Equal distribution or equal payoffs? Reciprocity and inequality aversion in the investment game

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Abstract

We report experimental evidence on second-movers' behavior in the investment game (also known as the trust game) when there exists endowment heterogeneity. Using a within-subject analysis, we investigate whether second-movers have a tendency to be reciprocal (i.e., they return to first movers at least what they have received from them), or exhibit some taste for inequality aversion (i.e., they return a larger (smaller) share of the available funds to first-movers who are initially endowed with a lesser (larger) endowment, respectively). Our results suggest that second-movers' behavior is consistent across distribution of endowments, what indicates that second-movers (on average) do not take into consideration the level of endowments when making their decisions. This finding, in turn, implies that subjects behave according to our definition of reciprocity and that inequality-aversion receives little support from our data.

JEL Codes: C72, C91, D3, D63

Keywords: reciprocity, inequality aversion, investment game, trust game, endowment heterogeneity

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1 Introduction

Models of inequality aversion (e.g., Fehr and Schmidt 1999, Bolton and Ockenfels 2000) have emerged as a useful tool for reconciling observed behavior in laboratory experiments with the standard assumption that individuals care only about their own material payoffs. Although intuitively attractive and capable of predicting behavior in many different settings, inequality aversion may sometimes be in conflict with other behavioral motives such as reciprocity (Cox 2004, Bereby-Meyer and Niederle 2005, Ciriolo 2007, Xiao and Bicchieri 2010). For example, if we look at the investment game (also known as the trust game) in Berg et al. (1995) and assume that subjects differ in their initial endowments, if the unequal distribution of endowments is in favor of the first-mover (hereafter, the investor, she) reciprocal behavior from the second-mover (hereafter, the allocator, he) may in fact induce more inequality. This type of situation is studied in Xiao and Bicchieri (2010), who show that allocators have a tendency not to pay back if doing so would increase inequality. Arguably, the allocator's decision can also reduce payoff inequality when his endowment is larger than the investor's. In that case, returning a large share of the available funds would lessen the difference in final payoffs. This may not necessarily be interpreted as reciprocal behavior but rather as a choice in pursuit of equality (i.e., allocators may dislike that their payoffs are ahead).

In this paper we use a within-subject design to investigate how allocators reciprocate the investors' decision when there is endowment heterogeneity. More specifically, we want to study whether (and how) allocators take into consideration differences in endowments when making their decision about the share of the available funds that they want to return.[1]

We consider that two driving forces may explain the allocator's behavior. The first, reciprocity, refers in our context to the allocator's willingness to pay back what he has received from the investor (see Coleman 1990, Ciriolo 2007). This, in turn, implies that reciprocity alone could not explain any effect of initial distributions on behavior, as reciprocal allocators should return the

[1]Hereafter, differences in endowments refer to differences in the amount that subjects receive in the experiment; i.e., we do not study any pre-existing differences in wealth.

same proportion of the surplus generated regardless of the level of endowments. As for second behavioral explanation, inequality-aversion, we consider that allocators may want to reduce the difference in final payoffs, so that they will return a higher share when investors are at a relative disadvantage with regard to the initial distribution of endowments, compared with the case in which they are at a relative advantage.

Our definitions of reciprocity and inequality aversion yield two clear-cut predictions of allocators' behavior depending on whether changing the initial distribution of endowments in our game affect the allocator's choices. We test these predictions using the behavioral data in Calabuig et al. (2013). Our data suggest that allocators make a division of the surplus generated that is consistent across the different distribution of endowments.[2] On average, allocators do not tend to compensate investors who are in a position of disadvantage with regard to the initial level of endowments, nor do they tend to keep a larger fraction of the available funds when they are in a disadvantage position. Allocators seem to return what they have received without accounting for differences in the initial endowments. These findings indicate that on average allocators are motivated by reciprocity rather than by a desire to equalize final payoffs.

Our paper is not the only paper that attempts to test inequality-aversion. Some evidence exists that subjects have a taste for egalitarian outcomes (e.g., Dawes et al. 2007, Korenok et al. 2012), although the idea of inequality aversion is sometimes rejected (e.g., Bereby-Meyer and Niederle 2005, Filippin and Raimondi 2014), especially when it is tested against other behavioral motives, such as efficiency (Kritikos and Bolle, 2001, Engelmann and Strobel 2004) or impure altruism (Chowdhury and Jeon, 2014). In the case of the investment game, some studies attempt to disentangle the different motives behind trust and reciprocity. These include the work of Cox (2004) or Ashraf et al. (2006) who assess the role of intentions, and investigate the importance of altruism and expectations on behavior (see also Fehr and Schmidt 2002, McCabe et al.

[2] Other behavioral motives, such as selfishness, are also possible and would predict no effect of initial endowments in the allocator's behavior. We should also account and test for this behavior.

2003, Cox et al. 2014). To the best of our knowledge, however, there is no direct test for inequality aversion in the investment game when the endowment of the investor and the allocator are systematically varied across different rounds of the experiment.[3] The closest paper to ours is Xiao and Bicchieri (2010), who compare allocators' behavior in a symmetric situation (where investors and allocators receive the same endowment), with behavior in an asymmetric situation (where allocators are given a lesser endowment). Besides some noteworthy differences in experimental design (e.g., they employ a between-subject analysis and constraint the investor's decision to be a binary choice) we also make allocators play with a higher endowment, so that we can test whether they are more willing to pay back if their action reduces inequality.[4]

The rest of the paper is organized as follows. In Section 2, we discuss the concepts of reciprocity and inequality aversion that we use in the paper, and we derive the two behavioral hypotheses that we test in our experiment. We outline our experimental design in Section 3. Our results are presented in Section 4. Section 5 concludes.

2 On the role of reciprocity and inequality-aversion in the investment game

Consider the investment game in Berg et al. (1995), where the investor (subject i) and the allocator (subject a) are assumed to be endowed with $e_i \geq 0$ and

[3] Other experiments that investigate investors' behavior in the presence of endowment heterogeneity include Glaeser et al. (2000), Anderson et al. (2006) or Greiner et al. (2007). In all these papers, the allocators' behavior (and, more specifically, the study of inequality versus reciprocity) is disregarded. The relevance of inequality aversion and reciprocity has also been studied in other games, such as the gift-exchange game (Falk et al. 2008) or the moonlighting game (Charness and Haruvy, 2002). See Charness and Shmidov (2014) for a recent review of the different games that have been used to elicit reciprocal motives.

[4] Another important difference relies on our definition of reciprocity. We ask allocators to return what they have received from investors for them to be considered as reciprocal. According to Xiao and Bicchieri (2010), any positive return from investors to allocators is interpreted as evidence in favor of reciprocity.

$e_a \geq 0$, respectively. In the first stage of the game, the investor has to decide the amount X in $[0, e_i]$ that she wants to send to the allocator. The allocator receives $3X$ and has to decide the percentage y in $[0, 1]$ of the available funds (3X) that he wants to return. The subjects' final payoffs in the game are computed as follows:

$\pi^i(e_i, X, y) := e_i + X(3y - 1) \geq 0$

$\pi^a(e_a, X, y) := e_a + 3X(1 - y) \geq 0$

Transfers between the investor and the allocator have been usually interpreted as evidence in favor of trust and trustworthiness (see Eckel and Wilson 2011, Johnson and Mislin 2011, Cooper and Kagel, 2013 for a review of the results). Our aim in this paper is to tease apart two plausible explanations for the allocator's behavior: reciprocity and inequality aversion.

We follow Coleman (1990) and Ciriolo (2007) and assume that reciprocity is fulfilled as long as the investor is not worse off than if she sent nothing; i.e., the investor should retrieve at least what she sent for the allocator to be defined as reciprocal.[5] Because we need the investor's payoff $\pi^i(e_i, X, y)$ to not fall behind her initial endowment, a minimum requirement for reciprocity is that the allocator returns a proportion $y = 1/3$ of the available funds. Interestingly, this implies that the reciprocal allocator should return a fixed proportion of the available funds, regardless of the amount that he received from the investor. In our experiment, we shall use two different level of the endowments $e_k \in \{10, 40\}$ for $k = i, a$. As a behavioral prediction, our concept of reciprocity implies that these values should play no role in the allocator's decision.

Reciprocity *If the allocator is reciprocal, he will return a share of the available funds that will not be affected by the level of endowments* (e_i, e_a)*, that is,*

$$y_{40,10} = y_{40,40} = y_{10,10} = y_{10,40}$$

One may argue, however, that inequality aversion may be an important motivation at stake. When the investor and the allocator differ in their initial

[5]Other models of reciprocal preferences include Rabin (1993), Charness and Rabin (2002), McCabe et al. (2003), Cox (2004), Dufwenberg and Kirchsteiger (2004), Falk and Fischbacher (2006) and Cox et al. (2007).

endowment, the allocator may want to equalize payoffs (Ciriolo 2007, Xiao and Bicchieri 2010). To build upon this possibility, we can consider that the allocator suffers a cost if his final payoff differ from the investor's one (e.g., Fehr and Schmidt 1999, Bolton and Ockenfels 2000). In particular, we can assume that the allocator wants to return a share of the available funds so as to maximize:

$$\underset{y\in[0,1]}{\text{maximize}} \quad \pi^a(e_a, X, y) - \frac{\alpha}{2}(\pi^a(e_a, X, y) - \pi^i(e_i, X, y))^2$$

If we take derivatives, we can see that the allocator should return a proportion of the available funds $y \in [0, 1]$ that takes into account both the amount that he receives from the investor (X) and the level of endowments. More specifically, the larger the difference between the allocator and the investor's endowment ($e_a - e_i$) the larger the share of the available funds that an inequality-averse allocator should return.[6] This, in turn, translates into the following behavioral prediction when we consider the two different level of the endowments $e_k \in \{10, 40\}$ for $k = i, a$ that are used in our experiment.

Inequality-aversion *If the allocator is inequality-averse, he will return a share of the available funds that will be affected by the level of endowments* (e_i, e_a)*, and the larger the difference between the allocator and the investor's payoffs* $(e_a - e_i)$ *the more he will return, that is,*

$$y_{40,10} < y_{40,40} = y_{10,10} < y_{10,40}$$

One aspect that is worth mentioning is that our concept of reciprocity implies not only that the return will be consistent across level of endowments but also that allocators will return (at least) one third of the available funds

[6] For this particular case, the optimal return is given by $y^* = \frac{2}{3} + \frac{e_a - e_i}{6X} - \frac{1}{12\alpha X}$, where $\alpha > 0$ indicates the extent to which allocators account for inequality in the final payoffs. If $\alpha = 0$ then the allocator can be said to be self-interested and the optimal return will be given by $y^* = 0$).

regardless of the distribution of endowments.[7] As for inequality aversion, the prediction for any particular distribution of endowments will depend on the utility function that we assume for allocators (i.e., the value of α). A plausible assumption is to consider that allocators want to equalize payoffs *up to a point*; i.e., $\alpha > 0$ but not sufficiently high so as to make $\pi^a(e_a, X, y)$ equals to $\pi^i(e_i, X, y)$ an optimal decision. In that were the case, we should expect a positive correlation between the amount sent (X) and the proportion returned (y) in the distribution (40,10). This is because for small transfers X, the allocator will tend to keep a high proportion of the available funds so as to restore equality. When the amount sent is sufficiently high, the allocator can restore equality by keeping a smaller proportion of the available funds, so a higher return would be expected. Similarly, a negative correlation between X and y may be expected in the (10,40) distribution. The allocator will tend to return nothing when he receives an small X, but he will tend to return a higher proportion of the available funds as X increases.

Arguably, we may also follow Ciriolo (2007) and assume that α is sufficiently high so that the inequality-averse allocator would want to equalize payoffs. If that were the case, allocators should return 2/3 of the available funds in the absence of endowment heterogeneity (i.e., when $e_a = e_i$). This is to keep the final distribution of payoffs equals, as it was the initial distribution of endowments. By the same token, the inequality averse allocator that wants to equalize final payoffs should return the entire available funds in (10,40). In that distribution, even if the allocator returns $y = 1$, he will be unable to equalize payoffs, despite the difference between $\pi^a(e_a, X, y)$ and $\pi^i(e_i, X, y)$ would be minimized.[8]

Although we may want to test these behavioral predictions (e.g., we can

[7]Trivially, a selfish allocator would return nothing in all distributions, what would be consistent with the hypothesis for reciprocity unless we require that allocators return (at least) one third of the available surplus.

[8]Appendix A presents these predictions in detail. In Figure 1A we depict the predictions of inequality aversion for each possible distribution of endowments. We show how the predictions are affected by the value of $\alpha > 0$ in Figure 2A. This includes a discussion on the expected correlation between the amount sent and the proportion returned in each distribution of endowments.

investigate if allocators are motivated to restore strict equality and return $y = 2/3$ in the absence of endowment heterogeneity, or if they return $y = 1$ in the distribution (10,40)), our goal is not to study whether reciprocity or inequality aversion can explain behavior for a particular distribution of endowments. Instead, we want to see whether any of these two behavioral motives can be reconciled with our data when we change the distribution of endowments. In that regard we note that the extent to which allocators react to changes in the endowments determine therefore if they are reciprocal or inequality averse. While reciprocity predicts no effect at all, inequality aversion predicts a larger return when the investor's endowment is low.

3 Experimental Design

We use the behavioral data in Calabuig et al (2013) to test our predictions. Calabuig et al (2013) recruited a total of 96 subjects to participate in a computerized experiment run at LINEEX (Universidad de Valencia). Their objective was to investigate the effects of punishment on trust behavior using a within-subject design, therefore two different treatments were considered: one with punishment and another one without punishment.

At the beginning of each session, instructions (read-aloud) informed subjects that they would be assigned a role (investor or allocator) to be kept during the entire session. Each session consisted of a total of 8 rounds: 4 with punishment and 4 without punishment. Treatments were randomized so that in half of the sessions the rounds with (without) punishment went first.[9] In what follows, we describe the experimental design and the procedures for the case without punishment, which corresponds to the data we use the current paper.

Each subject received an endowment at the beginning of each round that could be either 10 or 40 tokens. Subjects made a total of 4 decisions, one for

[9] At the end of the experiment, one of the two treatments was selected for the payment. The Wilcoxon rank-sum (Mann-Whitney) test suggests that allocators' behavior is invariant to the order in which treatments were implement ($Z = 1.084$, p-value = 0.278).

each distribution of endowments $(e_i, e_a) \in \{(40,10),(10,10),(40,40),(10,40)\}$. They went though the entire sequence by the end of the experiment, but we control for the order in which distributions were played so that subjects did not play the distributions in the same order. More specifically, some subjects start playing the distribution (40,10) and then moved to (10,10), (40,40) or (10,40), whereas some other players started with (10,10) and then moved to (40,10), (40,40) or (10,40). We balance the order in which each sequence was played so as to minimize the possible influence on behavior of the order in which distributions were played. We also minimize the possibility of subjects smoothing out incentives across distributions by not informing them that they would play the four distributions of endowments. It was common information that the amount that they would get in a particular round would not need to coincide with the amount received by the other player. Before making their decisions, however, investors and allocators were informed about the distribution of endowments for that round.

After each round, subjects received information about their own decision and the one of their partner before being re-matched. As for the matching protocol, subjects interacted with other each other using a perfect-stranger protocol. In particular, subjects were told that would meet with a different subject in each round, and would never play with the same subject twice. This was implemented by considering matching groups. Each session consisted of 24 subjects, divided in 3 groups of 8 subjects. Within each group, 4 subjects were randomly assigned the role of investors and 4 subjects were assigned the role of allocators. Subjects interacted with other members of their matching-group, and subjects from different groups never interacted with each other throughout the session.

Subjects received on average 15 Euros for participating in the experiment, which lasted around 90 minutes. Appendix B contains a translated version of the original instructions. This includes screenshots of the experiment and a detailed description of our matching protocol.

4 Results

4.1 Data analysis

We summarize the data in Table 1. Panel A presents the decision of the 48 investors for each possible distribution of endowments. The allocators' behavior is summarized in Panel B.[10] We report the correlation between the investor's transfer (X) and the allocator's returned share (y) in Panel C.

Table 1: Summary of the data

	$e_i = 40$		$e_i = 10$	
	$(40, 10)$	$(40, 40)$	$(10, 10)$	$(10, 40)$
A. Investor's behavior				
Amount sent (X)	4.479	6.062	2.437	2.667
Standard Deviation	8.69	10.50	3.38	3.18
Min/Max	0/40	0/40	0/10	0/10
Proportion of zero sent	0.547	0.437	0.458	0.354
Observations	48	48	48	48
B. Allocator's behavior				
Proportion returned (y)	0.220	0.238	0.286	0.220
Standard Deviation	0.20	0.24	0.29	0.23
95% confidence interval	(0.13, 0.31)	(0.14, 0.33)	(0.17, 0.40)	(0.13, 0.30)
Min/Max	0/0.54	0/1	0/1	0/0.66
Proportion of zero returned	0.278	0.333	0.346	0.419
Observations	22	27	26	31
C. Correlation coefficient between X and y				
Spearman (ρ)	-0.030	-0.230	-0.070	-0.048
Kendall (τ_b)	-0.039	-0.195	-0.056	-0.037

We observe in Panel A that the investor's amount sent (X) increases with

[10]In Panel B, the number of observations differs across treatments because allocators do not always receive a positive transfer from allocators.

her endowment but the proportion that is sent decreases with e_i as already suggested in Johansson-Stenman et al. (2005, 2008). We also see that investors send less when the endowment of the allocator is lower. This complements Johnson and Mislin (2011), where it is shown that the amount sent by investors decreases when allocators are endowed. Our findings seem to indicate that investors trust more when they are in a disadvantage position with regard to the initial distribution of endowments, what suggests a kind of discontinuity at a allocator endowment of zero. One plausible explanation for this behavior is that trust is really "altruism plus" as suggested by Cox (2004), but investors perceive that it is riskier to send money when the allocator has a low level of endowment compare with the case in which it is high.[11]

As for allocators, Panel B indicates that his behavior seems to be consistent across distributions, with an average return between 22% and 28%. When doing pairwise comparisons to test if allocators' behavior varies within distributions, we find that differences are never significant using a Wilcoxon signed-rank test (see Table 1C in Appendix C). These findings seem to contradict inequality aversion (or the equal-payoffs hypothesis), which predicts $y_{40,10} < y_{10,40}$ -note that allocators return 22% of the available funds in both distributions, with the proportion of zero returned being even higher in (10, 40), where $y_{10,40} = 1$ is expected if allocators were merely concerned about equalizing final payoffs. The 95% confidence interval seems to reject that idea, with the confidence interval in (10, 40) being roughly the same as in (40,

[11]The idea in Cox (2004) is to compare investors' giving when allocators are endowed and when they are not so as to isolate the effect of trust from the one of altruism. We note that experimental evidence on the relationship between risk attitudes and the investor's behavior in the investment game is mixed (e.g., Eckel and Wilson 2004, Schechter 2007, Ashraf et al. 2006). One plausible explanation is that other factors different from risk (e.g., attitudes to betrayal) may be at stake in the investment game (see Bohnet and Zeckhauser 2004, Hong and Bohnet 2007, Houser et al. 2010). An interesting finding along these lines is that investors are (slightly) more likely to send nothing in the (40,10) distribution, compared with the (10, 40) distribution (test of proportion: z = 1.847, p-value = 0.065, two-tailed). Investors may believe it is riskier to send money to allocators who are at a disadvantage position because they would be more likely to betray them.

10).[12,13] Further evidence against the equal-payoffs hypothesis is obtained from the correlation coefficients presented in Panel C, which measure the relationship between the amount sent (X) and the proportion returned (y). These correlations are never significant (p-values > 0.202), despite one might expect a positive (and significant) correlation in the case of the distribution (40,10), and a negative correlation in the (10, 40) distribution if allocators were concerned about equalizing payoffs.[14]

- Table 2 around here -

We perform an econometric analysis to confirm these findings. The results are summarized in Table 2, which reports maximum-likelihood estimates of three different random effects specifications that control for unobserved individual heterogeneity. The dependent variable in all the models refers to the

[12]In their asymmetric treatment, Xiao and Bicchieri (2010) find that allocators are less willing to return than in the symmetric one, but differences are not significant at the 5% level using a two-sided Fisher test; i.e., in their (80,40) treatment, 7 of 22 allocators return nothing (14 of 23 did it in the treatment (40,40)). In our study, allocator's willing to pay back is roughly the same in distributions (10,10) and (40,10); where 9 of 27 and 6 of 22 allocators decided to return nothing.

[13]When we only look at those allocators who decided to return a positive fraction of the available funds we also observe that allocators' behavior is fairly consistent with the idea of reciprocity (average proportion returned is 0.37, and median and mode equals 0.33).

[14]Some previous evidence in favor of reciprocity was based on finding a positive correlation between the amount that investors send and that allocator return, in absolute terms (e.g., Chaudhuri and Gangadharan, 2007). As already noted in Berg et al. (1995) this is not a good measure for reciprocity as the procedure "will bias the correlation statistic upwards, i.e., low amounts sent preclude some high returns" (page 131). Another possible measure for reciprocity is to consider the correlation between the proportion sent and the proportion returned after applying a logit transformation (see Johnson and Mislin, 2011). If we consider their transformation, the Spearman's correlation coefficient will be 0.530 in our (10,10) distribution (p-value = 0.06), what would be consistent with their findings (our correlation would be negative in the rest of distributions). For simplicity, we decided to use the same measure in Berg et al. (1995). Although we get similar results, we do not interpret the absence of correlation as evidence against reciprocity as we do not make any assumption on the allocator's beliefs about the investors' intentions when sending X (see Cox 2004, Dufwenberg and Gneezy 2000).

proportion of the available funds that the allocator returns, $y \in [0,1]$. In Model (1), the set of independent variables include the amount received (X), the period in which the decision is made (Period), and the treatment conditions, where the dummy variable I_{e_i,e_a} that takes the value 1 if the distribution of endowment is (e_i, e_a). Model (2) considers the same set of independent variables with the one exception of the amount received (X), which is now replaced by the proportion of the endowment the investor sent (X/e_i). Model (3) again considers the amount received but controls for differences in the endowments by including a dummy variable I_{HIGHe_i} that takes the value 1 when the investor is endowed with 40 tokens. This dummy is interacted with the amount received by the allocator to see if there is any difference in behavior depending on whether the allocator receives the transfer from an investor with a high or a low level of endowment. The reported standard errors (in brackets) take into account matching group clustering.[15]

We observe that allocators tend to return a smaller proportion of the available funds with the period, which is a common pattern in other experiments in which there is repetition (e.g., public good games). We also observe in Models (1) and (2) that the amount or the proportion received do not affect allocators' return. This is an interesting finding that is sometimes interpreted as evidence against reciprocity. In our case, we look at the treatment conditions to see whether reciprocity or inequality aversion can be reconciled with our data. Recall that our baseline model relies on the (10,10) distribution of endowments and predict no effect of $I_{40,40}$ (p-values > 0.563). Inequality aversion, however, predicts a higher (smaller) return in $I_{10,40}$ ($I_{40,10}$), compared with the baseline distribution. This does not seem to be the case as our estimates for the treatment variables $I_{10,40}$ and $I_{40,10}$ are not statistically different from zero (p-values > 0.156). In fact, the estimates for the treatment condi-

[15] We cluster at the group level to correct for standard errors, as suggested in Wooldridge (2002). The results are robust if we control for demographics (gender, age and attitudinal trust), which are never significant (see Table 2C in Appendix C). We note that the Breusch and Pagan Lagrangian multiplier test supports the random-effects specification, but our findings are also robust to other specifications (e.g., if we cluster at the individual level or consider subject fixed-effects). These results are available upon request.

tions $I_{10,40}$ and $I_{40,10}$ are statistically indistinguishable from each other at any common significance level (Model (1): $\chi^2_1 = 0.33$, p-value = 0.567; Model (2): $\chi^2_1 = 0.03$, p-value = 0.871). To further see that the investor's endowment does not affect the allocator's decision, we can see the estimate for the dummy variable I_{HIGHe_i} in Model (3). This is not statistically different from zero, despite one would expect a negative effect of $e_i = 40$ when the allocator is inequality averse (p-value = 0.435).

Overall, our results indicate that inequality aversion cannot be supported by our data. The finding that endowments do not affect the allocator's decision seems to align with the idea of reciprocity. An interesting question concerns whether reciprocity receives further support. Recall that a minimum requirement for reciprocity is that allocators return at least what they have received from investors. The estimated constants in Table 2 are 0.351 and 0.388 and 0.371 for Models (1), (2) and (3), respectively. These are always significant (p-values < 0.0001) so the hypothesis that allocators return the same proportion of the available funds in all the distributions because they are being selfish can easily be rejected. We can test if reciprocity is also rejected by looking at whether allocators give back the invested money (Bolle and Kaehler 2006, Johnson and Mislin 2011, Cooper and Kagel 2013). The null hypothesis that the estimate for the constant equals 1/3 and the estimate for the amount received equals 0 simultaneously (H_0: $\beta_{Constant} = 1/3$, $\beta_{received(X)} = 0$) cannot be rejected at any common significance level in the baseline distribution (p-values > 0.456).[16] As a result, we cannot reject the idea of reciprocity.

We note that our data can also be used to test inequality aversion within each particular distribution, once we assume a particular utility function (i.e., a value of α). Overall, inequality aversion would predict a positive relationship between the amount sent and the proportion returned in the (40,10) distribution. Using model (3), we cannot reject the null hypothesis that H_0: $\beta_{received(X)} + \beta_{received(X)I_{HIGHe_i}} = 0$) at any common significance level (p-

[16]The same holds when we test for reciprocal behavior in the rest of the distributions. The p-values are always larger than 0.187 except when we test for reciprocity in the distribution (10,40) in Models (1) and (2) (p-values = 0.095 and 0.061)

value = 0.486). This, in turn, indicates that the amount received does not affect the allocators' decision in the (40,10) distribution, in line with the correlation coefficients in Table 1. One other plausible assumption is to consider that allocators keep all what is generated because they want to restore strict equality (see Ciriolo, 2007). If that were the case, allocators should the entire available funds in the distribution (10,40). Using models (1) and (2), we reject that hypothesis at any common significance level (p-value < 0.0001). Along similar lines, we reject the null hypothesis that the constant equals 2/3 and the estimate for the amount received equals 0 simultaneously (H_0: $\beta_{Constant} = 2/3$, $\beta_{received(X)} = 0$) in both distributions (10,10) and (40,40) using Models (1) and (2) (p-values < 0.0001). Thus, inequality aversion seems to receive little support using our econometric analysis.

Next, we use an individual analysis and consider the best possible scenario in which inequality aversion could be used to explain the data. The results are summarized in Table 3. For any two distribution of endowments in which inequality aversion predicts that allocators will behave differently, we report the number of allocators that behaved in the expected direction (the frequency appears in brackets).

- Table 3 around here -

Overall, there are 91 situations in which the idea of inequality aversion provides a clear-cut prediction. We observe that less than 40% of the times, allocators behaved in the predicted direction (i.e., more than 60% of choices were inconsistent with inequality-aversion). Using a binomial test, we reject the hypothesis that majority of the choices went in the direction predicted by inequality aversion (p-value < 0.018, one-sided).[17]

[17]Note that this is the best possible scenario for inequality aversion in that we do not impose any value of α. In Appendix C, we use the assumption in Ciriolo (2007) to investigate within-subject heterogeneity; i.e., we assume that allocators want to restore strict equality. We observe that the majority of our subjects (roughly 57%) behave according to our definition of reciprocity, whereas inequality-aversion receives little support from our data as less than 5% of subjects tend to equalize final payoffs (see Appendix C, Figure 3C).

5 Conclusions

This paper has attempted to investigate whether allocators in the investment game are motivated by reciprocity (i.e. returning what they have received), or aversion to inequality (i.e., returning more to investors who were endowed with a smaller endowment). We used the behavioral data in Calabuig et a. (2013) to test these two contrasting behavioral motives using a within-subject design, where subjects play the investment game with different level of endowments that varied across rounds.

Our results suggest that allocators have a tendency to reciprocate investors' behavior by sending a share of the available funds that is consistent across distributions. This finding, in turn, provides little evidence in favor of inequality aversion in that allocators do not tend to return a larger (smaller) fraction of the available funds if their endowment is larger (smaller) than that of the investors. When we allow for individual heterogeneity, we observe that subjects seldom exhibit a behavior that is consistent with inequality aversion, whereas more than half of the allocators behave according to our definition of reciprocity.

The assumption that subjects are willing to forego monetary payoffs to reduce inequality has served to explain and predict a large swath of observed behavior in laboratory experiments. Although we may agree that inequality aversion has some predictive power in different settings, our results provide little evidence in that direction. One plausible explanation to rationalize our findings is to consider that allocators do not held themselves responsible for the initial distribution of endowments (which is exogenously determined) and thus simply focus on what is available to be distributed when making their choices. This, in turn, implies that allocators will focus on equalizing the distribution of the available funds rather than taking care of equalizing final payoffs.[18]

Our study is the not the first one in which inequality aversion is not supported by the data (e.g., Bereby-Meyer and Niederle 2005, Chowdhury and

[18]This is someone related to the accountability principle (Roemer 1998; Konow 1996) in the theory of justice (see also the studies of Cappelen et al. (2007, 2010) for further discussion on this topic).

Jeon 2014, Filippin and Raimondi 2014). What is interesting, in our view, is that inequality aversion is sometimes rejected when tested against other behavioral motives such as efficiency (e.g., see Kritikos and Bolle 2001, Engelmann and Strobel 2004 for the case of efficiency in the dictator game).

For the particular case of the investment game, we share the view advanced in Bereby-Meyer and Niederle (2005) or Xiao and Bicchieri (2010) that further research is needed to investigate subjects' behavior when different motives underlying decision making are in conflict. We consider our paper to be a contribution on these lines in that we test inequality aversion against the possibility of allocators being reciprocal. In this sense, we believe, our results enrich our understanding of the investment game by allowing us to test among competing explanations. In our view, the recent paper of Cox et al. (2014) is also an excellent step in that direction. We hope our results will provide the impetus to further research in this area.

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References

Anderson, L. R., Mellor, J. M. & Milyo, J. (2006). Induced heterogeneity in trust experiments. *Experimental Economics, 9,* 223-235.

Ashraf, N., Bohnet, I. & Piankov, N. (2006). Decomposing trust and trustworthiness. *Experimental Economics, 9,* 193-208.

Bereby-Meyer, Y. & Niederle, M. (2005). Fairness in bargaining. *Journal of Economic Behavior and Organization, 56,* 173-186.

Berg, J., Dickhaut, J. & McCabe, K. (1995). Trust, reciprocity and social history. *Games and Economic Behavior, 10,* 122?142.

Bohnet, I., & Zeckhauser, R. (2004). Trust, risk and betrayal. *Journal of Economic Behavior and Organization, 55,* 467-485.

Bolle, F. & Kaehler, J. (2006). Coleman's Hypothesis on trusting behaviour and a remark on meta-studies. *Journal of Economic Methodology, 13,* 469-483.

Bolton, G. E. & Ockenfels, A. (2000). ERC: A theory of equity, reciprocity, and competition. *American Economic Review, 90,* 166-193.

Calabuig, V., Fatas, E., Olcina, G. & Rodriguez-Lara, I. (2013). Carry a big stick, or no stick at all: An experimental analysis of trust and capacity of punishment. Working Paper University of Valencia, ERI-CES (No. 0413).

Cappelen, A. W., Hole, A. D., Srensen, E. . & Tungodden, B. (2007). The pluralism of fairness ideals: An experimental approach. *American Economic Review, 97,* 818-827.

Cappelen, A. W., Srensen, E. & Tungodden, B. (2010). Responsibility for what? Fairness and individual responsibility. *European Economic Review, 54,* 429?441.

Charness, G. & Haruvy, E. (2002). Altruism, fairness, and reciprocity in a gift-exchange experiment: An encompassing approach. *Games and Economic Behavior, 40,* 203?231.

Charness, G. & Rabin, M. (2002). Understanding social preferences with simple tests. *Quarterly Journal of Economics, 117,* 817?869.

Charness , G. & Shmidov, V. (2014). Trust and Reciprocity. Foundations and Trends in Microeconomics, 10, 167?207.

Chaudhuri, A. & Gangadharan, L. (2007). An experimental analysis of trust and trustworthiness. *Southern Economic Journal, 73,* 959?985.

Chowdhury, S. M. & Jeon, J. Y. (2014). Impure Altruism or Inequality Aversion? An experimental investigation based on income effects. *Journal of Public Economics, 118,* 143-150.

Ciriolo, E. (2007). Inequity aversion and trustees' reciprocity in the trust game. *European Journal of Political Economy, 23,* 1007-1024.

Coleman, J. (1990). *Foundations of social theory.* Cambridge, MA: Belknap Press.

Cooper, D. & Kagel, J. (2013). Other regarding preferences: A selective survey of experimental results. Forthcoming in J. H. Kagel, and A. Roth (Eds.), *The handbook of experimental economics (Vol. 2).* Princeton University Press.

Cox, J. C. (2004). How to identify trust and reciprocity. *Games and Economic Behavior, 46,* 260-281.

Cox, J. C., Friedman, D. & Gjerstad, S. (2007). A tractable model of reciprocity and fairness. *Games and Economic Behavior, 59,* 17-45.

Cox, J. C., Kerschbamer, R. & Neururer, D. (2014). What is trustworthiness and what drives it?, mimeo.

Dawes, C. T., Fowler, J. H., Johnson, T., McElreath, R. & Smirnov, O. (2007). Egalitarian motives in humans. *Nature, 446,* 794-796.

Dufwenberg, M. & Gneezy, U. (2000). Measuring beliefs in an experimental lost wallet game. *Games and Economic Behavior, 30,* 163?182.

Dufwenberg, M. & Kirchsteiger, G. (2004). A Theory of Sequential Reciprocity. *Games and Economic Behavior, 47,* 268-98.

Eckel, C.C. & Wilson, R. K. (2011). Trust and social exchange. In J. Druckman, D. Green , J. Kuklinski & A. Lupia (Eds.), *Handbook of Experimental Political Science*, pp. 243-257. Boston: Cambridge University Press.

Eckel, C. C., & Wilson, R. K. (2004). Is trust a risky decision? *Journal of Economic Behavior and Organization, 55,* 447-466.

Engelmann, D. & Strobel, M. (2004). Inequality Aversion, Efficiency, and Maximin Preferences in Simple Distribution Experiments. *American Economic Review, 94,* 857-869

Falk, A., Fehr, E. & Fischbacher, U. (2008). Testing theories of fairness -Intentions matter. *Games and Economic Behavior, 62,* 287?303.

Falk, A. & Fischbacher, U. (2006). A theory of reciprocity. *Games and Economic Behavior, 54,* 293-315.

Fehr, E. & Schmidt, K. (1999). A Theory of Fairness, Competition and Cooperation. *Quarterly Journal of Economics, 114,* 817-868.

Fehr, E. & Schmidt, K. (2002). Theories of fairness and reciprocity: Evidence and economic applications. In M. Dewatripont, L. P. Hansen, & S. J. Turnovsky (Eds.), *Advances in eEonomics and Econometrics.* Cambridge University Press

Filippin, A. & Raimondi, M. (2014). The Patron Game with Heterogeneous Endowments: A Case against Inequality Aversion, mimeo.

Glaeser, E., Laibson, D., Scheinkman, J. & Soutter, C. (2000). Measuring trust. *Quarterly Journal of Economics, 115,* 811-846.

Greiner, B., Ockenfels, A. & Werner, P. (2007). The dynamic interplay of inequality and trust: An experimental study. CESifo working paper, No. 2173.

Hong, K., & Bohnet, I. (2007). Status and distrust: The relevance of inequality and betrayal aversion. Journal of Economic Psychology, 28, 197-213.

Houser, D., Schunk, D., & Winter, J. (2010). Distinguishing trust from risk: An anatomy of the investment game. *Journal of Economic Behavior and Organization, 74,* 72-81.

Johansson-Stenman, O., Mahmud, M. & Martinsson, P. (2005). Does stake size matter in trust games? *Economic Letters, 88,* 365?369.

Johansson-Stenman, O., Mahmud, M., & Martinsson, P. (2008). Trust and religion: Experimental evidence from Bangladesh. *Economica, 76,* 462?485.

Johnson, N. D. & Mislin, A. (2011). Trust games: A meta-analysis. *Journal of Economic Psychology, 32,* 865?889.

Kritikos, A. & Bolle, F. (2001). Distributional concerns: equity-or efficiency-oriented? *Economics Letters, 73,* 333-338.

Konow, J. (1996). A positive theory of economic fairness. *Journal of Economic Behavior and Organization, 31,* 13-35.

Korenok O., Millner, E., L. & Razzolini, L. (2012). Are Dictators Averse to Inequality? *Journal of Economic Behavior and Organization, 82,* 543-547.

Rabin, M. (1993). Incorporating Fairness into Game Theory and Economics. *American Economic Review, 83,* 1281-1302.

Roemer, J. E. (1998). *Equality of opportunity.* Cambridge: Harvard University Press

Schechter, L. (2007). Traditional trust measurement and the risk confound: An experiment in rural Paraguay. *Journal of Economic Behavior and Organization, 62,* 272-292.

Wooldridge, J. M. (2002). *Econometric Analysis of Cross Section and Panel Data.* Cambridge, Massachusetts. The MIT Press.

Xiao, E. & Bicchieri, C. (2010). When equality trumps reciprocity. *Journal of Economic Psychology, 31,* 456-470.

Table 2. Random-effect estimates for the allocator's behavior.

Dependent variable: Proportion of the surplus returned (y)	Model (1)	Model (2)	Model (3)
Constant	0.351***	0.388***	0.371***
	(0.055)	(0.071)	(0.077)
Amount received (X)	-0.002		-0.012
	(0.002)		(0.008)
Proportion received (X/e_i)		-0.096	
		(0.063)	
Period	-0.032**	-0.034**	-0.033**
	(0.016)	(0.017)	(0.016)
$I_{10,40}$	-0.043	-0.046	
	(0.080)	(0.079)	
$I_{40,10}$	-0.058	-0.090	
	(0.054)	(0.063)	
$I_{40,40}$	0.002	-0.033	
	(0.054)	(0.054)	
$I_{HIGH\, e_i}$			-0.054
			(0.070)
Amount received x $I_{HIGH\, e_i}$			0.010
			(0.008)
σ_u	0.147	0.137	0.149
σ_e	0.194	0.194	0.197
ρ	0.367	0.333	0.362
R-squared	0.042	0.060	0.050
Wald test	17.15***	12.65**	12.46**
Breusch and Pagan LM test	4.83**	4.75**	4.57**
Observations	106	106	106

Note: Standard errors in parentheses are clustered by groups. Significance at the *** 1%, ** 5%, or *10% level.

Table 3. Frequency of choices that are consistent with the predictions of inequality aversion.

	N	Expected	Observed
(10,10) vs (10,40)	17	$y_{10,10} < y_{10,40}$	6 (35.29%)
(10,10) vs (40,10)	14	$y_{40,10} < y_{10,10}$	4 (28.57%)
(10,40) vs (40,40)	17	$y_{40,40} < y_{10,40}$	6 (35.29%)
(40,10) vs (40,40)	13	$y_{40,10} < y_{40,40}$	8 (61.54%)
(10,40) vs (40,10)	30	$y_{40,10} < y_{10,40}$	11 (36.67%)
Overall	91		35 (38.46%)

Appendix A

Recall that the investor and the allocator's payoffs in the investment game in Berg et al. (1995) are given by:

(1) $\pi^i(e_i, X, y) := e_i + X(3y - 1) \geq 0$

(2) $\pi^a(e_a, X, y) := e_a + 3X(1 - y) \geq 0$

where $e_i \geq 0$ and $e_a \geq 0$ denote the investor (subject *i*) and the allocator's (subject *a*) endowments, respectively, the value of X in $[0, e_i]$ corresponds to the amount that the investor sends to the allocator, and *y* in [0,1] stands for the percentage of the available funds that the allocator decides to return.

If we consider the assumption in Coleman (1990) and Ciriolo (2007), a minimum requirement for reciprocity is that the allocator returns at least one third of the available funds ($y = 1/3$), or otherwise the investor would be worse off than if she have sent nothing. As for inequality aversion, the allocator may want to equalize the final payoffs, so that the initial distribution of endowments may play a role in his decision (Ciriolo 2007, Xiao and Bicchieri 2010). To build upon this possibility, we can follow Ciriolo (2007) and impose equality of payoffs, $\pi^i(e_i,X,y) = \pi^a(e_a,X,y)$. If we solve for the allocator's decision, we obtain the result that the allocator who wants to equalize payoffs should return a fraction of the available funds that takes into account both the amount that he receives from the investor and the level of endowments. Thus, we can define an allocator as *inequality averse if he returns a proportion y* $\in$ *[0,1] of the available funds that satisfies:* $y = \frac{e_a - e_i}{6X} + \frac{2}{3}$.

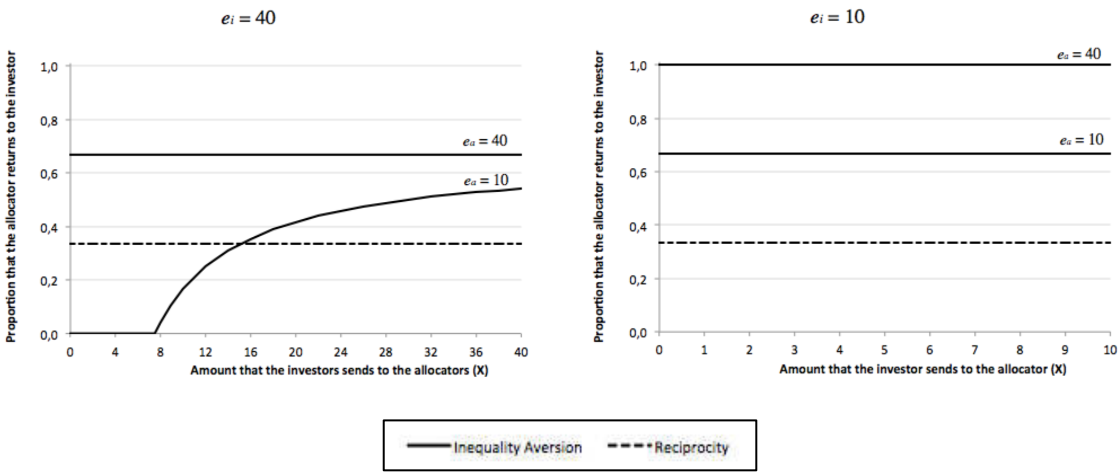
In the absence of endowment heterogeneity (i.e., when $e_i = e_a$) the inequality-averse allocator will return $2/3$ of the available funds. This is to keep the final distribution of payoffs equal, as it was the initial distribution of endowments. When the investor's endowment is larger than the allocator's one (i.e., $e_i > e_a$), a higher X implies that the inequality-averse allocator will return a larger share of the available funds. This is because for small values of X, the allocator will tend to keep the available funds and return nothing so as to reduce payoff inequalities.

Next, we use an example to illustrate the predictions of the reciprocal and the inequality-averse allocator in each possible distribution of endowments. Recall that we use two level of endowments in our experiment, $e_k \in \{10,40\}$ for $k = i, a$. Along the horizontal axis of Figure 1, we plot the investor's decision $X \in [0, e_i]$. We use the vertical axis to represent the allocator's decision, $y \in [0,1]$. Fig. 1a depicts the case of $e_i = 40$ tokens. The reciprocal allocator should return y = 1/3, regardless of his endowment or the amount he received from the investor. If he is inequality averse, and endowments coincide (i.e., $e_a = 40$), the amount received will play no role in the allocator's decision either, and y = 2/3. However, when the initial distribution of endowments is in favor of the investor (i.e., $e_a = 10$), inequality aversion predicts that the allocator will return nothing if he receives less than X = 7.5 tokens. As the allocator receives more money, he will return a larger fraction of the available funds, and will end up transferring y ≅ 0.54 if he receives 40 tokens (i.e., out of the 120 tokens generated with the investor's decision, the allocator keeps 55 tokens to be added to his initial endowment of 10 tokens; and returns 65 tokens).

The right-hand side panel of Fig 1A plots the case in which $e_i = 10$. Again, the reciprocal allocator should return y=1/3 and the inequality averse allocator y = 2/3 if endowments are equal ($e_a = 10$). Now, the reciprocal allocator should return the entire available funds (y = 1) when the initial distribution of endowments is in his favor ($e_a = 40$) so as to minimize payoff differences.[1]

[1] Note that for any amount X ∈ [0,10] that the allocator receives, inequality aversion predicts a return y > 1. This is not possible in our framework, as the allocator cannot transfer part of his own endowment to the investor. In the model of Ciriolo (2007), allocators are allowed to do so, and equality of payoffs is considered as a sufficient condition for reciprocity.

Figure 1A. Behavior in the investment game under reciprocity and inequality aversion



Our aim is not to study whether reciprocity or inequality aversion can explain behavior within particular distribution of endowments, but the extent to which both two behavioral motives can be reconciled with our data when we change the distribution of endowments. In that regard, reciprocity predicts that changing the endowments will not affect the allocator's choices, whereas inequality aversion predicts higher returns in (10,40) compared with (40,10).

One aspect that is worth mentioning is that our definition of reciprocity implies not only that the return will be consistent across treatments but also that allocators will return one third of the available funds regardless of the distribution of endowments. Importantly, our models of reciprocity and inequality aversion predict no relationship between the allocator's return (y) and the amount received from investors (X), except in the distribution (40,10), where a positive relationship between X and y is expected if allocators are inequality averse (especially when the allocator receives more than 7.5 tokens) (see Figure 1A). This is because we are considering the (extreme) assumption that allocators want to restore equality of payoffs if they are inequality averse; i.e., $\pi^i(e_i,X,y) = \pi^a(e_a,X,y)$ should be satisfied for the allocator to be considered as inequality averse.

Arguably, we can assume that allocators dislike payoff differences but not as much as to equalize payoffs. We can then consider that allocators, if inequality-averse, choose to return a proportion of the available funds so as to maximize:

$$\text{Max}_{\{y\}} \quad \pi^a(e_a, X, y) - \frac{\alpha}{2}(\pi^a(e_a, X, y) - \pi^i(e_i, X, y))^2$$

In this case, the optimal decision for the allocator if inequality averse will depend not only on the received amount (X) and the level of endowments, but also on the value of α, as follows:

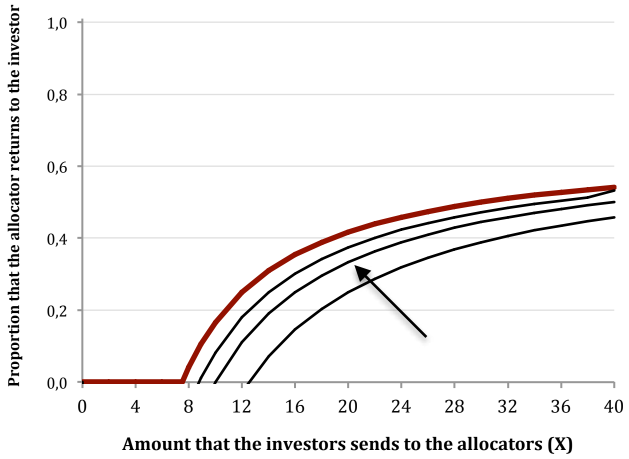
$$y = \frac{e_a - e_i}{6X} + \frac{2}{3} - \frac{1}{12\,\alpha\,X}$$

Figure 2A shows the allocator's decision depending on the particular value of α for each possible distribution of endowments separately.[2] An arrow indicates how the predictions change when the allocator is more adverse to inequality (i.e., when we increase the value of α). We observe that optimal choices tend to the ones represented in Figure 1A when the value of α is sufficiently large so that the allocator wants to restore strict equality (red lines).

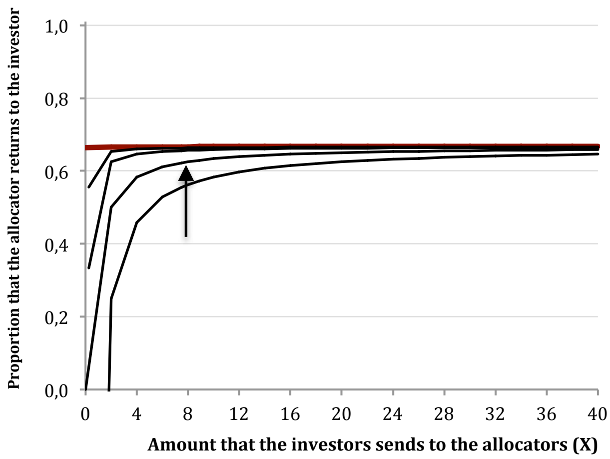
[2] We do not show the predictions in (10, 10) because these are similar to the ones in (40, 40) as in both cases $e_a = e_i$.

Figure 2A. Optimal return (*y*) under inequality aversion for different values of α

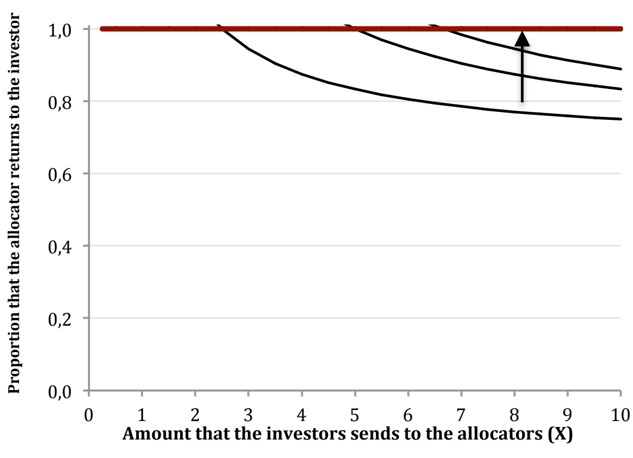
(40,10)



(40,40)



(10,40)



Note. The optimal behavior in (10, 10) is equivalent to the one in (40,40)

We observe in Figure 2A that inequality aversion predicts a positive correlation between the amount sent and the proportion of the available surplus returned in the distribution (40, 10). It is also the case in the absence of endowment heterogeneity (i.e., when $e_i = e_a$), although choices collapse to an optimal return of $2/3$ of the available funds when we increase α (i.e., when the allocator is sufficiently inequality averse then he will return $2/3$, regardless of what he has received). Similarly, inequality aversion predicts a positive correlation between amount sent and proportion returned in (10, 40), except for the case in which the inequality-averse allocator wants to restore strict equality. In that case, he should return all what is generated, therefore no correlation between X and y will be expected.

Appendix B: Instructions

This is a translated version of the original instructions in Calabuig et al. (2013). Their experiment consisted of 8 rounds, divided into 2 blocks of 4 rounds. These instructions explain how the experiment proceeded for the first 4 rounds (block 1, without punishment). Subjects were then provided new instructions for the second block (with punishment). There were additional sessions, in which the first block consisted of the treatment with punishment.

Welcome to the experiment!

This is an experiment to study decision-making. The instructions are simple and if you follow them carefully you will get an amount of money in cash at the end of the experiment in a confidential manner. All through the experiment you will be treated anonymously. Neither the experimenters nor the people in this room will ever know your particular choices or the amount of money that you get. Talking is forbidden during the experiment. If you have any questions, raise your hand and remain silent. You will be attended as soon as possible.

In this experiment there are two types of players: A and B. Before starting the experiment, you will be randomly selected either as player A or player B and this type will be kept all through experiment.
In each round, you will be matched with one of the subjects of the other type (i.e., you will be matched with a player B if you are player A, and you will be marched with a player A if you are player B). In this block, you will never be matched with the same person twice (i.e., you will take decisions with a different person in each round).

At the beginning of each round, you will get an amount of ECUs that can be either 10 or 40. The amount that you get does not need to coincide with the amount of ECUs received by the other player you are matched with, although you will always know both amounts before taking your decision.

If you are player A, you have to decide the amount of ECUs (if any) to send to player B. The amount of ECUs that you send will be deducted from your initial ECUs and will be triplicated (i.e., we will multiply this amount by 3). The amount of ECUs that you don't send to player B will be yours.
If you are player B, you will get three-times the amount of ECUs that player A sent you. After you know this amount, you have to decide the amount of ECUs (in any) that you want to return to player A. You will keep the ECUs that you do not send to player A plus your initial ECUs.

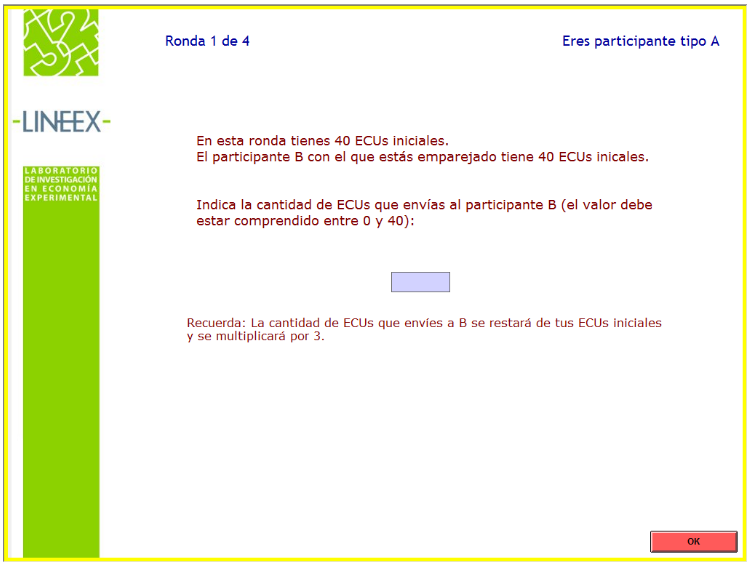
So, in this block, your gains in each round depend of your decisions in the following way:
Final payoff player A = Initial ECU of A – ECU sent to B + ECUs received from B
Final payoff player B = Initial ECU of B + 3* ECU received from A - ECU sent to A

To check that you have understood the instructions, we ask you to look at the computer screen. First, you will see the logic of the experiment through a numerical example. Next, you will need to compute the final payoffs of an example in which in which the computer chooses numbers randomly the ECUs send by player A and the ECUs returned by player B.

Screenshots

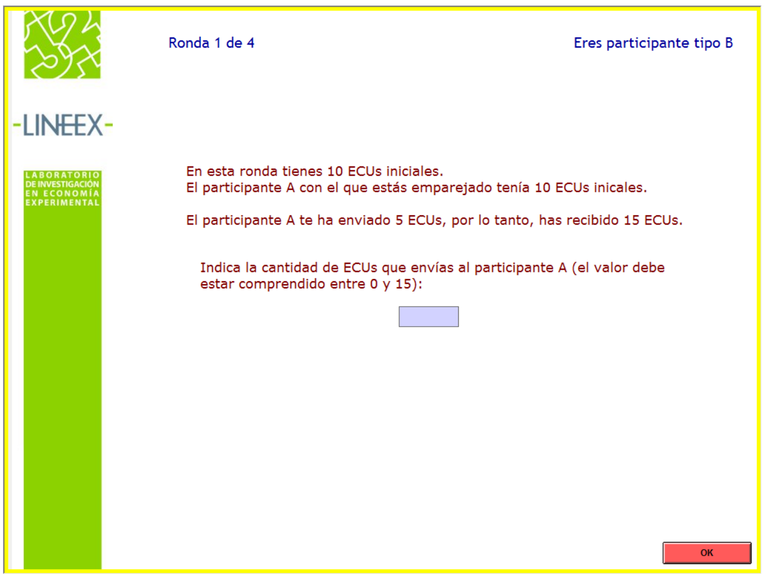
In what follows, we present the original screenshots of the experiment (in Spanish), both for the investor and for the allocator's decision. The translation for each screenshot is presented in the text below.

The investor's decision (Participant Type A)



Investors were informed on this screen: "In this round you have 40 ECUS. The player you are matched with has 40 ECUS". Then, investors had to "Indicate the amount of ECUs to send to player B (the amount must be between 0 and 40)". Investors chose the desired transfer using the blue box. The text below the box reminds subjects that "the amount that you send will be reduced from your initial ECUs and multiplied by the 3"

The allocator's decision (Participant Type B)

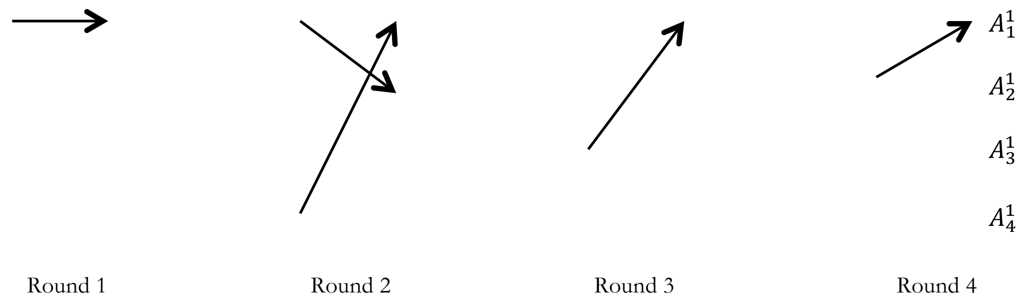


Investors were informed on this screen about the initial endowments (as explained for the case of investors). In the third line, the text states: "Player A sent you 5 ECUs, therefore you have received 15 ECUs. Indicate the amount that you want to send to player A (the amount must be between 0 and 15)".

Matching protocol

We recruited a total of 96 subjects, which interacted with each other using a perfect-stranger protocol (i.e., subjects). This was implemented in our experiment using matching group. Each session consisted of 24 subjects, which were divided into 3 groups of 8 subjects. In each groups, 4 subjects were assigned the role of investors and 4 subjects the role of allocators –the roles are kept constant through the experiment. To explain the matching protocol, consider that investors in Group 1 are denoted $(I_1^1, I_2^1, I_3^1, I_4^1)$, and allocators $(A_1^1, A_2^1, A_3^1, A_4^1)$. In Group 2, investors are $(I_1^2, I_2^2, I_3^2, I_4^2)$, and allocators $(A_1^2, A_2^2, A_3^2, A_4^2)$, etc…

The experimental protocol is such that in every round, subjects are matched with other members in their group, but subjects of different groups never interact with each other through the session. For example, in round 1, investor I_1^1 is matched with allocator A_1^1, I_2^1 is matched with A_2^1, I_3^1 is matched with A_3^1 and I_4^1 is matched with A_4^1, ... In round 2, investor I_1^1 is matched with allocator A_2^1, investor I_2^1 is matched with allocator A_3^1, … In round 3, investor I_1^1 is matched with allocator A_3^1,…. Thus, we can consider that in Group 1, the matching during the four rounds proceeds as follows:



And this is true for every possible group what implies that an investor in any Group g (say I_i^g) will never meet an allocator from a different group (say A_i^k for $k \neq$ g).

Although subjects were not aware of the details of this matching protocol, the experiment instructions were read aloud and made clear that they would "never interact with the same subject twice" across the 4 different rounds. This is a possible way to implement a "perfect-stranger protocol", in the sense that subjects were ensured to meet a different subject (i.e., an "stranger") in each round. One important advantage of our design is that it allows us to balance and control for the order in which distributions of endowments were implemented. Note that investor I_1^1 is matched with allocator A_1^1 in round 1. Suppose that they both played the distribution (10,10). Further assume that subjects I_2^1 and A_2^1 played the distribution (10,40), I_3^1 and A_3^1 played (40,10) and I_4^1 and A_4^1 played the distribution (40,40). In the second round, investor I_1^1 is matched with a new allocator A_2^1, as indicated above. Because they had already played the distributions (10,10) and (10,40), the matching protocol is such that the distribution (40,40) was chosen for them in Round 2. This procedure can be applied for each pair and group so that at the end of the four rounds each player goes through the four distributions, with different orders, as detailed below (superscript for groups are omitted for simplicity):

Distribution:	(10, 10)	(10, 40)	(40, 10)	(40, 40)
Round 1:	$I_1 - A_1$	$I_2 - A_2$	$I_3 - A_3$	$I_4 - A_4$
Round 2:	$I_2 - A_3$	$I_3 - A_4$	$I_4 - A_1$	$I_1 - A_2$
Round 3:	$I_4 - A_2$	$I_1 - A_3$	$I_2 - A_4$	$I_3 - A_1$
Round 4:	$I_3 - A_4$	$I_4 - A_1$	$I_1 - A_2$	$I_2 - A_3$

Appendix C

In Figure 1C, we present the histogram for the proportion of the available funds the allocator returns in each distribution separately. We then compare the allocator's behavior across distributions using a non-parametric analysis in Table 1C.

Figure 1C. Histograms for the proportion returned by allocators in each distribution.

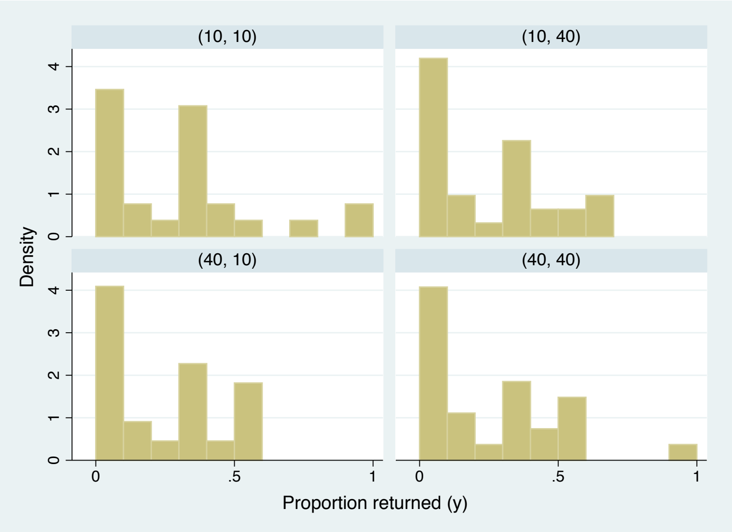


Table 1C. Non-parametric analysis to test the allocator's behavior across distributions. We perform a Wilcoxon matched-pairs signed-ranks test for the null hypothesis that the allocator's behavior is the same in any two distributions.[3] We report the value of the statistic and the p-value (in brackets), which are not corrected for multiple testing (i.e., we should expect higher p-values if we undertake the Bonferroni correction).

	$y_{40,40}$	$y_{10,10}$	$y_{10,40}$
$y_{40,10}$	-1.645 (0.100)	-0.129 (0.897)	0.736 (0.462)
$y_{40,40}$		1.607 (0.108)	0.523 (0.601)
$y_{10,10}$			-0.629 (0.529)

Recall that our hypotheses are such that:

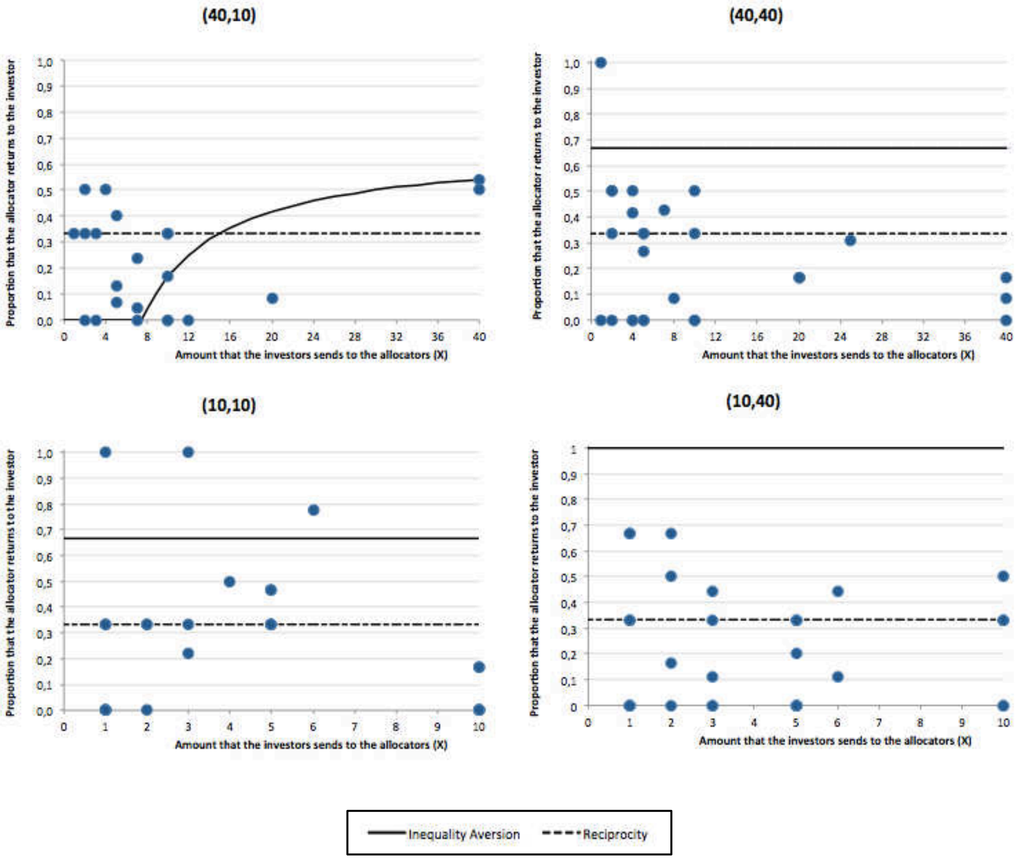
RECIPROCITY. $y_{40,10} = y_{40,40} = y_{10,10} = y_{10,40}$

INEQUALITY-AVERSION. $y_{40,10} < y_{40,40} = y_{10,10} < y_{10,40}$.

We can therefore conclude that inequality-aversion is not supported by our data using a non-parametric approach.

[3] Because allocators can only return money if they have received it, when we compare two distributions we only consider those allocators who received money in both of them. This is why the number of observations varies across comparisons. The minimum sample size (13 observations) is when we compare distributions (40,10) and (10,40), and the maximum (30 observations) when we compare (40,10) and (10,40).

Figure 2C. Observed behavior in each distribution of endowments and theoretical predictions. Recall that we want to see if allocators' behavior is compatible with our idea of reciprocity (Coleman 1990, Ciriolo 2007) or rather with inequality aversion (Fehr and Schmidt 1999, Bolton and Ockenfels 2000). Figure 2C depicts the theoretical prediction of both models, together with the observed behavior in each of the four distributions. In the upper (lower) panel, we present the predictions and the allocators' behavior for the case in which e_i = 40 (e_i = 10). For reciprocity, recall that allocators should return (at least) 1/3 of the available funds, so that investors get to receive (at least) what they have sent. As for inequality aversion, we depict the predictions when assuming that allocators want to restore strict equality of payoffs (Ciriolo 2007). The interested reader can see how these predictions may vary depending on the allocator's taste for strict-inequality in Appendix A (see Figure 2A).



For the data to support the idea of inequity aversion, we should observe $y_{40,10} < y_{40,40}$. Graphically, it does not seem to be the case. On the distribution (40,10) some allocators behave according to inequity aversion when receive 40 tokens, but allocators who received 40 tokens in the distribution (40,40) tend to return y < 0.2 of the available funds, when they should return y = 2/3 if they were motivated by equalizing payoffs. Inequality aversion does not seem to predict behavior for distributions in the lower panels either. Recall that inequality predicts $y_{10,10} < y_{10,40}$ but again we fail to observe this behavioral pattern. In fact, we observe that $y_{10,10}$= 1 in some cases, whereas $y_{10,40}$ never takes the value 1, contrary to what equality predicts (in fact, it is always the case that y < 0.7). Overall, we observe that allocators' behavior seem to be consistent across distributions. This is also clear from Panel B of Table 1 in the main text, where we showed that average return varied between 22% and 28% (see Figure 3C for within-subject heterogeneity and Table 2 for the number of allocators that behave according the pattern predicted by inequality aversion when considering any two distributions of endowments).

Table 2C. Econometric analysis (random-effect models) controlling for demographics. Below, we replicate the analysis in Table 2 in the main text and show that our results are robust if we control for demographics.

Dependent variable: Proportion of the available funds returned (y)	Model (1)	Model (2)	Model (3)
Constant	0.167	0.223	0.210
	(0.189)	(0.168)	(0.158)
Amount received (X)	-0.002		-0.010
	(0.002)		(0.008)
Proportion received (X/e_i)		-0.090	
		(0.062)	
Period	-0.032*	-0.034**	-0.033**
	(0.017)	(0.017)	(0.016)
$I_{10,40}$	-0.042	-0.049	
	(0.080)	(0.080)	
$I_{40,10}$	-0.059	-0.090	
	(0.056)	(0.065)	
$I_{40,40}$	0.008	-0.026	
	(0.050)	(0.057)	
$I_{HIGH\, e_i}$			-0.042
			(0.065)
Amount received x $I_{HIGH\, e_i}$			0.008
			(0.007)
Gender (=1 female)	0.054	0.050	0.041
	(0.080)	(0.080)	(0.077)
Age	0.007	0.006	0.006
	(0.010)	(0.010)	(0.009)
Trust (GSS)	-0.017	-0.017	-0.012
	(0.097)	(0.095)	(0.158)
σ_u	0.154	0.146	0.158
σ_e	0.194	0.194	0.197
ρ	0.387	0.364	0.391
R-squared	0.069	0.076	0.068
Wald test	39.33***	15.53**	40.45**
Observations	106	106	106

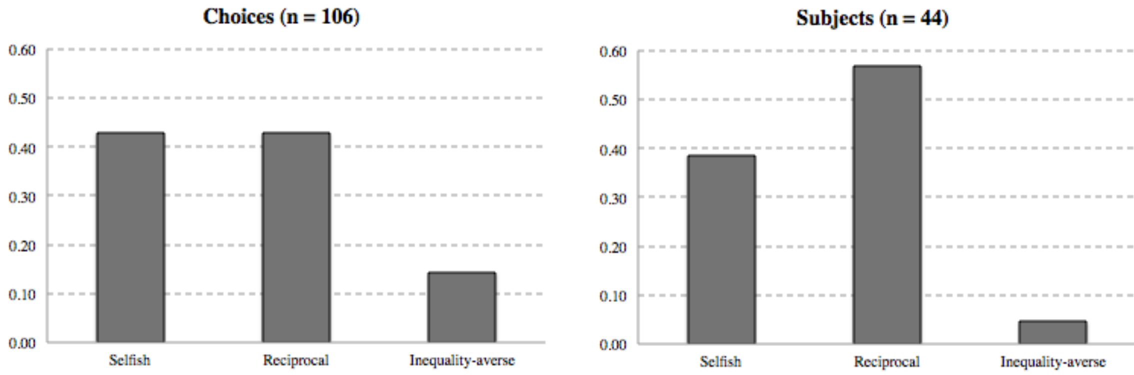
Note: Standard errors in parentheses are clustered by groups. The independent variable Trust (GSS) correspond to the answer in the attitudinal survey question from the General Social Survey: "Generally speaking, would you say that most people can be trusted or that you cannot be careful in dealing with people?" (=1 if most people can be trusted). Significance at the *** 1%, ** 5%, or * 10% level.

We observe that differences in endowments do not affect the allocator's behavior. We cannot reject the null hypothesis that the allocator's behavior in $I_{10,40}$ is the same as their behavior in $I_{10,40}$ at any common significance level (p-value = 0.519). The null hypothesis that the proportion of the available funds returned is equal to 1/3 cannot be rejected in any of the distributions (p-vales > 0.395), therefore we find evidence for reciprocity. The idea of inequality aversion is, however, rejected. For example, in Model (1) we do not see that the amount received affect the allocators' decision in the distribution (10, 10) or (40, 40). Further, if we assume that allocators would want to restore strict equality, we can reject that their return is equal to 2/3 in the absence of endowment heterogeneity in this model (p-values < 0.05). We can also reject that allocators return y = 1 in the distribution (10, 40) (p-value < 0.0001).

Figure 3C. Analysis for reciprocity and inequality aversion when considering heterogeneity across subjects.[4] Figure 3C depicts the percentage and the frequency of decisions taken according to three different behavioral patterns we may consider:

- *Selfish behavior*. Allocators keep the available funds and transfer, $y = 0$.
- *Reciprocity*. Allocators return what they have received from investors, $y = 1/3$.
- *Inequality-aversion*. Allocators return a proportion of the available funds that depend on the level of endowments and what they received from investors so as to equalize payoffs, $y = \frac{e_a - e_i}{6X} + \frac{2}{3}$ (see Appendix A).

We classify choices using the minimum distance to each of the three behavioral motives.[5] As for subjects, we consider what each allocator returns in the different distribution of endowments, and compute deviations to each prediction using the mean square error criteria.



A first thing to notice is that the large majority of choices (more than 90%) are either purely selfish or can be classified using our definition of reciprocity, both behavioral motives being equally important in explaining allocators' choices (less than 10% of choices are classified according to our definition of inequality aversion). At the subject level, the results also seem to be conclusive. Less than 5% of allocators make choices that are better explained by inequality than by selfish or reciprocal behavior. These two behavioral motives are best reconciled with our data (especially reciprocity, which is compatible with the observed choices of roughly 57% of subjects). Overall, these findings are in line with our results suggesting that inequality aversion does not greatly matter if we want to explain allocators' behavior.

[4] A similar approach has been undertaken in other studies. For example, Cappelen et al. (2007) examine the prevalence of different justice ideals in a dictator game with production. They find (using structural estimations) that there is substantial heterogeneity within individuals, what suggest that behavior cannot be explained by a unique justice principle.

[5] When a choice can be explained by two principles, we select one of them at random. For instance, a return of y = 0.165 in the distribution (10,40) can be explained by reciprocity and also by selfish behavior –the distance to both principles is the same. We select one of the two principles randomly, and assume that the choice is guided by either reciprocity or selfish behavior. The proportion of overlaps is very small, about 6 percent of all decisions.