

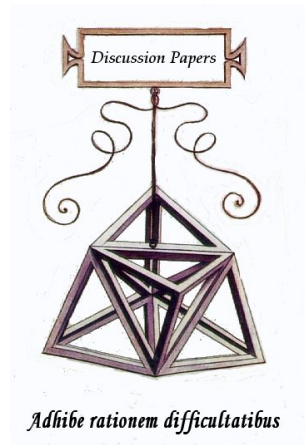


---

*Discussion papers*

E-papers of the Department of Economics and Management – University di Pisa

---



Pietro Battiston, Simona Gamba,  
Sharon G. Harrison

**My Poor(er) Friend:  
(Non-)Economic Integration  
in Public Good Games**

*Discussion paper n. 318*

2024

*Discussion paper n. 318, presented: November 2024*

**Authors' address/Indirizzo degli autori:**

Pietro Battiston — University of Pisa - Department of Economics and Management, Via Cosimo Ridolfi 10, 56124 Pisa – Italy. E-mail: [me@pietrobattiston.it](mailto:me@pietrobattiston.it)

Simona Gamba — University of Milan - Department of Economics, Management and Quantitative Methods, Via Conservatorio, 7, 20122 Milano - Italy. E-mail: [simona.gamba@unimi.it](mailto:simona.gamba@unimi.it)

Sharon G. Harrison — Barnard College - Department of Economics, 3009 Broadway, New York, NY 10027 – USA. E-mail: [sh411@columbia.edu](mailto:sh411@columbia.edu)

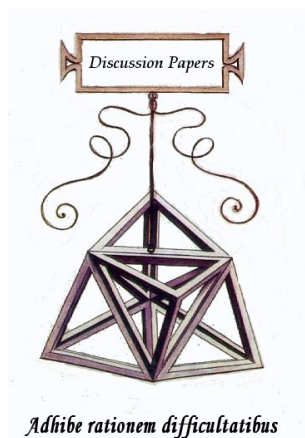
© Pietro Battiston, Simona Gamba and Sharon G. Harrison

Please cite as:/Si prega di citare come:

Pietro Battiston, Simona Gamba, Sharon G. Harrison (2024), “My Poor(er) Friend: (Non-)Economic Integration in Public Good Games”, Discussion Papers, Department of Economics and Management – University of Pisa, n. 318 (<http://www.ec.unipi.it/ricerca/discussion-papers>).

---

Discussion Papers Series contact: [pietro.battiston@unipi.it](mailto:pietro.battiston@unipi.it)



---

Pietro Battiston, Simona Gamba, Sharon G. Harrison

## **My Poor(er) Friend: (Non-)Economic Integration in Public Good Games**

---

### **Abstract**

We run an experiment where subjects play a standard repeated two player public good game looking at the effect of being matched to a subject with different endowment — and keeping fixed the overall distribution of endowments. Unlike most of the existing literature, all subjects are aware of the existing heterogeneity in endowments, regardless of whether they are assigned to a financially homogeneous or heterogeneous group. Moreover, since in modern societies financial heterogeneity typically correlates with many other forms of heterogeneity, including habits, tastes and membership in given social groups, we look at how financial heterogeneity interacts with in-group vs. out-group feeling, using randomly formed groups. While neither economic integration nor group membership alone significantly affects overall contributions, and hence welfare, the two strongly interact: being matched to a partner with a different endowment and from the other group results in particularly low contributions. Similarly, being matched to a partner who is from the other group and has low endowment results in particularly low contributions.

**Keywords:** public good game, economic segregation, in-group effect, laboratory experiment

**JEL Classification:** H41, C92, D31

# My Poor(er) Friend: (Non-)Economic Integration in Public Good Games\*

Pietro Battiston<sup>†</sup>, Simona Gamba<sup>‡</sup>, Sharon G. Harrison<sup>§</sup>

November 15, 2024

## Abstract

We run an experiment where subjects play a standard repeated two player public good game looking at the effect of being matched to a subject with different endowment — and keeping fixed the overall distribution of endowments. Unlike most of the existing literature, all subjects are aware of the existing heterogeneity in endowments, regardless of whether they are assigned to a financially homogeneous or heterogeneous group. Moreover, since in modern societies financial heterogeneity typically correlates with many other forms of heterogeneity, including habits, tastes and membership in given social groups, we look at how financial heterogeneity interacts with in-group vs. out-group feeling, using randomly formed groups. While neither economic integration nor group membership alone significantly affects overall contributions, and hence welfare, the two strongly interact: being matched to a partner with a different endowment *and* from the other group results in particularly low contributions. Similarly, being matched to a partner who is from the other group and has *low endowment* results in particularly low contributions.

**Keywords:** public good game, economic segregation, in-group effect, laboratory experiment.

**JEL classification:** H41, C92, D31

## 1 Introduction

Economic interactions, such as decisions about whether or not to invest in a public good, often happen in groups where individuals are heterogeneous along several dimensions — and know it.

---

\*We thank Caterina Giannetti and the Sant’Anna EMBEDS center for valuable support; we thank participants in the Milan Experimental Coffee for suggestions and comments on the experimental design; we thank Svenja Hippel and participant in the Regulation Research 2023 conference for useful feedback. We acknowledge funding from the MUSA – Multilayered Urban Sustainability Action – project, funded by the European Union – NextGenerationEU, under the National Recovery and Resilience Plan (NRRP) Mission 4 Component 2 Investment Line 1.5: Strengthening of research structures and creation of R&D “innovation ecosystems”, set up of “territorial leaders in R&D”, and from University of Pisa

<sup>†</sup>Department of Economics and Management, University of Pisa, Italy, me@pietrobattiston.it. ORCID 0000-0001-5343-7861

<sup>‡</sup>Department of Economics, Management and Quantitative Methods, Università degli Studi di Milano, Italy, simona.gamba@unimi.it. ORCID 0000-0002-5538-2873

<sup>§</sup>Department of Economics, Barnard College, Columbia University, sh411@columbia.edu. ORCID 0000-0003-0155-6062.

Some of these dimensions have direct economic implications. For instance, a low income or wealth will limit the ability to contribute. Others do not, but may *correlate* with economic conditions, such as race or ethnicity.

A stream of experimental literature has focused on the study of public good game experiments with heterogeneity. For instance, the analysis of heterogeneous endowments has grown slowly but steadily since the seminal work of Chan et al. (1996, 1999), motivated by the research question of what is the effect of *(re)distributing* wealth unequally among members of a same group playing a public good game. The effect of *integration* and *segregation*, that is, how *mixing* populations with different endowments will affect social welfare, has been neglected in comparison. In theory, the two research questions are similar, but they call for different experimental designs. First and foremost, in order to draw results on integration and segregation, a design is needed where subjects with differing endowments are observed both within heterogeneous *and* homogeneous groups. Instead, the literature on heterogeneity of endowments has systematically compared heterogeneous groups to homogeneous groups with either same average endowments (e.g. Marwell and Ames, 1979; Isaac and Walker, 1988; Chan et al., 1996, 1999; Hofmeyr et al., 2007; Keser et al., 2014), or only low or high endowments (e.g. Cherry et al., 2005; Spiller et al., 2016).<sup>1</sup>

Second, the literature on heterogeneity only focuses on *within-group* differences in endowment (if any); for instance, Spiller et al. (2016) find that richer subjects contribute less in proportion. Hence, members of homogeneous groups are never exposed to any heterogeneity in endowment *outside* of their group. Importantly, this differs from the context in which real world groups live: even in groups of only rich (poor) individuals, members know that society is heterogeneous. Indeed, integration and segregation are phenomena that happen in contexts where the distribution of wealth is *ex ante* given and observed. This dimension is lost in the control conditions (with homogeneous endowments) of previous experiments on heterogeneity in endowments: for instance, in a condition with all endowments equal to 20, subjects are not induced to feel poor, nor rich, as they do not know that other sessions/groups have higher or lower endowments.

Hence, our experimental design includes two crucial features. First, we observe subjects with given endowments choosing individual contributions both when facing peers with the same endowment, and when facing peers with lower or higher endowment. Second, when subjects are assigned their endowment, they know what the other options are — something that in the previous literature is only true for heterogeneous groups.

While our focus is on how integration (or lack thereof) affects contribution to public goods, the evidence we provide still represents a contribution to the existing research on heterogeneous endowments in public good games. Indeed, we verify whether heterogeneity affects choices because it implies *interacting* with people with different endowment, or whether the mere *knowledge* of one's relative position in the distribution of endowments has an effect, regardless of interaction.

We consider our research question as orthogonal to the analysis of redistribution in presence of non-linearities in the benefits from the public good (and hence to the existence of internal Nash equilibria). Indeed, it is true that early theoretical literature (Warr, 1983; Bergstrom et al., 1986) has established that redistribution between (only) contributing subjects does not affect, at the margin, predicted total contributions to the public good; but it is an established fact that subjects

---

<sup>1</sup>The only exception we are aware of is the work of Buckley and Croson (2006), who mention (in footnote 9) having run one session with “rich” and one with “poor” players only; but this involved only 6 groups in total, not analyzed in the study. In addition, Huber et al. (2022) study the similar issue of migration, with subjects able to move from a “poor” group to a “rich” group, making a homogeneous group heterogeneous, but focusing on the determinants and consequences of the transfer.

tend to contribute positive amounts even when, in linear public good games, it is a dominated strategy.

The other dimension of heterogeneity we study — and interact with heterogeneity of endowments — is the presence of different *groups*, and hence the comparison of contributions between in- and out-group matching. Since Tajfel et al. (1971) pioneered the *minimal group* paradigm, experimentalists have employed various mechanisms to manipulate the salience of *artificial* groups, including face-to-face interaction and group tasks. In our design we rely on artificial groups where, as in most economics experiments, group members interact (Chen and Li, 2009). We employ an original design where such interaction happens only between pairs of subjects, hence maximizing statistical power, while at the same time the presence of only two groups arguably makes group membership more salient. There is a sizeable literature looking at the effect of group identity on behavior in social dilemmas (Wit and Wilke, 1992), including public good games (Harbaugh and Krause, 2000; Solow and Kirkwood, 2002; Eckel and Grossman, 2005; Charness et al., 2014), but the aforementioned studies do not include a comparison between in- and out-group matching.<sup>2</sup> This comparison is present in the work of Charness et al. (2007), who focus on the battle of the sexes and the prisoner’s dilemma, with randomly formed groups whose salience they manipulate; the prisoner’s dilemma is also studied by Goette et al. (2006) with real groups, while Chen and Li (2009) look at various two-player dictator and response games. In public good games, Battiston et al. (2018) employ real world groups, while several authors (Espinoza and Garza, 1985; Finocchiaro Castro, 2008; Bigoni et al., 2017; Battiston and Gamba, 2020) create groups based on real world characteristics, such as ethnicity or geographic origin.<sup>3</sup> To the best of our knowledge, our study is the first to compare in- and out-group contributions in public good games with purely random artificial groups.<sup>4</sup>

## 2 Experimental design

The experiment is presented from the beginning of each session as composed of two separate activities, but subjects were provided no details on the second one until after the first was over. Initially, participants are randomly subdivided in two groups, identified by two different colors. We used the names *cobalt* and *coral* for the colors, to try to avoid any potential biases such as associations with political parties or sports teams of Italy, where the experiment was run. The first activity is a contest between the two groups, based on a trivia game. Participants are asked to answer 12 open answer trivia questions: they do so while matched each with another member of their group, with whom they take turns in answering, and can interact via a chat. They have 7 minutes total, and for each question, they are free to make multiple attempts, without any negative consequence for wrong answers; they move to the following question either when they find the right answer, or after 1 minute (see Figure 3 in Appendix B for a screenshot). Questions were chosen in such a way as to motivate subjects towards making many attempts and interacting via the chat.<sup>5</sup> The group

---

<sup>2</sup>Eckel and Grossman (2005) introduce an out-group component in their “tournament treatment” where, as in our design, groups compete, as a mechanism to increase group salience; but in their work the public good game is then played only with members of the same group.

<sup>3</sup>This approach was also applied in the study of other social dilemmas (Klor and Shayo, 2010; Chen et al., 2014; Currarini and Mengel, 2016).

<sup>4</sup>Tangentially related are studies on public good games with partners/stranger matching (Grund et al., 2018), or studies where interaction is in-group only but information on other groups is provided (Kandul and Lanz, 2021).

<sup>5</sup>For instance, while the question of “which Sicilian province is the island of Lampedusa part of?” was not easy for most participants, it was comparatively easy to guess all provinces from the Sicily region until getting the correct

whose members, on average, get the most answers correct wins the contest, and a prize of €1 per member; participants are not made aware of the winner of this contest until the end of the session.

This design guarantees that the pairwise interaction is the only way that group members can affect each other’s behavior, increasing statistical power without increasing the number of groups.

The second activity is a two player repeated linear public good game, involving 15 rounds. Each subject was matched to a same partner (different from the one in the first activity) over all rounds, and sees the partner’s contribution after each round (see Figure 4 in Appendix B for a screenshot). \*<sup>1</sup> Before the activity, subjects were asked to answer control questions to show they understood the game. Each participant is randomly assigned an endowment of either €5 or €10, and contributions are multiplied by 1.5 (resulting in a marginal per-capita return of 0.75). Depending on the endowment and on the group of participants, we obtain four experimental conditions at the pair level:

\*<sup>1</sup> Translate the two screenshots

- *Homo-Same*: the two subjects have the same endowment and are in the same group
- *Het-Same*: the two subjects have different endowments but are in the same group
- *Homo-Other*: the two subjects have the same endowment but are in different groups
- *Het-Other*: the two subjects have different endowments and are in different groups

Experimental sessions were designed in such a way that in some of them, labeled as TI (for “treatment interaction”), the group assignment coincided with the endowment assignment (€5 to members of *cobalt* group, €10 to members of *coral* group or vice-versa, alternated between sessions), and subjects were informed of this. In the other sessions, labeled as TS (for “treatment separation”) there was no such correspondence, and subjects were only informed that some of them had been assigned €5, some €10. In all cases, participants knew the endowment and group of their partner.

TI sessions included the *Homo-Same* and the *Het-Other* conditions. TS sessions each included two out of the *Homo-Same*, *Het-Same* and *Homo-Other* conditions.<sup>6</sup> Note that in order to target a balanced sample size for the different experimental conditions (including *Homo-Same* in the two different types of sessions), we ran more TS sessions than TI sessions.

We adopted the following randomization procedure: partners for the two activities were assigned by first forming random groups of 4 (participants in each session were always a multiple of 4), unobserved to participants. Then, given a group with members A, B, C, D, we formed pairs (A, B) and (C, D) in the first activity, and (A, C), (B, D) in the second activity, and assigned colors and endowments consistently with the desired condition (e.g. “A B cobalt and rich, C D coral and poor” would result in the *Het-Other* condition). The absence of any interaction between different groups of 4 guarantees that each of them can be considered an independent observation. Consistently with this, group level cluster robust standard errors in the later empirical analysis are based on these groups of 4 subjects.

---

one. A similar argument applies to “what chemical element is fundamental in organic chemistry?”, or “which was the first soccer team to win a Series A championship without ever losing a match?”.

<sup>6</sup>We included only two conditions at a time for consistency with TI sessions. In principle, we could have also tested the *Het-Other* condition in TS sessions, but we judged that concentrating it in TI sessions, purposely designed to test the combined effect, would be a better use of sample size.

## 2.1 Procedures

We conducted our experiment in Pisa and Milan in October and November 2023, and preregistered our hypotheses at the address <https://osf.io/gqae4>. Subjects were recruited using ORSEE (Greiner, 2015). The experimental software was developed in oTree (Chen et al., 2016).

A total of 224 subjects, students in various disciplines (see Table 5 in Appendix A for a summary of the control variables derived from the questionnaire), participated in 12 sessions (see Table 6 in Appendix A for details).<sup>7</sup> The first round in session III was accidentally skipped<sup>8</sup>; this results in  $224 \times 15 - 16 = 3344$  observations. In addition, 14 subjects did not successfully complete the control questions, for a final count of 3134 (results are virtually unchanged if we leave these in).

## 2.2 Hypotheses

Our first hypothesis concerns the effect of economic integration on contribution to public goods.

**(H1)** Contributions by participants in the *Het-Same* condition differ from those of participants in the *Homo-Same* condition.

The related literature does not allow for a clear prediction: first because no study compares rich, poor and mixed groups in the same experiment; second, because studies that compare mixed and some kind of homogeneous groups report different conclusions. After a conjecture by Ledyard (1995) that heterogeneity should reduce contributions, Chan et al. (1999) report a positive effect of heterogeneity, Isaac and Walker (1988); Cherry et al. (2005) a negative effect,<sup>9</sup> Hofmeyr et al. (2007) report no effect (rich and poor subjects tend to contribute a same share of their endowment) and Keser et al. (2014) confirms this except for an extremely asymmetric distribution of endowments (much more unequal than those we employ), in which case a negative effect is observed. Note that according to Warr (1983) overall contributions should be, at the margin, unaffected by heterogeneity, while Bergstrom et al. (1986) show that heterogeneity should increase overall contributions if only some subjects contribute; however these are theoretical results dealing with non-trivial Nash equilibria in non-linear public goods, and have little to say in the linear case where the only, trivial, Nash equilibrium is to not contribute anything.

Our second hypothesis concerns the interaction of endowment heterogeneity with ingroup feeling. That is, we regress contributions (in all experimental conditions) on the treatment variables *Het*, *Other* and their interaction, focusing on the latter coefficient.

**(H2)** The interaction of endowment and group membership affects contributions to the public good.

Said otherwise, we compare the combined effect of the two dimensions of heterogeneity (measured as the difference between contributions in *Het-Other* and *Homo-Same*) with the the sum of the effect of financial heterogeneity (measured as difference between *Het-Same* and *Homo-Same*) and of group membership (measured as the difference between *Homo-Other* and *Homo-Same*).

---

<sup>7</sup>Not considered are two pilot studies, as well as one session in Pisa in which unrecoverable network problems disrupted several participant’s computers, rendering the chat unusable. That session was concluded normally except that all participants were attributed the €1 prize from the trivia contest; the data was dropped.

<sup>8</sup>For consistency, in this session we subtract 1 from the variable indicating the round number for the first half of the rounds, hence guaranteeing that both initial and final rounds are aligned with those of other sessions. The choice to split rounds exactly in half, hence with round 8 missing, is somewhat arbitrary but largely irrelevant.

<sup>9</sup>Rappoport and Suleiman (1993) also report a negative effect of heterogeneity in threshold public good games.

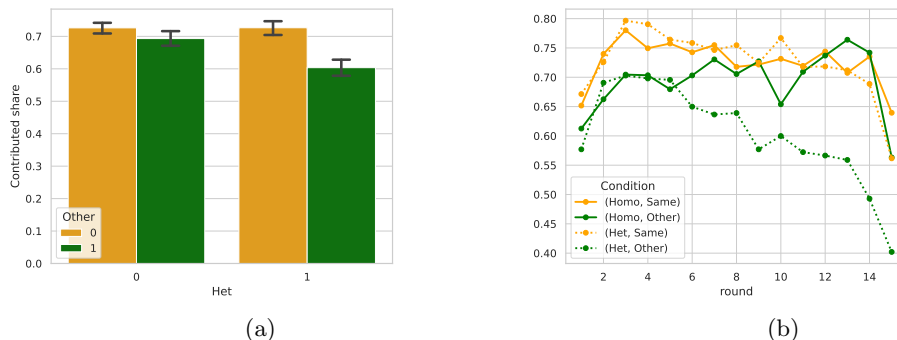


With respect to this hypothesis, and more in general to the interaction of heterogeneity in endowment and group membership, we are not aware of previous experimental studies that would help form educated predictions. The only observation we can make is that our subjects know that all participants in the session have either €5 or €10; hence, they can see these two values as identifying two *groups*, in such a way that the *Het* condition could embed an implicit out-group dimension, and potentially crowd out the explicit out-group dimension of the *Other* condition. If this was true, then we should observe an interaction coefficient that goes in opposite direction to that of the *Homo–Het* dimension taken in isolation — e.g. if subjects contribute less when matched to a partner from the other group, then being matched to a partner from the other group and with different endowment should result in *larger* contributions than the individual effect of out-group and heterogeneity, added together, would suggest.

### 3 Results

Figure 1a displays average contribution shares (that is, own contribution divided by own endowment) disaggregated by experimental condition. Note that contribution averages are the most appropriate measure for cross-condition comparisons, as different conditions happened to have (slightly) different shares of participants with high/low endowment. Alternatively, we estimate a regression with absolute contributions using Weighted Least Squares, where weights attributed to rich/poor subjects in each cell are inversely proportional to their number; the result of this approach, which gives virtually identical results, is displayed in Table 7 in Appendix A.

Figure 1: Average contribution shares, by experimental condition



*Note:* average contributions in each of the four experimental conditions, across all rounds in (a) (where bars indicate 95% confidence intervals) and disaggregated by round in (b).

Column (1) of Table 1 shows the results of a linear regression of contribution shares over a treatment variable indicating whether the two participants in a pair had different endowment ( $Het=1$ ), restricted to *Same* pairs. We see that the treatment variable has a positive but non-significant coefficient. Hence, we do not find evidence to support our first hypothesis.

**Result 1** *Financial integration per se does not affect overall contributions to the public good.*

If we interact *Het* with a dummy variable indicating contributing subjects with a €10 endowment (column (2) of Table 1), neither the coefficient for *Het* nor its sum with the interaction coefficient (0.071-0.037=0.034) is significant, so no effect of heterogeneity is found for either poor or rich subjects. In addition, consistent with the existing literature (Spiller et al., 2016), rich subjects appear to give a lower share of their endowment on average, as is visible from the negative and strongly significant coefficient for *rich*.

Table 1: Evidence concerning Hypothesis 1 (effect of heterogeneity in endowment)

	(1)	(2)
Intercept	0.612*** (0.172)	0.602*** (0.171)
Het	0.051 (0.061)	0.071 (0.065)
Het×rich		-0.037 (0.073)
TI	0.130*** (0.048)	0.130*** (0.047)
Milan	0.027 (0.057)	0.027 (0.057)
age	0.006 (0.006)	0.006 (0.006)
econ	-0.049 (0.054)	-0.046 (0.055)
male	0.044 (0.039)	0.043 (0.039)
rich	-0.119*** (0.034)	-0.107** (0.044)
round	-0.004* (0.002)	-0.004* (0.002)
Observations	1852	1852

*Note:* Dependent variable: contribution share. Estimation restricted to *Same* pairs. “rich”: dummy variable indicating an endowment of €10; “TI”: dummy variable indicating sessions where colors corresponded to endowment levels; “econ”: dummy variable indicating participants who studied Economics. Clustered standard errors at the group level in parentheses (“groups” are blocks of 4 subjects from which the pairs for the first and second activity are sourced). Two-sided  $p$ -values: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

For what concerns the second hypothesis, Table 2 shows the results of estimating the models with interaction between the treatment variables. In column (1), we find a negative and statistically significant coefficient for the *Het:Other* variable, consistent with evidence from Figure 1.

**Result 2** *The interaction of the two dimensions (difference in endowment and in group) has a negative, strong and statistically significant effect on contributions.*

Wald tests on both the sum of coefficients for *Het* and *Het:Other* (-0.229) and for *Other* and *Het:Other* (-0.262) find that they are strongly statistically significant: that is, subjects in the *Het:Other* condition contribute significantly less than subjects in the *Other* or in the *Het* conditions.

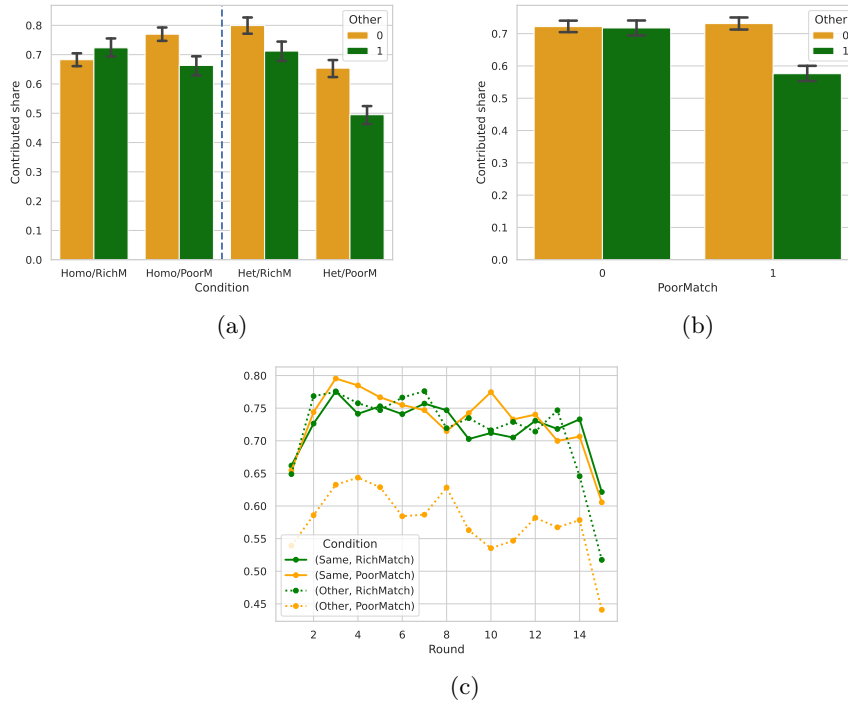
Table 2: Evidence concerning Hypothesis 2 (interaction effect)

	All (1)	Poor (2)	Rich (3)	All (4)	First round (5)
Intercept	0.680*** (0.100)	0.602*** (0.189)	0.603*** (0.155)	0.668*** (0.108)	0.616*** (0.128)
Het	0.052 (0.059)	0.060 (0.066)	0.027 (0.077)		
Other	0.019 (0.049)	-0.058 (0.045)	0.113 (0.070)	-0.001 (0.040)	0.009 (0.055)
rich	-0.111*** (0.030)				
Het×Other	-0.281*** (0.108)	-0.176 (0.116)	-0.408*** (0.147)		
PoorMatch				0.023 (0.038)	0.035 (0.045)
Oth×PoorMatch				-0.174*** (0.062)	-0.182** (0.080)
TI	0.140*** (0.046)	0.151** (0.059)	0.152** (0.065)	0.019 (0.030)	0.020 (0.036)
Milan	0.040 (0.036)	0.108** (0.047)	-0.019 (0.054)	0.032 (0.034)	0.013 (0.038)
age	0.002 (0.004)	0.004 (0.007)	0.001 (0.005)	0.002 (0.004)	0.000 (0.005)
econ	-0.014 (0.040)	-0.132** (0.058)	0.063 (0.054)	-0.016 (0.042)	-0.072* (0.041)
male	0.078*** (0.029)	0.139*** (0.043)	0.032 (0.042)	0.069** (0.030)	0.105*** (0.036)
round	-0.005*** (0.002)	-0.006** (0.002)	-0.004* (0.002)	-0.005*** (0.002)	
Observations	3134	1552	1582	3134	226

*Note:* Dependent variable: contribution share. Columns (2) and (3): poor and rich subjects, respectively; column (5): only first round. “rich”: dummy variable indicating endowment of €10; “TI”: dummy variable indicating sessions where colors corresponded to endowment levels; “econ”: dummy variable indicating participants who studied Economics; “PoorM[atch]”: dummy variable indicating being matched to a subject with an endowment of €5. Clustered standard errors at the group level in parentheses. Two-sided  $p$ -values: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Estimating the same regression on poor and rich subjects separately (columns (2) and (3)) reveals a more nuanced picture: while both these groups of subjects feature negative values for the interaction variable, it is statistically significant only for rich subjects — and it is also much larger in absolute value. In other words, contributions specifically decrease when (rich) subjects are matched to *poor subjects of the other group*. This effect is also visible looking at the last bar of Figure 2a; however, the same figure shows that also poor subjects matched to poor subjects of the other group contribute relatively little (fourth bar). The effect is even more clear when we do not control for the *Homo–Het* dimension (Figure 2b). Furthermore, when looking at contributions over time (bottom panel), the line for subjects with poor partners of the other group stands out, starting lower than and remaining below the others. Hence, in column (4) of Table 2, where all subjects are included, but *Other* is interacted with *PoorMatch* (rather than with *Het*), the interaction variable is once more large in absolute value, and statistically significant. Interestingly, it even remains significant if we restrict to the first round of play (column (5)), emphasizing that (as also appears from Figure 2c) this interaction effect is at work from the beginning, rather than emerging from the evolution of contributions.

Figure 2: Average contribution shares, conditional on partner’s endowment



Note: (a): average contributions in each of the four experimental conditions depending on partner’s endowment. (b): same as (a) but disregarding the *Homo–Het* dimension; (c) same as (b) but disaggregated by round. Bars, where present, indicate 95% confidence intervals.

**Result 3** *Subjects contribute significantly less when matched to a peer who is from the other group and is poor.*

Looking at control variables, we see that the coefficient for *Milan*, denoting the six sessions run there, is small and close to zero; it is positive (0.108) and statistically significant only when restricting to poor subjects (column (2) of Table 2). Age does not seem to affect contributions in any way (notice it has little variability within our sample of university students), being a student in economic disciplines has at most a marginally significant negative effect. Table 2 shows that male participants contribute significantly more — at least poor ones (column (2)): existing experimental literature on gender effects in public good games reports mixed results (Nowell and Tinkler, 1994; Solow and Kirkwood, 2002). As is typical in public good games (Andreoni, 1988), and clearly visible in Figure 1b, contributions significantly decrease over round: indeed the coefficient for *Round* is negative and significant in all specifications.

### 3.1 Exploratory analyses

The *Other* coefficient is close to zero and non-significant for all specifications in Table 2: being matched to a member of own or other groups does not affect contributions, if endowments are homogeneous (with the effect of heterogeneous endowments captured by the interaction variable). This is somewhat surprising given the literature presented in Section 1 — despite no previous study having looked at public good games and purely artificial groups, both studies of other social dilemmas with artificial groups (Wit and Wilke, 1992) and studies of public good games with real world groups/characteristics (Battiston et al., 2018; Espinoza and Garza, 1985; Finocchiaro Castro, 2008; Bigoni et al., 2017; Battiston and Gamba, 2020) find lower cooperation in out-group settings.

Interestingly, in Figure 1b, there appears to be a sharp distinction between *Same* and *Other* conditions during the first few rounds — a distinction which then disappears, with *Homo-Other* contributions becoming similar to contributions in the *Same* condition. In light of this, we present in column (1) of Table 3 a model focusing on the *Other/Same* dimension and restricted to the first round. The coefficient for *Other* is negative (-0.083) and significant:<sup>10</sup> being matched to a member of the other group negatively affects the *unconditional* propensity to contribute.

As a more general attempt to cleanly identify the role of reciprocity in our results, we define a variable  $sharediff_1$  measuring the difference between own and one’s partner’s contribution share in the first round: for ease of interpretation we re-scale it over the interval  $[0, 2]$  by adding 1 to its value (so all values are positive). We then regress the change in contribution share from the first to the second round over  $sharediff_1$ , *Het*, and their interaction, together with the usual controls. As can be expected,  $sharediff_1$  has a negative (-0.383) and statistically significant coefficient (see column (2) of Table 3) — subjects tend to reduce their contribution after having observed a lower contribution (in proportion) from their partner. *Het* also has a negative (-0.168) and marginally significant coefficient: partners with different endowments seem more likely to decrease their contribution from the first to the second round. However, the interaction variable has opposite sign (0.144) and is also marginally significant, suggesting that heterogeneity in endowments might be related to a *milder* reaction to an undercontributing partner. Interestingly, if we disaggregate this analysis by own endowment (columns (3) and (4) of Table 3), we find that the observed patterns essentially characterize only rich subjects, for whom both *Het* and the interaction variable have larger absolute

---

<sup>10</sup>It remains negative and significant if instead of round 1 we consider any round from 2 to 8 — results available upon request.

value and are statistically significant. This suggests that, although rich subjects decrease their contribution after having observed a lower contribution (in proportion) from their partner, this reaction is mitigated when their partner has a lower endowment.

Similarly, if we interact  $sharediff_1$  with *Other* (column (5)), we get a negative value (-0.144) for *Other* and a positive value (0.128) for  $Other:sharediff_1$ , neither significant (the coefficient for  $sharediff_1$  is again negative and statistically significant), but when we disaggregate the analysis by own endowment (columns (6) and (7)), we again find that the coefficients are larger in absolute value and statistically significant (only) for rich subjects. Perhaps, rich subjects who meet a partner different from them — be it in endowment, or in group membership — expect low contributions and hence tend not to increase their own; but for the same reason, they do not react too negatively if the partner contributes little, as this matches their expectation. Overall, these results, and in particular the positive sign of the interaction coefficients ( $Het:sharediff_1$  in column (3) and  $Oth:sharediff_1$  in column (7)), suggest that it is not lack of reciprocity that explains the negative effect of differences between partners (*Het* and *Other*); if anything, reciprocity attenuates the effect of the differences.

The coefficient for “male” is significant in Table 2 (e.g. column (1)), but not in Table 1, where we only consider subjects in the *Same* condition. Indeed, if we restrict to the *Other* condition (Table 4, column (1)), we find that the coefficient for “male” is strongly significant and quite large. In columns (2) and (3) of Table 4, we run a similar analysis splitting the sample along the *Homo–Het* dimension. Again, we find that the gender effect is treatment-specific, in the sense that males give significantly more, compared to females, in the *Het* condition, but not in the *Homo* condition. Notice that instead no difference in gender appears with reference to the *PoorMatch* variable: the interaction coefficient  $Other \times PoorMatch \times male$  is not significant in column (4) (the only significant coefficient being  $Other \times PoorMatch$ , already observed in Table 2). Summing up, women give significantly less than males when matched to a subject from the other group (column (1)) or with different endowment (column (3)), not specifically when matched to a subject who is from the other group *and* poor (column (4)).

As a reminder, all participants ignored what experimental conditions were being tested in the other groups — unobservable to them. So the *only* difference for participants in *TI* sessions as opposed to *TS* sessions was that they were *informed* of the association between colors and endowments (which did not exist, in *TS* sessions). The positive and significant coefficient of the *TI* variable in column (5) of Table 4, where we restrict the analysis to the *Homo/Same* condition (the only condition where we observe both  $TI=0$  and  $TI=1$ )<sup>11</sup> means that this information had a positive effect on contributions. In columns (6) and (7) we verify that this holds for both rich and poor subjects. That is, awareness that group membership would also determine one’s endowment induced both rich and poor subjects in *Homo/Same* conditions to contribute more. This overlap in group membership and endowment type could have arguably created a stronger in-group feeling, leading to higher contributions. This is an especially interesting result, given that endowments ultimately had the same distribution regardless of whether they were associated to groups. It is also possible that observing the association between endowment and groups might have led subjects to experience (just like in the real world) a sense of *injustice*, pushing them to contribute more; however, since *TI* varies only within the *Homo/Same* condition, we are unable to extrapolate this more general result from our experiment.

---

<sup>11</sup>Indeed, *TI* has a similar coefficient in Tables 1) and 2, where the presence of other conditions is virtually irrelevant.

Table 3: Analysis of reciprocity in initial rounds

	Round 1	Round 2	R 2/Poor	R 2/Rich	Round 2	R 2/Poor	R 2/Rich
Dep. var.	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	share	$\Delta$ share	$\Delta$ share	$\Delta$ share	$\Delta$ share	$\Delta$ share	$\Delta$ share
Intercept	0.689*** (0.106)	0.419*** (0.105)	0.391** (0.164)	0.422*** (0.150)	0.375*** (0.105)	0.431** (0.182)	0.327** (0.136)
Het		-0.168* (0.088)	-0.019 (0.188)	-0.227** (0.098)			
sharediff <sub>1</sub>		-0.383*** (0.058)	-0.375*** (0.088)	-0.369*** (0.072)	-0.361*** (0.051)	-0.392*** (0.087)	-0.338*** (0.060)
Het $\times$ sharediff <sub>1</sub>		0.144* (0.084)	0.030 (0.155)	0.191** (0.097)			
Other	-0.083** (0.039)				-0.144 (0.088)	-0.149 (0.147)	-0.202** (0.101)
Oth $\times$ sharediff <sub>1</sub>					0.128 (0.092)	0.092 (0.143)	0.252** (0.099)
TI	0.007 (0.039)	-0.001 (0.024)	0.023 (0.037)	-0.010 (0.031)	-0.002 (0.025)	0.028 (0.043)	0.002 (0.035)
Milan	0.027 (0.037)	0.022 (0.028)	0.049 (0.046)	-0.000 (0.033)	0.024 (0.028)	0.046 (0.045)	0.005 (0.032)
age	-0.000 (0.004)	0.001 (0.003)	0.001 (0.006)	0.001 (0.005)	0.002 (0.003)	0.001 (0.006)	0.002 (0.005)
econ	-0.069* (0.041)	-0.056** (0.027)	-0.130*** (0.044)	-0.010 (0.034)	-0.046* (0.027)	-0.131*** (0.039)	0.018 (0.035)
male	0.134*** (0.035)	0.028 (0.024)	0.034 (0.037)	0.028 (0.028)	0.022 (0.023)	0.034 (0.036)	0.012 (0.029)
rich	-0.138*** (0.037)						
Observations	210	210	104	106	210	104	106

*Note:* Dependent variable: contribution share in column 1, change in contribution share from first to second round in other columns. “rich”: dummy variable indicating endowment of €10; “TI”: dummy variable indicating sessions where colors corresponded to endowment levels; “econ”: dummy variable indicating participants who studied Economics; “PoorM[atch]”: dummy variable indicating being matched to a subject with an endowment of €5. Clustered standard errors at the group level in parentheses. Two-sided  $p$ -values: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 4: Exploratory analyses

	Other	Homo	Het	All	Homo/Same	H/S/Rich	H/S/Poor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	0.724*** (0.103)	0.545*** (0.163)	1.010*** (0.158)	0.678*** (0.114)	0.219 (0.225)	0.053 (0.284)	0.348 (0.432)
Het	-0.021 (0.028)						
Other		-0.128* (0.068)	-0.047 (0.036)	-0.034 (0.056)			
rich		-0.130** (0.061)	-0.065 (0.075)				
male	0.135*** (0.050)	-0.006 (0.077)	0.170*** (0.055)	0.086 (0.053)	0.014 (0.046)	0.038 (0.066)	0.022 (0.079)
Other: male		0.178 (0.118)	0.079 (0.098)	0.084 (0.077)			
rich: male		0.060 (0.111)	-0.166* (0.086)				
PoorMatch				0.065 (0.050)			
PoorMatch×male				-0.109 (0.080)			
Het: male	-0.060 (0.092)						
Oth×PoorMatch				-0.177** (0.083)			
Oth×PoorMatch×male				0.009 (0.130)			
Other: rich		0.227** (0.092)	-0.085 (0.132)				
Oth×rich×male		-0.138 (0.184)	-0.044 (0.181)				
Milan	0.068 (0.048)	0.078 (0.050)	-0.026 (0.055)	0.031 (0.035)	0.106 (0.077)	0.016 (0.093)	0.193 (0.123)
TI	-0.021 (0.028)	0.148*** (0.048)	-0.047 (0.036)	0.024 (0.030)	0.144*** (0.050)	0.148** (0.064)	0.172*** (0.062)
age	-0.004 (0.004)	0.006 (0.006)	-0.008 (0.007)	0.001 (0.004)	0.018** (0.008)	0.022** (0.010)	0.014 (0.015)
econ	0.059 (0.058)	-0.008 (0.048)	-0.026 (0.078)	-0.009 (0.043)	-0.013 (0.064)	0.111 (0.080)	-0.118 (0.099)
round	-0.007** (0.003)	-0.001 (0.002)	-0.011*** (0.002)	-0.005*** (0.002)	-0.002 (0.003)	-0.000 (0.004)	-0.005 (0.004)
Observations	1282	1837	1297	3134	1222	626	596

Note: Dependent variable: contribution share. “rich”: dummy variable indicating endowment of €10; “TI”: dummy variable indicating sessions where colors corresponded to endowment levels; “econ”: dummy variable indicating participants who studied Economics; “PoorM[atch]”: dummy variable indicating being matched to a subject with an endowment of €5. Clustered standard errors at the group level in parentheses. Two-sided  $p$ -values: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$



## 4 Discussion

The behavioral literature suggests that the choice of how much to contribute to a public good in a group where subjects have different endowments is not a trivial decision to make — or to model. Some of the motivations that the literature has identified, such as fairness motives and reciprocity, are in conflict, since a rich subject who primarily values fairness should contribute *more* when encountering a poorer subject, while the opposite should happen if the rich subject primarily values reciprocity — as the poorer partner is unable to match large contributions. Consistent with the presence of opposite forces, we do not observe an effect of facing a subject having a different endowment (financial heterogeneity) versus having the same endowment.

At the same time, fairness and reciprocity should not affect how subjects cooperate with members of own/other groups, if such groups (defined by colors, in our case) are ephemeral, anonymous and not related to the endowment. Our protocol for group priming was relatively mild: interaction happened with another anonymous group member only (who was different from the partner in the subsequent public good game), and it was mediated by a chat; the absence of payoff-relevant spillovers between the two activities was clear to subjects. Furthermore, the presence of another dimension of heterogeneity (in the endowment) might have partly distracted the subjects from the role of groups. Consistent with this, we do not find an effect of group membership on contributions.

Considering all of this, the presence, size and statistical significance of the interaction effect between group membership and financial heterogeneity (result 2) are striking; and the same holds for the interaction of group membership and being matched to a poor partner (result 3). This is even more true if we consider that heterogeneity in endowments itself creates *groups* — of high endowment and low endowment subjects — whose members actually have in common something more substantial than colors (or than cooperation in a past competition), and could hence experience in- vs outgroup effects, possibly crowding out those of color-based groups. The opposite instead happens, – we observe a crowding in, as heterogeneity in endowment and group membership strongly interact.

A possible explanation of result 2 is that subjects perceive a tension between a natural mistrust towards subjects from different groups and the more thoughtful reasoning that such differences would better be overcome, for the common good. The negative and significant coefficient we find for the interaction term suggests that when multiple differences add up, the latter way of reasoning is hindered to a point that mistrust dominates. Another way to see this would be that two subjects find it more natural to cooperate only they can find *at least one* common trait between them.<sup>12</sup> In a similar fashion, result 3 could be explained by the mental burden of facing a subject from the other group *and* poor. Despite a design that arguably limits the ability to form bonds among group members, a strong effect emerges according to which poor subjects *from a different group* receive less from both rich and poor participants alike.

Our findings have implications for cooperation in many economic contexts where group bonds abound. Clearly, a crucial element of our design is that subjects do not get to choose their partners for the public good game: it is possible that when economic agents are given freedom of choice in transactions, the freedom itself helps to build the required mutual trust. However, to the extent that differences — possibly under multiple dimensions — do reduce mutual trust, leading to sub-optimal outcomes, subjects might learn to expect this and simply reduce the occasions for economic interactions with fellow citizens who are somehow different from them. That is, if integration is not imposed, given the results from our experiment, it is only natural to expect that it will not happen

---

<sup>12</sup>This is consistent with Wald tests from Table 2 — see Section 3.

— precisely what recent experimental evidence shows in the case of endogenous group formation (Stallen et al., 2023).

We studied the interaction between endowments and group membership in public good games because, despite the simple rules (and game-theoretic analysis) of PGGs, they feature a complex mix of possible theoretical motives (including reciprocity), and of empirically observed behavioral patterns: thus we considered them likely to be affected by differences between subjects. Further research could be devoted to testing a similar design with other social dilemmas, including simpler games such as the trust game and the dictator game. In addition, given the reluctance of all subjects to give to poor subjects from a different group, it would be interesting to study the effect of permanent changes in endowment status — from rich to poor, or vice-versa — during the game.

## References

- Andreoni, J. (1988). Why free ride?: Strategies and learning in public goods experiments. *Journal of public Economics* 37(3), 291–304.
- Battiston, P. and S. Gamba (2020). When the two ends meet: an experiment on cooperation and social capital. *Economia Politica*, 1–30.
- Battiston, P., S. Gamba, M. Rizzolli, V. Rotondi, et al. (2018). What exactly is public in a public good game? a lab-in-the-field experiment. *Working paper 125, "Carlo F. Dondena" Centre for Research on Social Dynamics (DONDENA), Università Commerciale Luigi Bocconi*.
- Bergstrom, T., L. Blume, and H. Varian (1986). On the private provision of public goods. *Journal of public economics* 29(1), 25–49.
- Bigoni, M., S. Bortolotti, M. Casari, and D. Gambetta (2017). At the root of the North-South cooperation gap in Italy Preferences or beliefs? *The Economic Journal*.
- Buckley, E. and R. Croson (2006). Income and wealth heterogeneity in the voluntary provision of linear public goods. *Journal of Public Economics* 90(4-5), 935–955.
- Chan, K. S., S. Mestelman, R. Moir, and R. A. Muller (1996). The voluntary provision of public goods under varying income distributions. *Canadian Journal of Economics*, 54–69.
- Chan, K. S., S. Mestelman, R. Moir, and R. A. Muller (1999). Heterogeneity and the voluntary provision of public goods. *Experimental Economics* 2, 5–30.
- Charness, G., R. Cobo-Reyes, and N. Jiménez (2014). Identities, selection, and contributions in a public-goods game. *Games and Economic Behavior* 87, 322–338.
- Charness, G., L. Rigotti, and A. Rustichini (2007). Individual behavior and group membership. *American Economic Review* 97(4), 1340–1352.
- Chen, D. L., M. Schonger, and C. Wickens (2016). otree—an open-source platform for laboratory, online, and field experiments. *Journal of Behavioral and Experimental Finance* 9, 88–97.
- Chen, Y. and S. X. Li (2009). Group identity and social preferences. *American Economic Review* 99(1), 431–457.

- Chen, Y., S. X. Li, T. X. Liu, and M. Shih (2014). Which hat to wear? impact of natural identities on coordination and cooperation. *Games and Economic Behavior* 84, 58–86.
- Cherry, T. L., S. Kroll, and J. F. Shogren (2005). The impact of endowment heterogeneity and origin on public good contributions: evidence from the lab. *Journal of Economic Behavior & Organization* 57(3), 357–365.
- Currarini, S. and F. Mengel (2016). Identity, homophily and in-group bias. *European Economic Review* 90, 40–55.
- Eckel, C. C. and P. J. Grossman (2005). Managing diversity by creating team identity. *Journal of Economic Behavior & Organization* 58(3), 371–392.
- Espinoza, J. A. and R. T. Garza (1985). Social group salience and interethnic cooperation. *Journal of Experimental Social Psychology* 21(4), 380–392.
- Finocchiaro Castro, M. (2008). Where are you from? cultural differences in public good experiments. *The Journal of Socio-Economics* 37(6), 2319–2329.
- Goette, L., D. Huffman, and S. Meier (2006). The Impact of Group Membership on Cooperation and Norm Enforcement: Evidence Using Random Assignment to Real Social Groups. *American Economic Review* 96(2), 212–216.
- Greiner, B. (2015). Subject pool recruitment procedures: organizing experiments with orsee. *Journal of the Economic Science Association* 1(1), 114–125.
- Grund, C., C. Harbring, and K. Thommes (2018). Group (re-) formation in public good games: The tale of the bad apple? *Journal of Economic Behavior & Organization* 145, 306–319.
- Harbaugh, W. T. and K. Krause (2000). Children’s altruism in public good and dictator experiments. *Economic Inquiry* 38(1), 95–109.
- Hofmeyr, A., J. Burns, and M. Visser (2007). Income inequality, reciprocity and public good provision: an experimental analysis. *South African Journal of Economics* 75(3), 508–520.
- Huber, J., L. Hueber, D. Kleinlercher, and T. Stöckl (2022, 10). Acceptance or rejection of welfare migration—an experimental investigation. *SN Business & Economics* 2.
- Isaac, R. M. and J. M. Walker (1988). Communication and free-riding behavior: The voluntary contribution mechanism. *Economic inquiry* 26(4), 585–608.
- Kandul, S. and B. Lanz (2021). Public good provision, in-group cooperation and out-group descriptive norms: A lab experiment. *Journal of Economic Psychology* 85, 102382.
- Keser, C., A. Markstädter, M. Schmidt, and C. Schnitzler (2014). Social costs of inequality—heterogeneous endowments in public-good experiments. *Center for European, Governance and Economic Development Research-cege Discussion Papers* (217).
- Klor, E. F. and M. Shayo (2010). Social identity and preferences over redistribution. *Journal of Public Economics* 94(3-4), 269–278.

- Ledyard, J. O. (1995). Public goods: A survey of experimental research. In J. H. Kagel and A. E. Roth (Eds.), *Handbook of Experimental Economics*, pp. 111–194. Princeton: Princeton University Press.
- Marwell, G. and R. E. Ames (1979). Experiments on the provision of public goods. i. resources, interest, group size, and the free-rider problem. *American Journal of sociology* 84(6), 1335–1360.
- Nowell, C. and S. Tinkler (1994). The influence of gender on the provision of a public good. *Journal of Economic Behavior & Organization* 25(1), 25–36.
- Rappoport, A. and R. Suleiman (1993). Incremental contribution in step level public goods games with asymmetric players. *Organizational Behavior and Human Decision Processes* 55, 171–194.
- Solow, J. L. and N. Kirkwood (2002). Group identity and gender in public goods experiments. *Journal of Economic Behavior & Organization* 48(4), 403–412.
- Spiller, J., A. Ufert, P. Vetter, and U. Will (2016). Norms in an asymmetric public good experiment. *Economics Letters* 142, 35–44.
- Stallen, M., L. L. Snijder, J. Gross, L. P. Hilbert, and C. K. De Dreu (2023). Partner choice and cooperation in social dilemmas can increase resource inequality. *Nature Communications* 14(1), 6432.
- Tajfel, H., M. G. Billig, R. P. Bundy, and C. Flament (1971). Social categorization and intergroup behaviour. *European journal of social psychology* 1(2), 149–178.
- Warr, P. G. (1983). The private provision of a public good is independent of the distribution of income. *Economics Letters* 13(2-3), 207–211.
- Wit, A. P. and H. A. Wilke (1992). The effect of social categorization on cooperation in three types of social dilemmas. *Journal of Economic Psychology* 13(1), 135–151.

## A Additional material

Table 5: Distribution of control variables

	age	econ	male
City			
Pisa	24.73	0.15	0.47
Milan	20.91	0.29	0.37

*Note:* city-specific mean for each control variable. Beyond Economics, “econ” includes Marketing and Business Administration. The other most frequently observed disciplines were Political Sciences, International Relations and Engineering.

Table 6: Structure of sessions

Session type	TI	TS without...			TS (all)	Total
		<i>Homo-Same</i>	<i>Homo-Other</i>	<i>Het-Same</i>		
Sessions in ...						
Pisa	3	1	1	1	3	6
Milan	2	1	1	2	4	6
<b>Total sessions</b>	<b>5</b>	2	2	3	<b>7</b>	<b>12</b>
Subjects in condition ...						
<i>Homo-Same</i>	40		16	32	48	40 TI + 48 TS
<i>Het-Same</i>		20	24		44	44
<i>Homo-Other</i>		16		28	44	44
<i>Het-Other</i>	48				0	48
<b>Total subjects</b>	<b>88</b>	36	40	60	<b>136</b>	<b>224</b>

Table 7: Weighted Least Squares estimation of main results

	Same (1)	Same (2)	All (3)	Poor (4)	Rich (5)	All (6)	First round (7)
Intercept	3.329** (1.459)	3.224** (1.425)	3.875*** (0.800)	3.312*** (0.944)	6.690*** (1.351)	4.941*** (0.722)	5.020*** (0.789)
Het	0.279 (0.485)	0.439 (0.345)	0.308 (0.474)	0.246 (0.326)	0.275 (0.775)		
Other			0.355 (0.409)	-0.311 (0.220)	1.139 (0.698)	0.055 (0.564)	-0.323 (0.530)
rich	2.739*** (0.302)	2.889*** (0.369)	2.661*** (0.272)				
Het×Other			-2.382*** (0.877)	-0.814 (0.570)	-4.112*** (1.475)		
Het×rich		-0.303 (0.632)					
PoorMatch						-0.182 (0.503)	-0.237 (0.465)
Oth×PoorMatch						-1.230 (0.781)	-0.671 (0.778)
TI	0.954** (0.388)	0.957** (0.385)	1.064*** (0.373)	0.734** (0.300)	1.532** (0.662)	-0.180 (0.346)	-0.020 (0.344)
Milan	-0.030 (0.473)	-0.036 (0.474)	0.091 (0.320)	0.444** (0.217)	-0.160 (0.574)	0.169 (0.380)	-0.008 (0.371)
age	0.022 (0.054)	0.023 (0.053)	-0.010 (0.029)	0.009 (0.036)	-0.016 (0.044)	0.012 (0.029)	-0.019 (0.033)
econ	-0.391 (0.472)	-0.359 (0.469)	0.051 (0.367)	-0.684*** (0.255)	0.561 (0.571)	0.529 (0.421)	0.115 (0.351)
male	0.328 (0.335)	0.313 (0.339)	0.515** (0.250)	0.844*** (0.204)	0.349 (0.446)	0.935*** (0.309)	1.123*** (0.322)
round	-0.030* (0.016)	-0.030* (0.016)	-0.039*** (0.013)	-0.030** (0.013)	-0.047** (0.022)	-0.039*** (0.013)	
Observations	1852	1852	3134	1552	1582	3134	226

*Note:* Estimations featured in tables 1 (columns (1) and (2)) and 2 (columns (3) to (7)) using absolute (rather than relative) contributions, and estimating via Weighted Least Squares where weights of rich/poor subjects are inversely proportional to their numerosity in each cell. See tables 1 and 2 for details.

## B Screenshots

Dashed red boxes contain English translations (not included in the actual interface) of the original Italian text.

Figure 3: Screenshot of the first phase (trivia contest)

Tempo rimasto per completare questa pagina: 0:24  
Time left to complete this page: 0:24

Gruppo **Cobalto** Risposte corrette finora in questa coppia: 3/5  
Group Cobalt - Correct answers so far for your pair: 3/5

Di che band è il celeberrimo album *The Wall*, del 1979? Whose band is the famous 1979 album *The Wall*?

Tocca a te a rispondere! Your turn to answer!

Invia risposta Send answer

Ricorda che anche il partecipante con cui interagisci è del gruppo **Cobalto**, e che quello che conta per la gara è il **numero totale** di risposte corrette che daranno tutti i membri del tuo gruppo.  
Remember that the participant you are interacting with is, too, from the Cobalt group, and that what matters for the competition is the total number of correct answers given by all members of your group.

Con questa chat puoi comunicare con il tuo compagno/la tua compagna: You can use this chat to communicate with your partner.

È vietato solo 1) scrivere volgarità 2) dare qualsiasi indizio sulla propria identità. It is just forbidden to 1) write vulgarities 2) give hints on your identity.

Invia

Giocatore 1: Questa non la so Player 1: I don't know this one

Io: È Mennea! Me: It is Mennea!

Giocatore 1: Pietro Mennea Giusto! Player 1: Pietro Mennea - Correct!

Io: Prova Parigi... Me: Try Paris...

Io: Parigi Sbagliato... Me: Paris - Wrong...

Giocatore 1: Torino Giusto! Player 1: Turin - Correct!

Io: Pink Floyd, assolutamente! Pink Floyd, for sure!

Giocatore 1: Red Hot Chili Peppers Sbagliato... Player 1: Red Hot Chili Peppers - Wrong...

Io: No!! Me: No!!

Note: the frame and chat background had the color of the group — *cobalt* in this case.

Figure 4: Screenshot of the second phase (public good game)

Second phase: choice of your contribution, round 2 of 15

## Seconda fase: scelta del tuo contributo, round 2 di 15

Hai a disposizione 10,00 €. You have 10 euro.

Sei appaiato ad un giocatore del tuo stesso gruppo (**Cobalto**) che ha a disposizione 5,00 €. You are matched to a player from your same group (Cobalt) who has 5 euro.

Quello che ognuno di voi decide di contribuire verrà moltiplicato per 1,5 e quindi diviso in parti uguali. Whatever each of you chooses to contribute gets multiplied by 1.5 and subdivided in two equal shares.

Quanto vuoi contribuire? How much to you want to contribute?

€

Successivo

Next

Note: this player has €10 and is matched to a player with €5; both are members of the *Cobalt* group. Hence, this is the *Het-Same* condition, in a TS session.



## C Experimental instructions

The instructions that follow (translated from Italian) were displayed on each computer and also read aloud.

### General instructions

Welcome, and thanks for your participation in this experiment. If at any time you have a question, please raise your hand and we will come to answer.

- Please put away your phone or anything that might distract you, and do not communicate with the other participants.
  - This session is composed of two quick activities. We will now describe and run the first activity; then we will move to the second.
  - All participants to this session are subject to the same rules.
  - First, you will be split in two groups, which for convenience will be identified with the colors **cobalt** and **coral**.
  - The groups' composition will never be revealed.
- 

### Description of first activity

You have been assigned to the **cobalt** group. The first activity is a competition between your group and the **coral** group.

The two groups will remain the same until the end.

The competition consists in answering 12 trivia questions on various topics. Each correct answer is worth one point, each wrong or missing answer is worth 0. The winner will be the group whose members make on average more points: they will get €1 each (in addition to their respective earnings from the second phase).

In this competition, you will be paired with another member of your group, **cobalt**: you will take turns in answering, and you can help each other, using an in-screen chat that will be made available.

You have 60 seconds for answering each question, but as soon as the correct answer is provided, you will immediately move to the following question. During this time, you are free to make as many attempts as desired. In total you have 7 minutes to answer the questions. The answers do not discriminate between lower and uppercase letters, so you can use them indifferently.

In the chat box, you can write anything except:

1. profanities of any kind,
  2. your name or any element that might reveal your identity.
-

*[Inside the trivia screen]*

Remember that the participant you are interacting with is also a member of the **cobalt** group, and that what matters for the competition is the overall number of correct answers provided by all members of your group.

---

**Description of second activity**

We will now move to the second activity.

For this activity, each participant in this room is assigned a given endowment, that can be €5.00 or €10.00. *[In TI sessions:* For this activity, each participant of the **cobalt** group is assigned €10.00, and each participant of the **coral** group is assigned €5.00. ]

- You have now been matched to a different participant, who *may be from your group, or from the other*.
  - You must decide what to do with the amount of money you were assigned. In particular, you can decide how many euros to contribute to a common pool with the other participant you were matched to.
  - The other participant you were matched to is facing the same decision.
  - Any money in the common pool is multiplied by 1.5 and split between you and your partner *in equal shares*, hence regardless of each participant's specific contribution.
  - Instead, money you do not contribute to the common pool remains yours.
  - This mechanism will be repeated for 15 *rounds*. In each round, you will be matched to the same participant and you will have the same initial endowment (5,00 € o 10,00 €). After each round, you will see the other participant's choice, and hence your resulting payoff.
  - At the end, one of these rounds will be extracted, and it will determine the payment you will receive - together with the prize your group might have won in the first phase.
  - These rules apply to all participants in the room.
- 

To ensure everything is clear, we will now go through a small simulation of a different case, where the endowment you have is €7.

- You decide to contribute €3 to the common pool.
- The other participant decides to contribute €5.

How much will each of you get back from the common pool?

What will be your payoff from this round?

*(Feel free to enter what you think is the correct answers and click "Next": if the answers are correct you will transition to the next page, otherwise you will be able to try again.)*