85 Euro in game 3. Again, reactions to price changes are significant ($p < 0.001$) and in this treatment the recipients also earn the same in all three games (1.35 Euro on average, $p \geq 0.249$).[5]

In order to identify whether dictators react to the intentional choice of a game, we run the following random-effects Tobit regression on dictator $i$'s donation ${\pi_{ij}}^B$ in game $j$

$$ {\pi_{ij}}^B = \beta_0 + \beta_1 \cdot p_j + \beta_2 \cdot Choice_i + \beta_3 \cdot p_j \cdot Choice_i + \eta_i + \varepsilon_{ij}, $$

where $\eta_i$ and $\varepsilon_{ij}$ are independently and normally distributed error terms and $Choice_i$ is a dummy variable indicating the treatment. The lower bound on the recipient's payoff is 0 Euro-Cents and the upper bound 500 Euro-Cents.

If intentionality drives donations, we would expect a significant and positive coefficient $\beta_3$ for the interaction effect: The donations of a reciprocal dictator increase more strongly with $p$ if the game is chosen intentionally. That means, we test the one-sided null hypothesis that $\beta_3 \leq 0$. However, all of the model's coefficients – including $\beta_3$ – turn out to be insignificant at any conventional level ($\hat{\beta}_0 = 104.25$, SE $= 81.80$; $\hat{\beta}_1 = -9.34$, SE $= 34.35$; $\hat{\beta}_2 = -59.04$, SE $= 111.76$; $\hat{\beta}_3 = 6.80$, SE $= 47.41$). Thus, we are not able to reject the null hypothesis.

In other words: Dictators do not condition the size of their donation on the way the game is selected. However, this conclusion rests on the acceptance of the null hypothesis. We therefore conduct a power analysis of the Tobit model described above. By design the smallest behavioral difference our experiment is capable to detect corresponds to a payoff difference of 50 Euro-Cents in the recipient's payoff between games (cf., Table 1). We chose this increment to make the results comparable to previous studies (e.g., Brosig et al., 2007). Additionally, we think that smaller increments may not be economically significant and may not be salient enough for subjects.

[5] Individual patterns of behavior are also similar across treatments. In *Random* 95% of the dictators obey the law of demand including 33% of strictly selfish dictators. One dictator (5%) always shares equally. In *Choice* 91% of the dictators obey the law of demand including 35% of strictly selfish dictators. One dictator (4%) always shares equally.

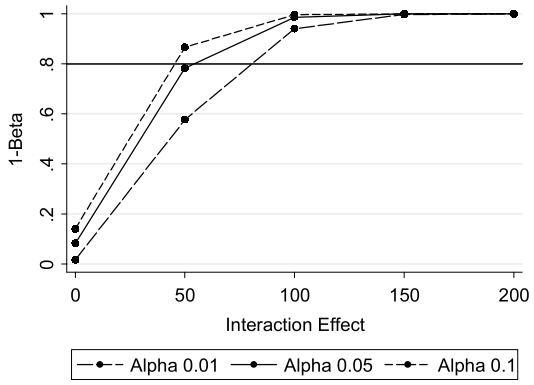


**Fig. 2.** Power estimates.

How large would the effect of intentions have to be, so it is reliably identified? To answer this question, we run simulations based on data sets with the same sample size as in our experiment that are generated based on the parameter estimates $\hat{\beta}_0$, $\hat{\beta}_1$ and $\hat{\beta}_2$, the observed error distribution and varying interaction effects. The data is generated so that the interaction effect $\beta_3$ corresponds to the increase in the recipient's payoff from game 3 to game 1. More precisely, we ran five simulations assuming that $\beta_3$ takes the values 0, 50, 100, 150 and 200. In each simulation run we randomly generated the data set accordingly, ran the Tobit regression and recorded the observed $p$-value for the estimate $\hat{\beta}_3$. We repeated this process 1000 times. The share of runs that reject the null hypothesis yields the estimated power $1 - \beta$ of the one-sided test. Fig. 2 displays the power estimates for the conventional significance levels $\alpha = 0.01, \alpha = 0.05$ and $\alpha = 0.10$. If applying a threshold of $\alpha = 0.05$, the regressions already yield a power of 0.77 for the smallest interaction effect of 50. Larger interaction effects are reliable identified with a power well above the 0.80 threshold that is typically applied.

How do recipients choose between the three games in the *Choice* treatment? If their choice is driven by the expectation of reciprocal dictator behavior, they should opt to maximize the dictator's attainable payoff and choose game 1. If their choice is driven by price considerations, they should choose game 3 in which giving is cheapest for dictators. Recipients choose game 2 most often (39%) and games 1 and 3 with the same frequency (30%) which is not significantly different from an equal distribution ($p = 0.840$, Chi-squared test).

## 4. Discussion

In this study, we present a variation to modified dictator games that allows responders to select one of three dictator games as payoff relevant. By choosing the game they can increase or decrease

dictators' maximum attainable payoff. It is a natural conjecture to regard the former as kind and the latter as unkind behavior. Reciprocal dictators would condition their donation on the choice of game and donate more if treated kindly and less if treated unkindly. However, donations are the same when the game is selected randomly and intentions cannot play a role. Moreover, recipients receive the same in all three games.

Our result is broadly in line with a number of studies that observe unkind moves to be punished less harshly when the strategy method is used in bargaining games (see, e.g., Brandts and Charness, 2003, Brosig et al., 2003, and the survey by Brandts and Charness, 2011). However, dictator game behavior is known to be highly sensitive to a number of subtle influences. In light of this evidence it is surprising that recipient behavior does not affect donations. In particular, the absence of any positive reciprocity is surprising. From the recipient's perspective game 3 (where the price for giving is lowest) seems to be a more promising choice than game 1 (where it is cheap for the dictator to be selfish). Therefore, choosing game 1 is a "nice" move by the recipient that should be rewarded by a reciprocal dictator. The fact that we do not observe any corresponding pattern of rewarding behavior indicates that reciprocity does not seem be at work in our experiment. An alternative explanation would be that interpreting recipients' choices of games may not be straightforward for dictators. If the choice is neither interpreted as kind or unkind, there is no reason for a reciprocal response.

## Appendix A. Supplementary data

Supplementary material related to this article can be found online at http://dx.doi.org/10.1016/j.econlet.2013.08.004.

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