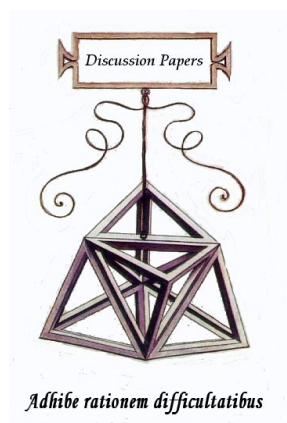




Discussion Papers

Collana di

E-papers del Dipartimento di Economia e Management – Università di Pisa



Marco Catola, Simone D'Alessandro, Pietro
Guarnieri, Veronica Pizziol

Multilevel Public Goods Game: an Online Experiment

Discussion Paper n. 263

2020

Discussion Paper n. 263, presentato: Novembre 2020

Indirizzo dell'Autore:

Marco Catola

Dipartimento di Economia e Management, via Ridolfi 10, 56100, Pisa – Italy

Email: marco.catola@ec.unipi.it

Simone D'Alessandro

Dipartimento di Economia e Management, via Ridolfi 10, 56100, Pisa – Italy

Email: simone.dalessandro@unipi.it

Pietro Guarnieri

Dipartimento di Economia e Management, via Ridolfi 10, 56100, Pisa – Italy

Email: pietro.guarnieri@ec.unipi.it

Veronica Pizziol

IMT School of Advanced Studies, Piazza S. Francesco 19, 55100, Lucca - Italy

Email: veronica.pizziol@imtlucca.it

© Marco Catola, Simone D'Alessandro, Pietro Guarnieri, Veronica Pizziol

La presente pubblicazione ottempera agli obblighi previsti dall'art. 1 del decreto legislativo luogotenenziale 31 agosto 1945, n. 660.

Si prega di citare così:

Catola M., D'Alessandro S., Guarnieri P., Pizziol V. (2020), “**Multilevel Public Goods Game: an Online Experiment**”, Discussion Papers del Dipartimento di Economia e Management – Università di Pisa, n. 263 (<http://www.ec.unipi.it/ricerca/discussion-papers.html>).

Discussion Paper
n. 263



Marco Catola, Simone D'Alessandro, Pietro Guarnieri, Veronica Pizziol

Multilevel Public Goods Game: an Online Experiment

Abstract

In the multilevel public goods games, subjects face a trade-off between contributing to the provision of a local good or a global good benefiting the whole society. Institutions may attempt to counteract in-group favouritism by increasing the efficiency of the global public good. In an online experiment, we systematically address all the conflicting results concerning efficiency obtained in the literature. By gradually increasing the relative return of the global good, we find evidence of i. a levelling up in the contribution to the global good, ii. a substitution at the expenses of the local good, and iii. no evidence of an increase in the total contribution to the two groups (i.e. marginal crowding in). We also provide a measure of an intrinsic preference for the local group revealing in-group favouritism and a novel measure of an intrinsic preference for the global good revealing a motivation to contribute to the society independently of efficiency reasons

Keywords: Multilevel public good game, online experiment, efficiency, social dilemma.

JEL: C9; D71; H4

Multilevel Public Goods Game: an Online Experiment

Marco Catola^a, Simone D'Alessandro^a, Pietro Guarnieri^a, Veronica Pizziol^b

^aDepartment of Economics and Management, University of Pisa

^bIMT School of Advanced Studies, Lucca

Abstract

In the multilevel public goods games, subjects face a trade-off between contributing to the provision of a local good or a global good benefiting the whole society. Institutions may attempt to counteract in-group favouritism by increasing the efficiency of the global public good. In an online experiment, we systematically address all the conflicting results concerning efficiency obtained in the literature. By gradually increasing the relative return of the global good, we find evidence of i. a levelling up in the contribution to the global good, ii. a substitution at the expenses of the local good, and iii. no evidence of an increase in the total contribution to the two groups (i.e. marginal crowding in). We also provide a measure of an intrinsic preference for the local group revealing in-group favouritism and a novel measure of an intrinsic preference for the global good revealing a motivation to contribute to the society independently of efficiency reasons.

JEL classification: C9; D71; H4.

Keywords: Multilevel public good game, online experiment, efficiency, social dilemma.

1 Introduction

In-group favouritism – “the tendency to favour members of one’s own group over those in other groups” (Everett et al., 2015) – is a common feature of human social interaction. It typically drives a pro-social behaviour that fosters between-group competition by excluding non-members from the benefits of cooperation (Tajfel et al., 1971; Nowak, 2006; Choi and Bowles, 2007; Haidt, 2012; Rusch, 2014). The experimental literature has deeply investigated this kind of discriminatory pro-social behaviour and highlighted the role of group identity as a main driver.¹ The stronger the identification of individuals with their group the more they will act in-group favouritism (Tajfel, 1970, 1974, 1982). However, group-membership has become a complex fact in modern communities, organisations and institutions.

Groups do not interact and compete in a vacuum, but are typically embedded in societies which contain them. Accordingly, people are not only members of specific local groups but meanwhile feel to belong to overall global groups identifying what

¹In-group favouritism has been studied in the context of the prisoner’s dilemma (Ahmed, 2007) and the public good games (Krupp et al., 2008); in the dictator (Chen and Li, 2009) and the ultimatum games (McLeish and Oxoby, 2011), in relation to punishment (Bernhard et al., 2006), social heuristics (Filippin and Guala, 2017) and moral suasion (Bilancini et al., 2019).

they perceive as their society. For example, they are both members of an ethnic or cultural group but placed in the institutional setting of a certain country. They may feel committed to exert effort to attract funding for a specific research team, but also spend energies for the success and prestige of the hosting academic institution. When there is a conflict of interest between the welfare of the local group and the one of the global group a peculiar social dilemma emerges. In these cases, the agent faces a trade-off between contributing to the local good and the global one and social institutions often need to increase the efficiency of the global good in order to counteract in-group favouritism and boost social cohesion.

The multilevel public goods game (MLPGG) is an extension of the original public good game explicitly designed to investigate the interaction between in-group favouritism and efficiency promoted in societies. It is characterised by multiple goods in a nested structure.² The decision maker is assigned to one of many local groups and asked to allocate her endowment among her private account, the public good provided only to her local group, and the public good provided to the global group formed by all the local groups (i.e., all subjects in the experimental session).³ This design has been applied to study a wide range of situations. [Buchan et al. \(2009, 2011\)](#) apply the MLPGG to investigate the impact of globalisation over the willingness to cooperate at the international level. [Chakravarty and Fonseca \(2017\)](#) study whether local goods can be used as a way to exclude members of other groups for their lack of cooperation or as a way to reward in-group members for their cooperation. [Gallier et al. \(2019\)](#) analyse the strength of in-group bias among subjects living in the same regions of Germany. Typically two types of manipulations are simultaneously performed: a) a change in the relative efficiency of the different public goods b) a change in the salience of group identity for the members of the local groups. However, the diversity of specific designs – especially with respect to the latter manipulation – produced mixed evidence (see Section 2 below).

We contribute to the replicability of the MLPGG results by providing a set of treatments comprehensively investigating the various effects of changes in the relative efficiency of public goods on the subjects allocation choice. In particular, we investigate to what extent the increase in the relative efficiency of the global public good levels up the contribution to the global good itself and crowds in the overall amount contributed to the local and the global public good, or to what extent in-group favouritism conditions these phenomena. In order to reduce potential uncontrolled effects connected to the activation of group identity, we run our experiment online and keep the information on group composition provided to participants at a minimum level. Our results provide a robust evidence for a non linear levelling up, but no evidence for the crowding in effect. The circumstance that in-group favouritism is still at stake even in online interaction and in the absence of any elicitation of group identity confirms the force of this bias for human social decisions. However, our design let us single out an opposite intrinsic preference for the global good useful to understand pro-sociality in nested social structures.

The paper is organised as follows: Section 2 provide a review of the main exper-

²The nested structure distinguishes the MLPGG from other uses of multiple public good designs ([Cherry and Dickinson, 2008](#); [Bernasconi et al., 2009](#); [Falk et al., 2013](#); [McCarter et al., 2014](#)).

³An additional way to set up the MLPGG structure is maintaining the standard design of one single public good and allowing for different spillovers between the local and the global group (see for example [Engel and Rockenbach, 2011](#); [Güth and Sääksvuori, 2012](#)).

89 imental findings concerning the MLPGG, while Section 3 describe the experimental
 90 design and our main hypothesis. Section 4 provides the main analysis together with
 91 some robustness checks. Finally Section 5 concludes the paper by providing a sum-
 92 mary of the main results and discuss future research avenues.

83 2 Review of experimental findings

84 In the standard PGG, it is an established result that an increase in marginal per-
 85 capita return (MPCR) has a positive effect on contribution (Ledyard, 1995; Chaud-
 86 huri, 2011); in other words, subjects react to an increase in efficiency in provision
 87 by levelling up their contribution (see for example Isaac and Walker, 1988; Isaac
 88 et al., 1994; Zelmer, 2003). However, efficiency changes in the nested structure of
 89 the MLPGG entails additional trade-offs and several potential effects that makes pre-
 90 dictions on contributions less straightforward. In particular, we have to distinguish
 91 between the increase in contribution towards the global public good due to an in-
 92 crease of its efficiency (*levelling up effect*) and the impact over the total contribution
 93 of the same change in efficiency (*marginal crowding in effect*). A further indepen-
 94 dent effect involves the local good. Indeed, subjects could finance an hypothetical
 95 levelling up of the contribution to the global good either by reducing the amount
 96 kept in the private account (thus producing the marginal crowding in effect) or the
 97 contribution to the local public good, thus potentially substituting the contribution
 98 to one public good to the other and potentially offsetting any positive effect on the
 99 total contribution (*substitution effect*).

100 In recent years, several contributions in the MLPGG literature (Blackwell and
 101 McKee, 2003; Fellner and Lünser, 2014; Chakravarty and Fonseca, 2017; Gallier et al.,
 102 2019) have provided evidence on efficiency effects. However, the debate is far from
 103 settled. In fact, while the presence of a levelling up effect has been confirmed in
 104 all the available studies, the empirical evidence regarding the substitution effect and
 105 marginal crowding in is mixed. On the one hand, Blackwell and McKee (2003) do
 106 not find any supporting evidence for substitution effect and conclude that an increase
 107 in efficiency makes the total contribution rise only through a transfer from the pri-
 108 vate account to the global good. On the other hand, more recent studies (Fellner
 109 and Lünser, 2014; Gallier et al., 2019) obtain the opposite result with the substitu-
 110 tion effect completely balancing the levelling up and leaving the total contribution
 111 unchanged.

112 Nonetheless, with the exception of Blackwell and McKee (2003), all the evidence
 113 concerning this effect has been reached in a simplified design where only two very
 114 critical treatments are compared: the first where MPCRs of the public goods are
 115 normalised for the group size and a second where the MPCRs are equal and the global
 116 group potentially generates higher earnings given the circumstance that a greater
 117 number of players are involved in the public good. This simplification eliminates the
 118 trade-offs between returns, strategic risk and costs, and it is likely to work in favour
 119 of a levelling up, to the detriment of the clearness of the other effects. The reason is
 120 that in the normalised case the total return of the goods is equal but the local public
 121 good is safer in terms of strategic uncertainty and less costly, thus undermining
 122 the incentive to contribute to the global good. Conversely, when the MPCRs are
 123 equal, the two goods are equally costly but the returns for the global good are at

124 least doubled, providing a strong incentive to choose the global good. Therefore,
125 the evidence of levelling up obtained by comparing only these two cases are hardly
126 generalisable.

127 The above mentioned normalised treatment has also been used to test in-group
128 favouritism. Indeed, the two public goods produce the same expected gain (in case
129 of equal contribution by each local group members) and, thus, the evidence that
130 people tend to contribute more to the local public good than to the global has
131 been interpreted as revealing a bias in favour of the local (see for example Krupp
132 et al., 2008; Chen and Li, 2009; Everett et al., 2015). This evidence was standard
133 in the MLPGG experiments (Blackwell and McKee, 2003; Fellner and Lünser, 2014;
134 Chakravarty and Fonseca, 2017), up to Gallier et al. (2019) who could not replicate
135 it. However, despite the robustness of this effect across studies, its interpretation
136 is still controversial. Chakravarty and Fonseca (2017) for example explain it as
137 a consequence of the lower degree of strategic uncertainty involved in cooperation
138 at the local level due to the lower number of players (*size effect*). Moreover, an
139 additional explanation for this preference could simply be connected to the higher
140 opportunity cost of contributing to the global good with respect to the local good.

141 These reasons lead us to reconsider this test of in-group favouritism and investi-
142 gate whether a different treatment can provide a better index of an *intrinsic prefer-*
143 *ence for the local*, where “intrinsic” stands for independent on efficiency reasons. In
144 fact, measuring contribution to the local public good when the MPCRs of the local
145 and the global public good are equal provides a more univocal reference. The rea-
146 son is that, in this circumstance, the decision maker is more likely to obtain, at the
147 same cost, a higher earning by contributing to the global rather than the local good,
148 given the potential larger number of contributors. Consequently, the only reason
149 for contributing to the local good is excluding the members of the other group from
150 the returns of the public goods, thus acting in accordance to in-group favouritism
151 and against one’s own personal interest. Similarly, individuals could reveal an *in-*
152 *trinsic preference for the global good* intended as a propensity to be pro-social in an
153 universal way, i.e. a propensity to benefit the society as a whole, despite the higher
154 convenience of parochial altruism (and self-interest) in the situation. To measure
155 this phenomenon – not yet investigated in the literature – we devised a treatment
156 where the global public good is both less efficient, riskier and yielding a potential
157 earning which is lower than the local, thus eliminating any reason to contribute to it.

158 Finally, following Bowles and Polania-Reyes (2012); Bowles (2016) we single out
159 a *categorical crowding in effect* from the marginal crowding in mentioned above.
160 Indeed, total contribution may increase as a result of the mere addition of a further
161 public good in the choice set and not of the increase in the efficiency of that new
162 (global) public good. This crowding in effect was firstly studied in a standard PGG
163 (Cherry and Dickinson, 2008; Bernasconi et al., 2009) and more recently documented
164 in the context of MLPGGs by Chakravarty and Fonseca (2017), who demonstrates
165 that adding local goods to a global one increases the total contribution. In this paper
166 we test the existence of the *categorical crowding in* in the opposite case: we add a
167 global good in a situation in which only local goods are present and we test whether
168 total contribution increases.

169 3 Methods

170 The main objective of this paper is to provide robust and replicable evidence of
 171 levelling up and crowding in phenomena in the MLPGG. In particular, we firstly
 172 investigate the potential monotonicity of the levelling up by studying whether con-
 173 tribution to the local public good linearly increases with the relative efficiency of the
 174 global public good. Secondly, we investigate whether such an increase in efficiency
 175 actually produces a marginal crowding in in the total contribution or rather induces
 176 a substitution effect with subjects simply adjusting their contribution choice between
 177 the two public goods. Additionally, our design is able to provide measures of intrinsic
 178 preferences for the local and the global good, and of categorical crowding in.

179 The review of experimental evidence in Section 2 suggests that results are sensi-
 180 tive to the specific characteristics of the performed designs. Specifically, the variety
 181 of strategies adopted to induce group identity and frame intergroup interaction might
 182 have conditioned the replication of stable tendencies in contribution decisions.⁴ This
 183 circumstance leads us to apply a very restrictive version of the minimal identity
 184 approach (Tajfel, 1970, 1974, 1982), providing participants with no framing or char-
 185 acterisation concerning groups.⁵ Moreover, since the experiment was run online, no
 186 other visual reference was available to subjects, thus avoiding also other sources of
 187 potential identification.

188 3.1 Experimental design

189 Each subject is placed both in a local group and in a global one, the former being
 190 nested in the latter to form a hierarchical structure as depicted in Figure 1. The size
 191 of the groups has been chosen following Gallier et al. (2019): 4 members form the
 192 local group and 8 members form the global one.

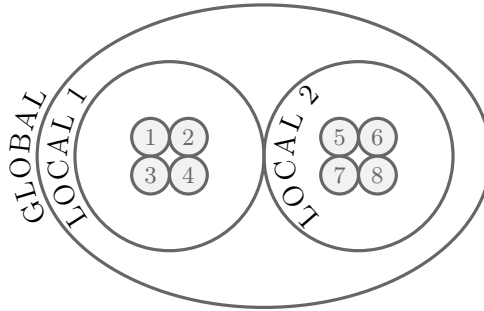


Figure 1: Group Composition

193 The game is a one-shot linear multilevel public good game where each subject has
 194 to decide how to allocate an initial endowment of 10 tokens among three alternatives:
 195 a private account, a local account and a global account. Every token contributed to
 196 the local pool is multiplied by a local-specific factor and then redistributed equally

⁴Blackwell and McKee (2003) and Fellner and Lünser (2014) rely on random assignments of individuals to different groups while Chakravarty and Fonseca (2017) implement an endogenous reinforced procedure to form groups and make group identity more salient before subjects play the game and Gallier et al. (2019) set up an artefactual field experiment exploiting the participants' belonging to municipalities within the same region to bring out localism in a natural way.

⁵See Instructions in the Appendix B.

among all the 4 members of the group, while every token allocated to the global pool is multiplied by a global-specific factor and then redistributed equally among all the 8 members of the group. Finally, the tokens allocated to the private account are simply retained by the subjects.

Given the structure of the experiment, the payoff of player i is equal to:

$$\pi_i = 10 - c_i - C_i + \alpha \sum_{j=1}^M c_j + \beta \sum_{k=1}^N C_k. \quad (1)$$

where c is the individual contribution to the local public good, while C is the individual contribution to the global good; α and β are the MPCRs of the local and global public goods, respectively. Across all treatments, α has been kept at a fixed value of 0.6, whereas β has been varying assuming values 0.15, 0.30, 0.45 and 0.6. Table 1 provides a summary of all the values across treatments and, to better clarify the social efficiency of both goods, of the total benefit (TB), defined by Gallier et al. (2019) as the individual earnings from the good obtained when every group-member make a one-token contribution.

| Treatment | Local PG | | | Global PG | | |
|-------------|----------|----------|-----|-----------|---------|-----|
| | M | α | TB | N | β | TB |
| <i>ctrl</i> | 4 | 0.6 | 2.4 | - | - | - |
| T_1 | 4 | 0.6 | 2.4 | 8 | 0.15 | 1.2 |
| T_2 | 4 | 0.6 | 2.4 | 8 | 0.3 | 2.4 |
| T_3 | 4 | 0.6 | 2.4 | 8 | 0.45 | 3.6 |
| T_4 | 4 | 0.6 | 2.4 | 8 | 0.6 | 4.8 |

Table 1: Summary of treatments' parameters

It is worth to discuss the treatments in more detail. As in Blackwell and McKee (2003), treatments involve only the manipulation of β . In particular, T_2 and T_4 represent the two special cases commonly implemented in all previous related research. On the one hand, T_2 corresponds to the situation where the returns of the goods are normalised, thus meaning that any efficiency effect due to scale-effects is sterilised. Indeed, the local good is less costly and hence less risky. On the other hand, T_4 corresponds to the opposite case in which marginal returns are equal. Therefore, the global good is equally costly, but it is more efficient due to the scale-effect. It must be underlined that while for T_2 the members of the local group are better off if the fellow member i contributes to the local account rather than to the global one, this is not the case for T_4 given that α and β are equal but the global good yields a higher TB. Accordingly, a decision-maker would opt for the local good only out of an intrinsic preference for the local good.

Differently, in treatment T_1 – which is a specific novelty of our design – we introduce a global public good that is worse than the local one in any respect. It is more costly – β is lower – and the TB is lower as well. Hence, there would be no reason to contribute to this global good other than an intrinsic preference for the global good. Finally, treatment T_3 is an intermediate case where both the trade-offs

of cost and total benefit are present and affect the decision in the opposite direction, favouring contribution to the local and to the global public good, respectively.

3.2 Hypotheses

Our design let us address the following hypotheses which aim at systematising the MLPGG studies and evidence. Accordingly, we specify three main focuses respectively on the contribution to the local good, the global good and the total contribution.

Hypothesis 1 (Global Contribution).

a) *levelling up*: Contribution to the global public good is strictly monotonically increasing with respect to its β .

b) *intrinsic preference for the global good*: Contribution to the global good in T_1 is greater than zero.

Hypothesis 2 (Local Contribution).

a) *substitution effect*: Contribution to the local public good will decrease as β increases and will be higher than the contribution to the global good as long as its total benefit is not lower.

b) *intrinsic preference for the local good*: Contribution to the local good in T_4 is greater than zero.

Hypothesis 3 (Total Contribution).

a) *marginal crowding in*: Total contribution increases as β increases.

b) *categorical crowding in*: Total contribution increases due to the addition of a global good per se.

3.3 Implementation

The experiment was implemented using the oTree software (Chen et al., 2016) and conducted online on the Prolific platform (Palan and Schitter, 2018), which allowed for the recruitment of a socio-demographically various and well-powered sample and for complete anonymity and full randomisation. A total of 802 UK nationals participated in two different sessions. 80 subjects participated in the first session (run as a pilot) and the remaining 722 in the second session.⁶ We succeeded in having sub-samples of almost the same size, although some dropouts led to small imbalances due to the substitution procedure which randomly assigns new entrants to treatments (see Table 3).

Each subject was randomly assigned to one of the treatments, and then to a local and a global group. Table 2 reports the demographics of our sample, showing that the treatment sub-samples were homogeneous with respect to the mean values of key individual-specific variables and hence that the randomisation of individuals

⁶This aggregation was possible because no substantial changes occurred between session 1 and 2. Furthermore, we have cautiously chosen comparable time slots and days for launching the sessions.

264 across treatments worked successfully.⁷ Each participant was completely unaware
 265 of the characteristics of the individuals forming both the local group to which she
 266 was assigned and the other matched group. This guarantees the application of the
 267 minimal identity approach, which was strengthened by the circumstance that the
 268 experiment was run online, with no opportunity to have any visual contact between
 269 participants.

| | Age | Male | Income | Student | Soc. status | Education | Employed |
|-----------------------|-------|------|--------|---------|-------------|-----------|----------|
| <i>ctrl</i> | 36.28 | 0.32 | 2.59 | 0.23 | 5.39 | 3.68 | 0.70 |
| <i>T</i> ₁ | 35.00 | 0.31 | 2.42 | 0.20 | 5.31 | 3.79 | 0.74 |
| <i>T</i> ₂ | 33.89 | 0.30 | 2.27 | 0.26 | 5.36 | 3.64 | 0.70 |
| <i>T</i> ₃ | 34.28 | 0.37 | 2.59 | 0.18 | 5.46 | 3.72 | 0.68 |
| <i>T</i> ₄ | 34.16 | 0.30 | 2.64 | 0.20 | 5.32 | 3.65 | 0.76 |

Table 2: Participants’ average characteristics by treatment group. Education is coded as: 1 “no formal qualifications”, 2 “secondary education”, 3 “high school diploma”, 4 “undergraduate degree”, 5 “graduate degree”, 6 “doctorate degree”. Personal income is coded as: 1 “less than 10 k”, 2 “10–20 k”, 3 “20–30 k”, 4 “30–40 k”, 5 “40–50k”, 6 “50–60k”, 7 “60–70k”, 8 “80–90k”, and 9 “greater than 90 k”. Socioeconomic status refers to what participants self-reported as their place in a ladder representing society that goes from 1 to 10.

270 After going through detailed instructions, subjects faced the decision on the main
 271 task i.e. the decision on how to allocate their endowment between their personal
 272 account, the local public good and the global public good. After the decision task,
 273 participants answer a series of questions aimed at measuring empirical expectations,
 274 personal normative beliefs and normative expectations (Bicchieri and Xiao, 2009;
 275 Bicchieri and Chavez, 2010) and a 3-items Cognitive Reflection Test in the standard
 276 version proposed in Frederick (2005). At the end of the experimental procedure, we
 277 elicited subjects social and risk preferences by using selected items from Falk et al.
 278 (2018).⁸

279 Each participant had been endowed with 10 points and was advised in the instruc-
 280 tions that points would have been converted in pounds at the end of the experiment
 281 at a given rate (i.e., 1 point corresponds to £ 0.025). Overall, the average payment
 282 was £ 1.13 (out of which £ 0.50 show-up fees).

283 4 Results

284 We begin our statistical analysis considering the full sample, Table 3 provides a
 285 summary of the average contributions and number of observations per treatment.

⁷There is no statistically significant difference across treatments at any level of significance. We performed Kruskal-Wallis tests for the variables: age, income, socioeconomic status and education; while we performed Fisher’s tests for the dichotomous variables: gender, student status and employment status.

⁸The evidence concerning norms will be analysed in another study investigating the role of empirical expectations, personal normative beliefs and normative expectations in the MLPGG contribution decisions.

| Treatment | Subjects | Local contribution | Global contribution | Total contribution |
|-------------|----------|--------------------|---------------------|--------------------|
| <i>ctrl</i> | 164 | 6.13 (2.80) | - | 6.13 (2.80) |
| T_1 | 160 | 4.56 (2.49) | 2.67 (1.78) | 7.23 (2.32) |
| T_2 | 164 | 4.35 (2.31) | 3.15 (2.14) | 7.50 (2.44) |
| T_3 | 160 | 3.63 (2.41) | 4.24 (2.73) | 7.87 (2.36) |
| T_4 | 154 | 3.18 (2.03) | 4.38 (2.71) | 7.56 (2.69) |

Table 3: Number of subjects, mean and standard deviation of the contributions to local and global public goods and total contributions listed by treatment.

4.1 Univariate Analysis

Firstly, we focus on the effects of the increase in β on the contributions to the local and the global goods, respectively. Figure 2 reports the average contributions to the local and global public goods by treatment.

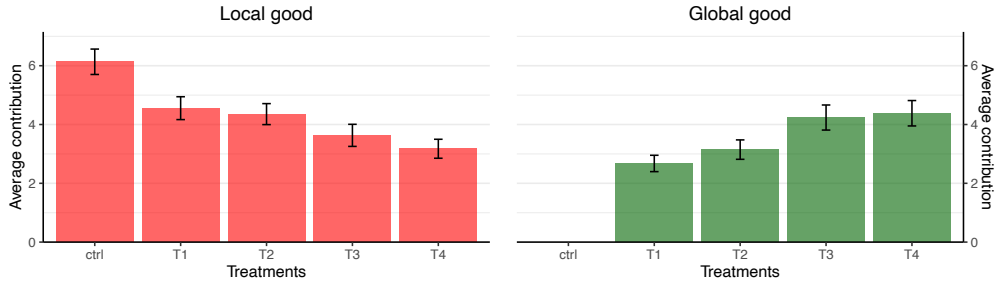


Figure 2: Average contribution to local and global public goods per treatment. Confidence intervals at the 95% level.

The first evidence that we can highlight just by looking at the figure is that the contribution to both goods is always positive across treatments. In particular, both global contribution in T_1 and local contribution in T_4 are positive.⁹

Result 1 (intrinsic preference for the global good). *Despite the lack of any incentive to do so, subjects contribute to the global public good in T_1 , thus revealing an intrinsic preference for the global good.*

Result 2 (intrinsic preference for the local good). *Despite the lack of any incentive to do so, subjects contribute to the local public good in T_4 , thus revealing an intrinsic preference for the local good.*

⁹Wilcoxon signed-rank test, $p = 0.0000$ in both cases.

299 Focusing on the variations of local and global contributions across treatments, we
300 can see that local and global contributions show opposite trends as β increases. To
301 quantify these effects we perform pairwise comparisons over contributions between
302 each pair of treatments through a Wilcoxon rank-sum test. Results are reported in
303 Table 4.¹⁰

| Treatments | Local contribution | Global contribution |
|--------------|--------------------|---------------------|
| $ctrl - T_1$ | 0.0000 | - |
| $T_1 - T_2$ | 0.6124 | 0.0502 |
| $T_2 - T_3$ | 0.0020 | 0.0003 |
| $T_3 - T_4$ | 0.2135 | 0.3700 |

Table 4: P-value results of the Wilcoxon rank-sum tests for the local and global contributions.

304 The comparison of the local and global contributions allows us to identify the exis-
305 tence of both the levelling up and substitutions effects. The comparisons between
306 the contributions to the global public good show a significant increase between T_2
307 and T_3 and a weakly significant increase between T_1 to T_2 , while the increase between
308 T_3 and T_4 is statistically not significant. This analysis leads to the following result:

309 **Result 3 (levelling up).** *Although there is evidence of a levelling up effect, there*
310 *is no statistical significant evidence about its monotonicity.*

311 This result has a twofold meaning. On the one hand, it confirms the existence of a
312 levelling up effect. An increase in the efficiency of the global public good can generate
313 an increase in the contribution to the global good; on the other hand, however, its
314 presence depends on the specific level of efficiency considered. It is worth to notice
315 that the effect is statistically significant if one compares T_2 with either T_3 and T_4 .
316 Therefore, while our result confirms the findings of [Chakravarty and Fonseca \(2017\)](#)
317 and [Gallier et al. \(2019\)](#), it also points out how limiting the analysis to T_2 and T_4
318 could possibly lead to an overestimation of the strength and regularity of the levelling
319 up effect.

320 Moving to the analysis of the variations in the local contribution we observe a
321 statistically significant decrease from $ctrl$ to T_1 and from T_2 to T_3 while there is no
322 statistically significant evidence of a decrease between T_1 and T_2 and between T_3 and
323 T_4 .

324 It is worth to notice how the statistical significance of levelling up and substitution
325 effects are connected, suggesting that the substitution is motivated by the increase
326 in contribution to the global good. We can point out the following result:

327 **Result 4 (substitution effect).** *In presence of a statistically significant increase in*
328 *global contribution, there is a statistically significant reduction in local contribution.*

329 Thus, as far as the substitution effect is concerned, our results are again in accordance
330 with [Chakravarty and Fonseca \(2017\)](#) and [Gallier et al. \(2019\)](#) but contradict the

¹⁰For the sake of clarity, Table 4 reports the results of the pairwise comparisons only for adjacent treatments, while complete results are shown in the Appendix A.

findings of Blackwell and McKee (2003) which report that the increase in global contribution is never detrimental to the local one.

Before moving on to the effect on the total contribution, we complete the discussion about the substitution effect by considering the difference between local and global contribution within each treatment. In this way we can determine which level of relative efficiency is required for the global contribution to overcome the local one. The difference is depicted in Figure 3, while Table 5 reports the p-values of the Wilcoxon signed-ranks tests.

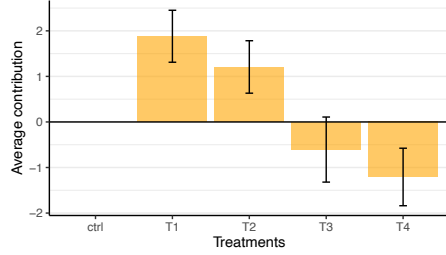


Figure 3: Difference in average contribution between local and global good per treatment. Confidence intervals at the 95% level.

| Treatment | Local vs Global |
|-----------|-----------------|
| T_1 | 0.0000 |
| T_2 | 0.0000 |
| T_3 | 0.1664 |
| T_4 | 0.0008 |

Table 5: P-value results for the Wilcoxon signed-ranks tests for the difference between local and global contribution within treatment.

In both T_1 and T_2 , the average contribution to the local good is significantly higher than the average contribution to the global good, while the opposite is true for T_3 and T_4 even though such difference is significant only in the case of T_4 .

Result 5 (Total Benefit effect). *Subjects prefer to contribute to the local public good unless the global good yields an higher total benefit.*

This comparison is particularly relevant with respect to T_2 where the returns of the two goods are normalised so to yield the same Total Benefit. Our result confirms the standard results of the MLPGG literature (Blackwell and McKee, 2003; Fellner and Lünser, 2014; Chakravarty and Fonseca, 2017) that in case of same total benefit, subjects tend to prefer the local public good; this result was questioned by Gallier et al. (2019) who did not find any significant preference.

Concerning the total contribution, we have already observed how an increase in the global contribution is usually associated with a decrease in local contribution. However it is not clear yet whether this crowding out is full or partial: in the former case, the increase in efficiency would be connected with an increase in total contribution, while in the latter case the increase in efficiency would only lead to a different allocation of the same amounts.

The average total contribution per treatment is depicted in Figure 4, while Table 6 reports the p-values of the Wilcoxon rank-sum tests.

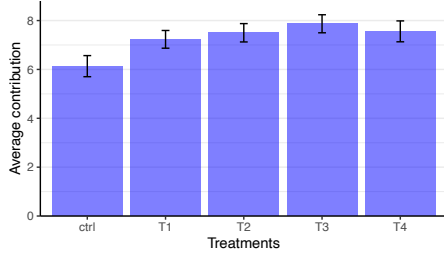


Figure 4: Average total contribution. Confidence intervals at the 95% level.

| Treatments | Total contribution |
|--------------|--------------------|
| $ctrl - T_1$ | 0.0000 |
| $T_1 - T_2$ | 0.1974 |
| $T_2 - T_3$ | 0.1237 |
| $T_3 - T_4$ | 0.4579 |

Table 6: P-value results of the Wilcoxon rank-sum tests for the total contribution.

It is immediate to notice that while the total contribution in the control treatment is significantly lower than the other treatments, it is rather stable across the treatments where the global good is present, in fact there is no statistical difference between T_1 , T_2 , T_3 and T_4 .¹¹ This suggests that while the *categorical crowding in* is a significant effect, the *marginal* is not.

Result 6 (marginal crowding in). *There is no statically significant evidence of the presence of a marginal crowding in effect*

Our result, therefore, suggests that changes in relative efficiency have only redistributive effects but are not able to induce subjects to increase their overall contribution. This result is in contrast with the findings of Blackwell and McKee (2003) but in accordance with Gallier et al. (2019).

Finally, we compare the total contribution in the *ctrl* with the total contribution in each of the other treatments. The results confirm that in any treatment where subjects can choose among the local and the global goods, the total contribution is higher than the case where the only local good is available. It is worth to mention that this is true even in the case of T_1 , meaning that even adding a public good which is worse than the other is enough to increase total contribution. This particular result is a novelty and provides strong evidence in support for the categorical crowding in hypothesis.

Result 7 (categorical crowding in). *The introduction of an additional global public good produces a statistically significant increase in the total contribution.*

4.2 Robustness Check

The analysis performed over the full sample leaves open the question whether the impact of changes in efficiency over the contributions is conditioned by specific types of subjects. In this section, we check for the robustness of our findings by testing the same hypotheses over a sub-sample of the subjects that is obtained after either dropping the observation of those who did not contribute at all (0 points) or dropping the observations of those who contributed to public goods their entire endowment (10 points).

¹¹Actually, there is a statistical difference between T_1 and both T_3 and T_4 (see Appendix A for the complete results). Therefore, in this sense one may argue that this could represent a marginal crowding in effect. Nonetheless, treatment T_1 is a very disadvantageous for the global good, hence such result has to be taken with caution.

389 The reason for such a check is intrinsically connected to the main research ques-
390 tion posed in the paper. Indeed, given that we are interested in how subjects re-
391 spond to changes in the economic incentives when contributing to public goods, it
392 makes sense to rule out those that, for opposite reasons, are less (or not) sensitive
393 to marginal changes in relative efficiencies. Those who did not contribute at all (*free*
394 *riders*) behaved as rational self-regarding agents; concerning them, it is plausible
395 to think that changes in relative efficiencies are irrelevant given that free-riding is
396 always the dominant strategy. On the other hand, subjects that contributed their
397 entire endowment to public goods provision (*altruists*) can be considered as being
398 driven by purely altruistic motives. Thus, their choice to contribute is probably also
399 unaffected by the relative efficiency of the two goods. By removing these subjects
400 from the sample, we can focus on those who show both a concern for their own
401 interest and for the provision of the public goods and are therefore more likely to
402 respond to variations in relative efficiency.

403 While in our sample the number of free riders is rather limited (almost 4%), there
404 is a large presence of altruists (more than 29%). The share of altruists presents also a
405 larger variability across treatments with a larger share in the treatments with higher
406 efficiency. The numbers per treatment, both in value and percentage, are reported
407 in Table 7. We then tested our research hypotheses on the new sub-sample to verify
408 whether the results are robust and consistent also after the elimination of these types
409 of subjects.

| Treatment | <i>Free Riders</i> | | <i>Altruists</i> | |
|-----------------------|--------------------|------|------------------|-------|
| | # | % | # | % |
| <i>ctrl</i> | 8 | 4.88 | 35 | 21.34 |
| <i>T</i> ₁ | 5 | 3.12 | 37 | 23.12 |
| <i>T</i> ₂ | 4 | 2.44 | 52 | 31.71 |
| <i>T</i> ₃ | 6 | 3.75 | 59 | 36.88 |
| <i>T</i> ₄ | 9 | 5.84 | 54 | 35.06 |
| Total | 32 | 3.99 | 237 | 29.55 |

Table 7: Presence of free riders and altruists in the full sample.

410 The first check we perform is to run the Wilcoxon rank-sum tests for the sub-
411 sample obtained after dropping the *free riders*.¹²

412 **Check 1.** *Once free-rides are dropped, the unique difference with respect to the full*
413 *sample analysis is the significance of the increase in total contribution between *T*₂*
414 *and *T*₃*

415 The exclusion of the free riders does not change significantly the result, as one
416 could expect given the small number, but increase the strength of the marginal
417 crowding in effect. This finding is in line with our expectation concerning the impact
418 of free riders.

¹²For the sake of conciseness, we do not report in this section the p-values of the pairwise comparisons, see the Appendix A for all the results.

The other category of individuals that is unlikely to strongly react to variations in relative efficiency is the altruists who are motivated by an intrinsic motivation to share their whole endowment.

Check 2. *Once altruists are dropped, the difference from the full sample is the significance of the increase in total contribution between T_2 and T_3*

On the one hand, the exclusion of the altruist from the sample produces an effect on the total contribution; without the altruist there is no statistical difference across all treatments but *ctrl*. This result confirms the absence of the marginal crowding in effect and could be ascribed to the large numerical difference between the number of altruists in T_1 (37) and in T_3 and T_4 (59, 54). The interpretation of the results concerning local and global contribution is more puzzling. In fact, while it is true that altruists should not be responsive to efficiency in their choice regarding total contribution, there is no reason to rule out the possibility that their decision to contribute to either the local or the global goods depends on the relative efficiency of the two.

The result of the Check 2 begs the question about whether and to what extent altruists adjust their allocation depending on the relative efficiency of the two public goods. To answer this question we perform the same analysis as before on the sub-sample composed only of altruists.

Check 3. *Altruists react to the variations of relative efficiency by switching their contribution toward the global good. However the variation is statistically significant only between T_2 and T_3 while is not significant between T_1 and T_2 and between T_3 and T_4 .*

This final result provides additional strength to our main result as it appears that the only significant threshold is represented by the normalised treatment T_2 .

4.3 Multivariate Analysis

To take into account the presence of possible confounding factors, we perform an OLS analysis of the individuals' contribution choices, employing treatment dummy variables. The baseline treatment is T_1 , which is a convenient choice to isolate the categorical crowding in effect. We estimate both a simple model (regressions 1, 2 and 3) as well as a larger model with additional controls (regressions 4, 5 and 6). The controls include both socio-demographic information collected through Prolific (age, gender, income, socioeconomic status, education, employment status and student status) and a set of individual-specific characteristics about preferences (altruism, patience, risk, trust, negative and positive reciprocity) collected in the post-task questionnaire.¹³¹⁴

The results of the OLS confirm all the results obtained with the non parametric tests. Confronting T_1 with the *ctrl* produces an increase in the local contribution but a decrease in the total contribution, providing evidence of the categorical crowding in.

¹³See Appendix A.3 for the full regressions

¹⁴Specifically, we refer to the following items of the Global Preference Survey: AF.1.2, AF.2.1, AF.3.2, AF.4.3, AF.5.1, AF.6.

| | (1) Local | (2) Global | (3) Total | (4) Local | (5) Global | (6) Total |
|-----------------------|----------------------|---------------------|----------------------|----------------------|---------------------|----------------------|
| <i>ctrl</i> | 1.578*** (0.294) | | -1.097*** (0.286) | 1.551*** (0.317) | | -1.143*** (0.301) |
| <i>T</i> ₂ | -0.203 (0.267) | 0.471** (0.219) | 0.269 (0.264) | -0.325 (0.284) | 0.598** (0.241) | 0.264 (0.275) |
| <i>T</i> ₃ | -0.925*** (0.274) | 1.563*** (0.258) | 0.637** (0.262) | -0.999*** (0.303) | 1.528*** (0.285) | 0.537* (0.276) |
| <i>T</i> ₄ | -1.381*** (0.256) | 1.708*** (0.260) | 0.327 (0.284) | -1.510*** (0.294) | 1.786*** (0.288) | 0.280 (0.307) |
| <i>constant</i> | 4.556*** (0.197) | 2.675*** (0.141) | 7.231*** (0.184) | 1.919*** (0.712) | 1.296* (0.765) | 3.393*** (0.785) |
| Controls | No | No | No | Yes | Yes | Yes |
| <i>N</i> | 802 | 638 | 802 | 658 | 525 | 658 |

Table 8: OLS regression with robust standard errors in parentheses. The dependent variable is either the local contribution, the global contribution or the sum of the two (total contribution). Columns (1)-(2)-(3) report the results of the basic models that only include a set of treatment dummies, where the omitted category is the T_1 treatment. Columns (4)-(5)-(6) report results from regressions that contain additional control variables (for details see Table A.5). ***, **, and *: significance at respectively 1%, 5%, and 10% levels.

5 Conclusions

This paper contributes to the debate concerning the various effects that changes in relative efficiency have in the context of a multilevel public goods game. The motivation sustaining this reassessment was the lack of consensus concerning whether and to what extent the levelling up in contribution to the global good is accompanied by a decrease of contribution to the local good – the substitution effect – or by an increase in total contribution – that we named marginal crowding in.

Experimental results suggest the presence of a weak levelling up effect, that depends on the specific level of efficiency considered. On the other hand, we provide robust evidence of a full substitution between the local and global goods which compensates for any increase in total contribution ruling out the marginal crowding-in hypothesis. By contrast, we confirm the presence of a categorical crowding in of the total contribution following the introduction of the global good *per se*.

Furthermore, our design let us highlight intrinsic preferences for the local good in line with the in-group favouritism hypothesis. By introducing a novel treatment, we also identify an intrinsic preference for the global good revealing a motivation to contribute to the good of the society as a whole despite the lack of any economic incentive.

Overall, the evidence collected suggests that pro-sociality in the multilevel public goods game is only marginally affected by efficiency reasons. Further research will attempt to explain contribution decisions by taking into consideration the role of normative priors and exploring how a multiple groups context can constitute a double reference for norm-following.

Appendices

A Results

In this section, the p-values of all the comparisons performed through the Wilcoxon rank-sum discussed in the paper are reported.

A.1 Univariate Analysis

| Treatments | Local contribution | Global contribution | Total contribution |
|----------------------|--------------------|---------------------|--------------------|
| <i>ctrl</i> vs T_1 | 0.0000 | - | 0.0000 |
| <i>ctrl</i> vs T_2 | 0.0000 | - | 0.0000 |
| <i>ctrl</i> vs T_3 | 0.0000 | - | 0.0000 |
| <i>ctrl</i> vs T_4 | 0.0000 | - | 0.0000 |
| T_1 vs T_2 | 0.6124 | 0.0502 | 0.1974 |
| T_1 vs T_3 | 0.0004 | 0.0000 | 0.0026 |
| T_1 vs T_4 | 0.0000 | 0.0000 | 0.0386 |
| T_2 vs T_3 | 0.0020 | 0.0003 | 0.1237 |
| T_2 vs T_4 | 0.0000 | 0.0000 | 0.4859 |
| T_3 vs T_4 | 0.2135 | 0.3700 | 0.4579 |

Table A.1: P-value results of the Wilcoxon rank-sum tests over the full sample.

A.2 Robustness Checks

| | # | Local | Global | Total | | Local | Global | Total |
|-------------|-----|--------|--------|--------|----------------------|---------------|---------------|---------------|
| <i>ctrl</i> | 156 | 6.45 | - | 6.45 | <i>ctrl</i> vs T_1 | 0.0000 | - | 0.0000 |
| | | (2.49) | | (2.49) | <i>ctrl</i> vs T_2 | 0.0000 | - | 0.0000 |
| T_1 | 155 | 4.70 | 2.76 | 7.46 | <i>ctrl</i> vs T_3 | 0.0000 | - | 0.0000 |
| | | (2.39) | (1.74) | (1.95) | <i>ctrl</i> vs T_4 | 0.0000 | - | 0.0000 |
| T_2 | 160 | 4.46 | 3.23 | 7.69 | T_1 vs T_2 | 0.5232 | 0.0534 | 0.2175 |
| | | (2.24) | (2.11) | (2.15) | T_1 vs T_3 | 0.0004 | 0.0000 | 0.0010 |
| T_3 | 154 | 3.77 | 4.40 | 8.18 | T_1 vs T_4 | 0.0000 | 0.0000 | 0.0074 |
| | | (2.34) | (2.65) | (1.81) | T_2 vs T_3 | 0.0027 | 0.0001 | 0.0660 |
| T_4 | 145 | 3.37 | 4.66 | 8.03 | T_2 vs T_4 | 0.0000 | 0.0000 | 0.1864 |
| | | (1.92) | (2.56) | (1.97) | T_3 vs T_4 | 0.3041 | 0.1961 | 0.6563 |

(a) Number of subjects, mean and sd of the local, global and total contributions

(b) P-value results of the Wilcoxon rank-sum tests.

Table A.2: Robustness Check 1: dropping free riders

| | # | Local | Global | Total |
|-------------|-----|----------------|----------------|----------------|
| <i>ctrl</i> | 129 | 5.09 (2.19) | - | 5.09 (2.19) |
| T_1 | 123 | 3.76 (1.68) | 2.64 (1.29) | 6.40 (2.00) |
| T_2 | 112 | 3.71 (1.57) | 2.62 (1.33) | 6.34 (2.10) |
| T_3 | 101 | 3.49 (1.51) | 3.14 (1.30) | 6.62 (2.15) |
| T_4 | 100 | 3.06 (1.43) | 3.18 (1.72) | 6.24 (2.48) |

(a) Number of subjects, mean and sd of the local, global and total contributions

| | Local | Global | Total |
|----------------------|---------------|---------------|---------------|
| <i>ctrl</i> vs T_1 | 0.0000 | - | 0.0000 |
| <i>ctrl</i> vs T_2 | 0.0000 | - | 0.0000 |
| <i>ctrl</i> vs T_3 | 0.0000 | - | 0.0000 |
| <i>ctrl</i> vs T_4 | 0.0000 | - | 0.0000 |
| T_1 vs T_2 | 0.6284 | <u>0.9858</u> | 0.9052 |
| T_1 vs T_3 | 0.0636 | 0.0011 | <u>0.1492</u> |
| T_1 vs T_4 | 0.0006 | 0.0025 | <u>0.7380</u> |
| T_2 vs T_3 | <u>0.2187</u> | 0.0027 | 0.1826 |
| T_2 vs T_4 | 0.0045 | 0.0055 | 0.7613 |
| T_3 vs T_4 | 0.1039 | 0.8699 | 0.3750 |

(b) P-value results of the Wilcoxon rank-sum tests

Table A.3: Robustness Check 2: dropping altruists

| | # | Local | Global | Total |
|-------------|----|-----------------|----------------|-----------------|
| <i>ctrl</i> | 35 | 10.00 (0.00) | - | 10.00 (0.00) |
| T_1 | 37 | 7.22 (2.89) | 2.78 (2.89) | 10.00 (0.00) |
| T_2 | 52 | 5.73 (2.98) | 4.27 (2.98) | 10.00 (0.00) |
| T_3 | 59 | 3.88 (3.44) | 6.12 (3.44) | 10.00 (0.00) |
| T_4 | 54 | 3.39 (2.82) | 6.61 (2.82) | 10.00 (0.00) |

(a) Number of subjects, mean and sd of the local, global and total contributions

| | Local | Global |
|----------------------|---------------|---------------|
| <i>ctrl</i> vs T_1 | 0.0000 | - |
| <i>ctrl</i> vs T_2 | 0.0000 | - |
| <i>ctrl</i> vs T_3 | 0.0000 | - |
| <i>ctrl</i> vs T_4 | 0.0000 | - |
| T_1 vs T_2 | 0.0126 | 0.0126 |
| T_1 vs T_3 | 0.0000 | 0.0000 |
| T_1 vs T_4 | 0.0000 | 0.0000 |
| T_2 vs T_3 | 0.0022 | 0.0022 |
| T_2 vs T_4 | 0.0001 | 0.0001 |
| T_3 vs T_4 | 0.6177 | 0.6177 |

(b) P-value results of the Wilcoxon rank-sum tests.

Table A.4: Robustness Check 3: sub-sample of only altruists.

| | (1) | (2) | (3) |
|----------------------|----------------------|---------------------|----------------------|
| | Local | Global | Total |
| <i>ctrl</i> | 1.551*** (0.317) | 0.000 (.) | -1.143*** (0.301) |
| T_2 | -0.325 (0.284) | 0.598** (0.241) | 0.264 (0.275) |
| T_3 | -0.999*** (0.303) | 1.528*** (0.285) | 0.537* (0.276) |
| T_4 | -1.510*** (0.294) | 1.786*** (0.288) | 0.280 (0.307) |
| altruism | 0.000 (0.001) | -0.000 (0.001) | -0.000 (0.001) |
| patience | 0.181*** (0.068) | 0.006 (0.073) | 0.196*** (0.070) |
| risk | -0.079 (0.056) | 0.133** (0.059) | 0.017 (0.054) |
| negative reciprocity | -0.004 (0.040) | -0.030 (0.042) | -0.018 (0.043) |
| trust | 0.092** (0.047) | 0.176*** (0.048) | 0.237*** (0.048) |
| positive reciprocity | 0.070 (0.056) | 0.065 (0.063) | 0.125** (0.060) |
| time on task | 0.000 (0.003) | -0.001 (0.003) | -0.001 (0.003) |
| score CRT | 0.152* (0.085) | 0.124 (0.092) | 0.236*** (0.087) |
| age | 0.002 (0.009) | 0.012 (0.009) | 0.011 (0.010) |
| gender | -0.260 (0.221) | 0.087 (0.249) | -0.176 (0.228) |
| personal income | -0.085 (0.079) | -0.120 (0.083) | -0.173** (0.084) |
| student status | 0.413 (0.273) | -0.265 (0.281) | 0.187 (0.277) |
| socioeconomic status | -0.012 (0.064) | -0.053 (0.075) | -0.056 (0.065) |
| education | 0.193* (0.099) | -0.010 (0.109) | 0.195* (0.107) |
| employment status | 0.453* (0.240) | -0.425 (0.271) | 0.110 (0.246) |
| <i>constant</i> | 1.919*** (0.712) | 1.296* (0.765) | 3.393*** (0.785) |
| <i>N</i> | 658 | 525 | 658 |

Table A.5: OLS regression with robust standard errors in parentheses. The dependent variable is either the local contribution, the global contribution or the sum of the two (total contribution). The regressors are a set of treatment dummies, where the omitted category is the T_1 treatment, in addition to a set of individual-specific characteristics about preferences (altruism, patience, risk, trust, negative and positive reciprocity), time spent on the task page, a score variable for correct answers in the Cognitive Reflection Test, and demographic characteristics (age, gender, personal income, student status, socioeconomic status, education, employment status). ***, **, and *: significance at respectively 1%, 5%, and 10% levels.

488 B Experimental Instructions

489 Participants were randomly divided into five treatments. We report here the com-
490 plete instructions shown for one of the treatments (T_1).

491 *In this study, you will be randomly assigned to a group of 4 participants. Your*
492 *group will be randomly matched with another group of the same size.*

493 *You are given 10 points and have to decide whether to contribute to a local com-*
494 *mon pool (the common pool of your group) and a global common pool (the common*
495 *pool of both your group and the other group).*

496 *Contributions can be any integer from 0 to 10. You keep the remaining points.*
497 *The other participants face the same decision.*

498 *The local and the global common pools yield the following returns.*

499 *Local common pool: The contributions of the 4 participants are added up and the*
500 *total is multiplied by a factor of 2.4. The resulting amount is equally split among the*
501 *4 participants.*

502 *Global common pool: The contributions of the 8 participants are added up and*
503 *the total is multiplied by a factor of 1.2. The resulting amount is equally split among*
504 *the 8 participants.*

505 *Your payoff equals your earnings from the local common pool, plus your earnings*
506 *from the global common pool, plus the amount you keep for yourself.*

507 *The final conversion will be as follows: 40 points correspond to 1 GBP.*

508 *Please decide how to distribute your 10 points among the three options.*

509 *• Your contribution to the local common pool: (...)*

510 *• Your contribution to the global common pool: (...)*

511 *• What you keep for yourself: (...)*

512 *Remind: The total amount contributed to the local common pool will be mul-*
513 *tiplied by 2.4 and divided by 4; The total amount contributed to the global*
514 *common pool will be multiplied by 1.2 and divided by 8.*

515 *In your opinion, how much the other members of your group contribute to the*
516 *local common pool and to the global common pool?*

517 *Please indicate in the boxes below what you believe was the average contribution of*
518 *the other members of your group to the local common pool and to the global common*
519 *pool.*

520 *You will receive additional 4 points for each correct answer. An answer is con-*
521 *sidered to be correct if it is less than 0.50 close to the true value.*

522 *• Local common pool: (...)*

523 *• Global common pool: (...)*

524 *Consider again the decision task you faced.*

525 *How much do you believe a member of your group ought to contribute to the local*
526 *common pool and to the global common pool?*

527 *Please indicate in the boxes below what you believe a member of your group ought*
528 *to contribute to the local common pool and to the global common pool.*

529 • *Local common pool: (...)*

530 • *Global common pool: (...)*

531 *In your opinion, how have the other members of your group answered to the*
532 *previous question?*

533 *Please indicate in the boxes below what you believe was the average answer by the*
534 *other members of your group to the previous question.*

535 *You will receive additional 4 points for each correct answer. An answer is con-*
536 *sidered to be correct if it is less than 0.50 close to the true value.*

537 • *Local common pool: (...)*

538 • *Global common pool: (...)*

539 *Please answer the following questions.*

540 *Question 1: What are your total earnings if all (you included) contribute 10 to*
541 *their group? (... points) Question 2: What level of your contribution to the group*
542 *earns the highest payoff for you personally if all others contribute 0 to the group?*
543 *(... points) Question 3: What level of your contribution to the group earns the highest*
544 *payoff for you personally if all others contribute 10 to the group? (... points)*

545 *Remind: the total amount contributed to the group common pool is multiplied by*
546 *2.4 and divided by 4.*

547 *Please answer the following questions.*

548 *A bat and a ball cost 1.10 \$ in total. The bat costs 1.00 \$ more than the ball.*
549 *How much does the ball cost? (... cents)*

550 *If it takes 5 minutes for five machines to make five widgets, how long would it*
551 *take for 100 machines to make 100 widgets? (... minutes)*

552 *In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If*
553 *it takes 48 days for the patch to cover the entire lake, how long would it take for the*
554 *patch to cover half of the lake? (... days)*

555 *We now ask for your willingness to act in a certain way in different areas. Please*
556 *indicate your answer on a scale from 0 to 10, where 0 means you are “completely*
557 *unwilling to do so” and a 10 means you are “very willing to do so”.*

558 *1) How willing are you to give up something that is beneficial for you today in*
559 *order to benefit more from that in the future? (0-10) 2) How willing are you to take*
560 *risks? (0-10) 3) How willing are you to punish someone who treats others unfairly,*
561 *even if there may be costs for you? (0-10)*

562 *How well does the following statement describe you as a person? Please indicate your*

563 answer on a scale from 0 to 10. A 0 means “does not describe me at all” and a 10
564 means “describes me perfectly”.

565 4) I assume that people have only the best intentions. (0-10)

566 Please now imagine yourself in the following situations and think about what you
567 would do.

568 5) Today you unexpectedly received 1,000 £. How much of this amount would
569 you donate to a good cause? (...)

570 6) You are in an area you are not familiar with, and you realize you lost your way.
571 You ask a stranger for directions. The stranger offers to take you to your destination.
572 Helping you costs the stranger about 20 £ in total. However, the stranger says he
573 or she does not want any money from you. You have six presents with you. The
574 cheapest present costs 5 £, the most expensive one costs 30 £. Do you give one of
575 the presents to the stranger as a “thank-you”gift? If so, which present do you give to
576 the stranger? (None; The one worth 5 £; The one worth 10 £; The one worth 15
577 £; The one worth 20 £; The one worth 25 £; The one worth 30 £)

References

- Ahmed, A. M. (2007). Group identity, social distance and intergroup bias. *Journal of Economic Psychology*, 28(3):324–337.
- Bernasconi, M., Corazzini, L., Kube, S., and Maréchal, M. A. (2009). Two are better than one!. Individuals’ contributions to "unpacked" public goods. *Economics Letters*, 104(1):31–33.
- Bernhard, H., Fischbacher, U., and Fehr, E. (2006). Parochial altruism in humans. *Nature*, 442(7105):912–915.
- Bicchieri, C. and Chavez, A. (2010). Behaving as expected: Public information and fairness norms. *Journal of Behavioral Decision Making*, 23(2):161–178.
- Bicchieri, C. and Xiao, E. (2009). Do the right thing: But only if others do so. *Journal of Behavioral Decision Making*, 22(2):191–208.
- Bilancini, E., Boncinelli, L., Capraro, V., Celadin, T., and Di Paolo, R. (2019). “Do the Right Thing” for Whom? An Experiment on Ingroup Favouritism, Group Assortativity and Moral Suasion. *SSRN Electronic Journal*.
- Blackwell, C. and McKee, M. (2003). Only for my own neighborhood? Preferences and voluntary provision of local and global public goods. *Journal of Economic Behavior and Organization*, 52(1):115–131.
- Bowles, S. (2016). *The moral economy: Why good incentives are no substitute for good citizens*. Yale University Press.
- Bowles, S. and Polania-Reyes, S. (2012). Economic incentives and social preferences: substitutes or complements? *Journal of Economic Literature*, 50(2):368–425.
- Buchan, N. R., Brewer, M. B., Grimalda, G., Wilson, R. K., Fatas, E., and Foddy, M. (2011). Global Social Identity and Global Cooperation. *Psychological Science*, 22(6):821–828.
- Buchan, N. R., Grimalda, G., Wilson, R., Brewer, M., Fatas, E., and Foddy, M. (2009). Globalization and human cooperation. *Proceedings of the National Academy of Sciences*, 106(11):4138–4142.
- Chakravarty, S. and Fonseca, M. A. (2017). Discrimination Via Exclusion: An Experiment On group Identity and Club Goods. *Journal of Public Economic Theory*, 19(1):244–263.
- Chaudhuri, A. (2011). Sustaining cooperation in laboratory public goods experiments: A selective survey of the literature. *Experimental Economics*, 14(1):47–83.
- Chen, D. L., Schonger, M., and Wickens, C. (2016). oTree-An open-source platform for laboratory, online, and field experiments. *Journal of Behavioral and Experimental Finance*, 9:88–97.
- Chen, Y. and Li, S. X. (2009). Group identity and social preferences. *American Economic Review*, 99(1):431–457.

- Cherry, T. L. and Dickinson, D. L. (2008). Voluntary contributions with multiple public goods. In Cherry, T. L., Kroll, S., and Shorgen, J. F., editors, *Environmental Economics, Experimental Methods*, pages 184–193. Routledge, London.
- Choi, J. K. and Bowles, S. (2007). The coevolution of parochial altruism and war. *Science*, 318(5850):636–640.
- Engel, C. and Rockenbach, B. (2011). We are not alone: the impact of externalities on public good provision. *MPI Collective Goods Preprint*, 2009(29).
- Everett, J. A., Faber, N. S., and Crockett, M. (2015). Preferences and beliefs in ingroup favoritism. *Frontiers in Behavioral Neuroscience*, 9:15.
- Falk, A., Becker, A., Dohmen, T., Enke, B., Huffman, D., and Sunde, U. (2018). Global Evidence on Economic Preferences. *The Quarterly Journal of Economics*, 133(4):1645–1692.
- Falk, A., Fischbacher, U., and Gächter, S. (2013). Living in two neighborhoods-social interaction effects in the laboratory. *Economic Inquiry*, 51(1):563–578.
- Fellner, G. and Lünser, G. K. (2014). Cooperation in local and global groups. *Journal of Economic Behavior and Organization*, 108:364–373.
- Filippin, A. and Guala, F. (2017). Group identity as a social Heuristic: An experiment with reaction times. *Journal of Neuroscience, Psychology, and Economics*, 10(4):153–166.
- Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives*, 19(4):25–42.
- Gallier, C., Goeschl, T., Kesternich, M., Lohse, J., Reif, C., and Römer, D. (2019). Leveling up? An inter-neighborhood experiment on parochialism and the efficiency of multi-level public goods provision. *Journal of Economic Behavior and Organization*, 164:500–517.
- Güth, W. and Sääksvuori, L. (2012). Provision of multilevel public goods by positive externalities: Experimental evidence. *The B.E. Journal of Economic Analysis and Policy*, 12(1).
- Haidt, J. (2012). *The righteous mind: Why good people are divided by politics and religion*. Vintage.
- Isaac, R. M. and Walker, J. M. (1988). Group Size Effects in Public Goods Provision: The Voluntary Contributions Mechanism. *The Quarterly Journal of Economics*, 103(1):179.
- Isaac, R. M., Walker, J. M., and Williams, A. W. (1994). Group size and the voluntary provision of public goods. Experimental evidence utilizing large groups. *Journal of Public Economics*, 54(1):1–36.
- Krupp, D. B., Debruine, L. M., and Barclay, P. (2008). A cue of kinship promotes cooperation for the public good. *Evolution and Human Behavior*, 29(1):49–55.

- 654 Ledyard, J. O. (1995). Public Goods: A Survey of Experimental Research. In
655 Kagel, J. H. and Roth, A. E., editors, *The Handbook of Experimental Economics*,
656 chapter 2, pages 111–194. Princeton University Press, Princeton.
- 657 McCarter, M. W., Samek, A., and Sheremeta, R. M. (2014). Divided Loyalists or
658 Conditional Cooperators? Creating Consensus About Cooperation in Multiple
659 Simultaneous Social Dilemmas. *Group & Organization Management*, 39(6):744–
660 771.
- 661 McLeish, K. N. and Oxoby, R. J. (2011). Social interactions and the salience of social
662 identity. *Journal of Economic Psychology*, 32(1):172–178.
- 663 Nowak, M. A. (2006). Five rules for the evolution of cooperation. *Science*,
664 314(5805):1560–1563.
- 665 Palan, S. and Schitter, C. (2018). Prolific.ac—A subject pool for online experiments.
666 *Journal of Behavioral and Experimental Finance*, 17:22–27.
- 667 Rusch, H. (2014). The evolutionary interplay of intergroup conflict and altruism in
668 humans: a review of parochial altruism theory and prospects for its extension.
669 *Proceedings of the Royal Society B: Biological Sciences*, 281(1794):20141539.
- 670 Tajfel, H. (1970). Experiments in intergroup discrimination. *Scientific american*,
671 223(5):96–103.
- 672 Tajfel, H. (1974). Social identity and intergroup behaviour. *Social Science Informa-*
673 *tion*, 13(2):65–93.
- 674 Tajfel, H. (1982). Social psychology of intergroup relations. *Annual review of psy-*
675 *chology*, 33(1):1–39.
- 676 Tajfel, H., Billig, M. G., Bundy, R. P., and Flament, C. (1971). Social categorization
677 and intergroup behaviour. *European Journal of Social Psychology*, 1(2):149–178.
- 678 Zelmer, J. (2003). Linear public goods experiments: A meta-analysis. *Experimental*
679 *Economics*, 6(3):299–310.

Discussion Papers

Collana del Dipartimento di Economia e Management, Università di Pisa

Comitato scientifico:

Luciano Fanti - *Coordinatore responsabile*

Area Economica

Giuseppe Conti
Luciano Fanti
Davide Fiaschi
Paolo Scapparone

Area Aziendale

Mariacristina Bonti
Giuseppe D'Onza
Alessandro Gandolfo
Elisa Giuliani
Enrico Gonnella

Area Matematica e Statistica

Laura Carosi
Nicola Salvati

Email della redazione: lfanti@ec.unipi.it