

UNIVERSITÀ CATTOLICA del Sacro Cuore

# CRANEC

Centro di ricerche in Analisi economica  
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**Working Paper 01/26**

**Risk, Social Closeness, and  
Cooperation Across Levels**

Floriana Cerniglia, Riccarda Longaretti,  
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# Risk, Social Closeness, and Cooperation Across Levels

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## Abstract

Cooperation in real-world public goods often takes place in multilevel structures and under uncertainty about the returns to collective action. We study how risk in marginal returns affects cooperation in a multilevel public goods game. In an incentivized online experiment, participants are randomly assigned to either a deterministic scenario or an otherwise identical one with risky marginal per capita returns, holding expected returns constant. We find that risk reduces total contributions, mainly by lowering contributions to the local public good. Risk also lowers expectations about local cooperation by group members, consistent with a conditional-cooperation channel. Moreover, the impact of risk depends on social closeness: individuals who feel closer to their local group tend to reduce global contributions more strongly under risk, while local contributions are not differentially affected.

*Keywords:* Multilevel public goods, Cooperation, Risk, Social distance, Experiment

*JEL Classification:* C72, D70, H41

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# 1 Introduction

The presence of multi-group membership lies at the core of human societies. Individuals simultaneously belong to multiple social groups that together shape their identities. A person may reside in one country and belong to the community of its residents, hold citizenship in another nation and share that national identity, and also adhere to a particular faith that connects them to a religious group. When these groups are organized in a nested structure, as is the case with geographic affiliations, a multilevel social structure emerges (Blackwell and McKee, 2003; Buchan et al., 2009, 2011).

Individuals embedded in multiple groups often face choices about contributing to several collective goods at once. Each group is tied to its own public good, such as local infrastructure, national welfare, or transnational programmes addressing global challenges. Each of these goods can differ in scope and produced benefits, but all depend on individuals' willingness to make voluntary contributions (Chakravarty and Fonseca, 2017; Catola et al., 2023). Because individuals face resource constraints, contributing to one public good may crowd out contributions to another. Moreover, local public goods tend to generate more targeted benefits, whereas higher-level (global) public goods produce more diffuse gains, creating tensions between parochial and broader collective interests.

Yet one rarely decides whether to voluntarily contribute knowing the benefits of cooperation with certainty (Levati and Morone, 2013). Contributions to public goods often involve uncertainty, with individuals facing probabilistic returns from cooperation. Returns to contributions to a national defense or public health program, for instance, through taxation or voluntary earmarked donations, may be high if public funds are implemented efficiently. However, they could be substantially lower if resources are misallocated due to administrative inefficiencies or weak institutional capacity. Individuals may have information about the probability of these different implementation states, yet cannot observe *ex ante* which state will ultimately materialize. In nested, multigroup societies, this uncertainty is compounded by the payoff structure of the public goods themselves. Contributions to both local and global public goods generate local and global returns, respectively, but the magnitudes of these returns may be probabilistic.

In this paper, we study contributing behavior in the multilevel public goods game (MLPGG), an extension of the standard Public Goods Game that behavioral economists use to explore individual behavior in a nested social dilemma (Fellner and Lünser, 2014; Gallier et al., 2019; Quan et al., 2026).<sup>1</sup> We extend the standard MLPGG framework by introducing risky marginal per capita returns (MPCRs). To identify the causal effect of risk, we conduct an incentivized online experiment in which participants are randomly assigned to either a deterministic MLPGG (control group) or an otherwise identical MLPGG with risky returns

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<sup>1</sup>The hierarchical structure of MLPGGs distinguishes them from settings involving multiple independent public goods (Polzer et al., 1999, 2001; Böhm et al., 2014).

(risk treatment), where returns from both local and global public goods are stochastic and independent of individuals' contribution levels. In the control condition, participants decide how much to contribute to the local and global public goods knowing that MPCRs are certain and equal for both goods. This condition provides the deterministic benchmark against which the effects of risk are identified, and also corresponds to the standard MLPGG studied in the literature. In the risk treatment, by contrast, participants make their contribution decisions under risk: the MPCRs of both local and global public goods can take either a high value or a low value, each with equal probability. These returns are realized at the global-group level after contributions are made, corresponding to a "good" or "bad" state of the world, respectively. The risky nature of MPCRs adds a layer of complexity to the decision-making process. Subjects must evaluate the expected benefits of their contributions against the risk that their contributions may yield low returns. This introduces an additional strategic dimension: individuals must balance the temptation to free-ride on others' contributions with their own risk attitudes. This treatment reflects the risk individuals typically face when contributing to real-world public goods, while holding expected payoffs constant.

This design allows us to address two main research questions. First, we ask whether the introduction of risk in marginal returns affects individuals' overall willingness to contribute to public goods in a multilevel setting. Based on existing evidence from standard public goods games, we expect risk to reduce overall contributions.

Second, building on evidence that social closeness – namely, the extent to which an individual feels close to another person or group (e.g., [Bogardus, 1926](#)) – fosters trust, reciprocity, and altruistic motivations ([Binzel and Fehr, 2013](#)), we ask whether the effect of risk on local and global contributions is moderated by individuals' social closeness to their local group. We measure social closeness using a standard and well-established tool, namely the Inclusion of Other in the Self (IOS) scale ([Gächter et al., 2015](#); [Baader et al., 2024](#)). More specifically, we hypothesize that when participants feel closer to their own local group members, the negative effect of risk on contributions is stronger for the global public good than for the local public good. Such a pattern may arise even in minimal group settings, where increased social closeness can emerge solely from mere group membership ([Yang et al., 2024](#)).

Our article contributes to two strands of the behavioral and experimental literature. The first examines the role of risk in standard public goods games. Risk in cooperative settings has been introduced in the literature through a variety of mechanisms. These include risky provision thresholds ([Dannenberg et al., 2015](#); [Brown and Kroll, 2017](#)) and exogenous risk with different correlations across group members ([Bilancini et al., 2024](#)). Our approach is most closely related to studies that model risk through lottery-style MPCRs ([Levati et al., 2009](#); [Artinger et al., 2012](#); [Levati and Morone, 2013](#); [Cherry et al., 2015](#); [Théroude and Zylbersztejn, 2020](#); [Vesely and Wengström, 2025](#)). Risk in marginal returns has long been recognized as a deterrent to cooperation in single-group settings, with existing explanations

often emphasizing the role of risk aversion. Yet it remains unexplored in environments with multiple nested groups. To the best of our knowledge, our study is the first to examine cooperation under risk in a multi-group setting.

The second stream of literature to which our study closely relates focuses on multilevel public goods games. In recent years, behavioral economists have shown increasing interest in understanding cooperative behavior in multi-group societies. This literature examines a range of factors that drive individuals' willingness to contribute to collective welfare across group boundaries, including punishment institutions (Otten et al., 2024; Pilgrim et al., 2026), productivity gains from higher-level public goods (Blackwell and McKee, 2003; Catola et al., 2023, 2024b), income inequality and the way income is generated (Lange et al., 2022; Catola et al., 2024a), group composition (Bjedov et al., 2025), as well as normative considerations (Catola et al., 2025). A common finding is that while individuals tend to favor public goods that directly benefit their local group—exhibiting a form of parochial bias—they also respond positively to productivity increases by reallocating contributions toward (higher-level) public goods with higher relative returns. While this framework captures the essential features of multilevel cooperation, existing studies have exclusively assumed deterministic returns. Our study is the first to provide experimental evidence on how individuals make contribution decisions in multilevel public goods contexts under risk.

To anticipate our results, we highlight three main findings. First, the presence of risky marginal returns, relative to deterministic returns, leads to a significant reduction in total contributions. Second, when decomposing total contributions into local and global components, we find that this negative treatment effect is primarily driven by a decline in local contributions. Third, individuals who feel closer to their local group tend to reduce their global contributions more strongly under risk than their local contributions.

The rest of the paper is organized as follows. Section 2 is devoted to the description of the experiment: it introduces the multilevel public goods game, describes our treatments, states our behavioral predictions, and provides details on the employed experimental procedures. Section 3 reports our experimental results. Section 4 discusses the results and offers concluding remarks.

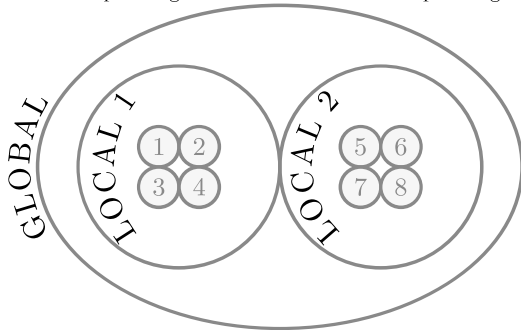
## 2 Research design

### 2.1 Multilevel public goods game and treatments

Our experiment implements a multilevel public goods game. Four participants are randomly matched in a local group and two local groups form a global group (see Figure 1). Subjects receive an endowment  $W = 20$  Points (with 1 Point = £0.025) and, in a one-shot interaction, have to decide how to allocate their endowment among a local public good (neutrally framed as a group account), a global public good (collective account), and a private account.

Contributions to the local and global public goods are limited to integer values.

Figure 1: Group configuration of the multilevel public goods game



Given the structure of the game, the payoff of individual  $i$  is equal to:

$$\pi_i = W - c_i - C_i + \alpha \sum_{j=1}^4 c_j + \beta \sum_{k=1}^8 C_k$$

where  $c_i$  denotes individual  $i$ 's contribution to the local public good,  $C_i$  denotes individual  $i$ 's contribution to the global public good, and  $\alpha$  and  $\beta$  are the MPCRs of the local and global public goods, respectively.

In the control treatment, the marginal per capita returns,  $\alpha$  and  $\beta$ , are deterministic and both equal to 0.6.<sup>2</sup> In the risk treatment,  $\alpha$  and  $\beta$  are identical and stochastic, each taking values of 0.3 or 0.9 with equal probability. The realizations of the MPCRs are common to all members of the global group and are determined after all contribution decisions have been made, but before payoffs are calculated. The treatments are implemented between subjects, with each participant exposed to only one condition. Table 1 summarizes the treatment parameters and shows that the risk treatment corresponds to a mean-preserving spread of the MPCR relative to the control, so that expected returns are identical across treatments.

The parameter values are chosen with two main aims in mind. First, the restriction  $\alpha = \beta$  implies that the two public goods provide identical marginal returns at the individual level. Differences in contributions across levels are therefore not driven by asymmetries in individual incentives or in the distribution of risk across the two public goods. Second, our parameterization guarantees that the game retains the structure of a social dilemma in each realization of the marginal returns, and not only in expected terms. For both possible realizations of the MPCR, free-riding remains individually optimal, while full contribution remains socially efficient. Hence, behavioral responses to the risk treatment cannot be attributed to state-dependent changes in the underlying incentive structure of the game. Together, these

<sup>2</sup>These parameter values coincide with those used in treatment T4 of [Catola et al. \(2023\)](#).

Table 1: Treatment parameters

Treatment	Level	MPCR	Probability	E(MPCR)	SD(MPCR)	Total benefit
Control	Local	0.6	1	0.6	0	2.4
	Global	0.6	1	0.6	0	4.8
Risk	Local	0.3 / 0.9	0.5 / 0.5	0.6	0.3	1.2 / 3.6
	Global	0.3 / 0.9	0.5 / 0.5	0.6	0.3	2.4 / 7.2

*Note:* MPCR realizations are identical for local and global public goods and are drawn at the global-group level after contribution decisions. The risk treatment corresponds to a mean-preserving spread of the MPCR relative to the control. Total benefit refers to the aggregate return generated by one unit of contribution (i.e., MPCR multiplied by group size).

features allow us to study the effect of introducing risk while holding constant both expected marginal returns and the underlying incentive structure of the game.

## 2.2 Behavioral predictions

We formulate two main predictions, pre-registered on AsPredicted prior to data collection (<https://aspredicted.org/hjgw-bx2d.pdf>), regarding how risk in marginal returns affects overall willingness to contribute to public goods and how it affects the allocation of contributions across local and global levels depending on social closeness. They draw on insights from the experimental literature on cooperation under risk, risk preferences, and social identity.

Evidence that risk in public good returns reduces voluntary contributions stems from classic linear public goods games in which all group members are symmetrically positioned and social closeness is typically homogeneous across participants. In these settings, introducing stochastic marginal per capita returns leads to lower contributions, even when expected returns are held constant (Levati et al., 2009; Levati and Morone, 2013).

This effect can be attributed to several complementary mechanisms. First, individuals are typically risk-averse over monetary outcomes (Holt and Laury, 2002; Cox and Harrison, 2008; Crosetto and Filippin, 2013).<sup>3</sup> While allocations to the private account yield a certain payoff, contributions to a public good with risky marginal returns expose participants to payoff risk. As a result, even when expected returns are unchanged, risky public goods become less attractive relative to the safe private alternative. More generally, under concave utility, Jensen’s inequality implies that the expected utility of a risky contribution is lower than the utility of its expected value. Second, risk reduces the perceived effectiveness of contributions. In deterministic environments, the marginal impact of a contribution on collective payoffs is transparent. When marginal returns are stochastic, the realized benefit of a contribution becomes less predictable, weakening efficiency-based motives for cooperation. Third, even

<sup>3</sup>This result is robust across a wide range of elicitation methods, although the magnitude of risk aversion may vary (Charness et al., 2013).

in a one-shot setting, individuals may hold beliefs about others' behavior. For conditionally cooperative individuals, risk in returns can make joint cooperation appear less beneficial, thereby reducing willingness to contribute.

These mechanisms may carry over to the multilevel public goods environment studied here. Although individuals can allocate contributions across a local and a global public good, both collective accounts share the feature that returns are risky in the treatment condition, while the private account provides a safe payoff. Thus, relative to the deterministic benchmark, contributing to public goods becomes less attractive under risk, even though expected marginal returns are unchanged. Importantly, this argument does not hinge on differences in social closeness across levels but applies holding social closeness constant.

**Prediction 1.** *Holding social closeness constant, risky marginal returns lead to lower total contributions compared to deterministic returns.*

In addition to these general effects, the multilevel structure introduces an important role for social closeness. A large literature shows that individuals exhibit stronger pro-social behavior toward socially closer or more salient in-group members (see, among others, [Bernhard et al., 2006](#); [Chen and Li, 2009](#); [Balliet et al., 2014](#); [Gallier et al., 2019](#); [Romano et al., 2021a](#)). In multilevel public goods games, this may translate into placing greater weight on the welfare of local group members relative to more distant others.

In our setting, contributions to the local public good benefit members of the individual's own local group, whereas contributions to the global public good also benefit members of the other local group. When individuals feel closer to their local group, social preferences place relatively greater weight on local payoffs. This asymmetry becomes particularly relevant when individuals adjust their contribution decisions in response to risk. If total contributions decline under risk, reductions are more likely to occur where social motivation is weaker, namely at the global level.

**Prediction 2.** *The effect of risk on the allocation of contributions across levels depends on social closeness. If participants feel closer to local group members, risk leads to a relatively stronger reduction in contributions to the global public good than to the local public good.*

## 2.3 Procedures

The experiment was approved by the Ethical Committee of the University of Milan-Bicocca (Italy). It was programmed in oTree ([Chen et al., 2016](#)) and conducted online in July 2025. The participants were recruited through Prolific ([Palan and Schitter, 2018](#)) among the UK adult population. Upon entering the study, they were asked to provide informed consent and to read the instructions (reproduced in [Appendix A](#)). Before starting the experiment, subjects had to answer some control questions testing their comprehension of the decision task. The

experiment did not start until the participants had answered all the questions correctly. We can, therefore, safely assume that they understood the game.

After making their game choices and without having received any feedback, participants had to report their (first-order) beliefs about others' contributions. Beliefs were elicited by asking each participant to guess the average contributions to the local public good and to the global public good by (i) the other members of their own local group and (ii) the members of the other local group within the global group. For each belief, participants had to indicate an integer number between 0 and 20. We gave them a monetary incentive to report their beliefs accurately. One of the four belief questions was randomly selected for payment, and participants received an additional 4 Points if their selected guess exactly matched the actual average contribution or was not more than 0.5 Points away from it. Incentives in the belief task were kept small relative to incentives in the MLPGG game to avoid hedging (Blanco et al., 2010). When participants made their game decisions, they were unaware of the subsequent belief elicitation task. This avoids any influence of beliefs on game decisions.<sup>4</sup>

To measure social closeness, we used an extended interactive version of the Inclusion of Other in the Self scale (IOS<sub>11</sub>; Baader et al., 2024).<sup>5</sup> Participants adjusted a slider on an 11-point scale that controlled the degree of overlap between two circles displayed on the screen, with one circle representing the self and the other representing another person. Moving the slider from left to right increased the overlap between the circles, ranging from 0 (no overlap) to 11 (almost complete overlap). Participants completed this task twice: once to indicate their perceived connectedness with a representative member of their own local group, and once to indicate their perceived connectedness with a representative member of the other local group within the global group.

Finally, participants filled out a post-experimental questionnaire asking them about their (i) demographic characteristics (age, gender, and education), (ii) risk tolerance and (iii) prosocial traits (positive and negative reciprocity, trust, and altruism). The risk tolerance was measured with a non-incentivized question from the German Socio-Economic Panel asking participants to rate their willingness to take risks in general on an 11-point scale ranging from 0 (not at all willing) to 10 (very willing). The behavioral validity of this survey risk measure has been confirmed by Dohmen et al. (2011). Prosocial traits were elicited with questions from the Global Preference Survey (Falk et al., 2018, 2023). Specifically, positive reciprocity was measured by asking participants how much they would spend on a thank-you gift (from 0 to 30, in increments of 5) for a stranger who helped them reach a desired destination in an unfamiliar area. Negative reciprocity, trust, and altruism were measured through self-

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<sup>4</sup>After the belief elicitation task, subjects answered additional questions aimed at eliciting their personal norms and normative expectations. These data are analyzed in a companion paper.

<sup>5</sup>The IOS scale originated in psychology (Aron et al., 1992) and has been further validated by economists (Gächter et al., 2015, 2022; Beranek and Castillo, 2024). The 11-point version (IOS<sub>11</sub>) introduced by Baader et al. (2024) measures closeness as accurately as the two-item Oneness scale (Cialdini et al., 1997) with a single item, making it well suited for online experiments like ours.

Table 2: Total, local, and global contributions by treatment

	Control			Risk		
	Total	Local	Global	Total	Local	Global
% Zero	7.81	10.94	8.75	5.62	8.12	6.88
% Full	14.06	0.31	2.81	10.94	0.31	2.19
Mean	14.11	7.08	7.36	13.71	6.75	7.23
SD	4.20	2.78	3.63	4.14	2.55	3.41
<i>N</i>	320	320	320	320	320	320

*Note:* % Zero indicates the percentage of subjects contributing zero. % Full indicates the percentage of subjects contributing 20 Points, i.e., the entire endowment. Means and standard deviations are calculated conditional on positive contributions.

assessments of participants’ willingness i) to take revenge when treated very unjustly, even if doing so is costly, ii) to assume that people have only the best intentions, and iii) to give to good causes without expecting anything in return. Responses had to be provided on a scale from 0 to 10, with higher values indicating a higher willingness to act in the described manner.

Overall, 640 subjects participated in the experiment, i.e., 320 participants per treatment. The sample size was determined using an a-priori power analysis for a (two-tailed) Wilcoxon rank-sum test comparing means with the following parameters: an average total contribution without risk of 14 out of 20 Points, a power of 0.90, an alpha of 0.05, and a small-to-medium effect size (Cohen’s *d*) of 0.266.<sup>6</sup>

The experiment lasted approximately 10 minutes. Averaging across both treatments, mean earnings amounted to £2.05, including a £0.80 fixed participation fee. This corresponds to an hourly rate of about £12, which is well above the Prolific’s minimum compensation guideline of £6 per hour. The incentives in the experiment were thus substantial and comparable to the typical hourly compensation offered in laboratory experiments.

### 3 Experimental results

In Appendix B we verify that the random assignment of participants to treatments has been effective. In what follows we describe the data and present the results.

#### 3.1 The effect of risk on contributions

Table 2 reports summary statistics for total contributions as well as their allocation between the local and global public goods (the full distribution of contributions is depicted in Figure

<sup>6</sup>The assumed effect size is consistent with prior experimental evidence on the impact of risk on cooperation in public goods games, which typically documents modest but economically meaningful reductions in contributions when returns are stochastic.

C1). Its visual inspection reveals that introducing risk does not increase free-riding. The share of subjects contributing zero to the public goods (i.e., allocating the entire endowment to the private account) is 7.81% in the control and 5.62% in the risk treatment. At the same time, risky returns reduce contribution levels conditional on contributing. Average total positive contributions decline from 14.11 points (SD = 4.20) in the control treatment to 13.71 points (SD = 4.14) under risk. Consistent with this pattern, the proportion of subjects contributing the full endowment falls from 14.06% in the control treatment to 10.94% in the risk treatment. Taken together, these summary statistics suggest that risk primarily reduces contributions at the upper end of the distribution rather than by increasing outright free-riding.

Turning to the allocation across levels, the presence of risk does not increase the incidence of zero allocations to either account. If anything, the share of zero contributions declines in both cases—from 10.94% to 8.12% for the local public good and from 8.75% to 6.88% for the global public good—mirroring the pattern observed for total contributions.

Conditional on contributing, however, modest differences across levels emerge. For the local public good, mean positive contributions decrease from 7.08 (SD = 2.78) in the control to 6.75 (SD = 2.55) under risk. By contrast, contributions to the global public good remain comparatively stable: the mean declines only slightly, from 7.36 (SD = 3.63) to 7.23 (SD = 3.41).

In what follows, we assess treatment effects using OLS regression models, with total, local, and global contributions as dependent variables.<sup>7</sup> The set of explanatory variables includes the treatment indicator and measures of closeness to own and other group members. We further control for demographic characteristics and individual preferences – age, education (college graduate = 1, otherwise 0), risk tolerance, positive and negative reciprocity, altruism, and trust – as well as session fixed effects (i.e., session dummies). Estimation results are summarized in Table 3.

In column (1), where the dependent variable is total contributions, the coefficient of the treatment dummy, “Risk treatment”, is negative and statistically significant. In line with Prediction 1, this indicates that the introduction of risky marginal per capita returns reduces total contributions relative to the deterministic benchmark. More specifically, holding social closeness constant, total contributions are lower under risk by approximately 1.5 points, which corresponds to about 10% of average contributions. The effect is thus not only statistically significant but also economically meaningful.

Disaggregating total contributions into their local and global components, we find that the negative effect is driven by local contributions. For local contributions (column (2)), the coefficient of “Risk treatment” is negative and statistically significant, indicating that risk reduces contributions to the local public good. In economic terms, local contributions decrease by about one point under risk. By contrast, for global contributions (column (3)),

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<sup>7</sup>All results remain qualitatively unchanged when using Tobit models instead of OLS (see Appendix C).

Table 3: OLS regressions examining total, local and global contributions

	Total (1)	Local (2)	Global (3)
Risk treatment	-1.456* (0.825)	-1.074** (0.523)	-0.382 (0.615)
Closeness to group members	0.514*** (0.115)	0.349*** (0.073)	0.165* (0.085)
Closeness to other group members	0.244* (0.125)	-0.112 (0.079)	0.355*** (0.093)
Constant	8.604*** (1.204)	3.239*** (0.763)	5.365*** (0.897)
Control variables	✓	✓	✓
$N$	640	640	640

*Note:* Standard errors in parentheses. Control variables include: age, college graduate, risk tolerance, positive and negative reciprocity, trust, altruism, and session dummies. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

the coefficient of the treatment dummy is negative but small and statistically insignificant, implying no systematic effect of risk on contributions to the global public good. The decline in total contributions under risk is thus mainly due to a reduction in contributions to the local public good, while contributions to the global public good remain unaffected.

The coefficient of “closeness to group members” is positive and statistically significant across all specifications. This indicates that stronger closeness to the local group is associated with higher contributions. For total contributions, the coefficient is slightly above 0.5, implying that a one-point increase on the IOS scale is associated with an increase of about half a point in total contributions. A similar effect emerges for local contributions and, to a lesser extent, for global contributions.

As it could be expected, the effect of “closeness to other group members” is positive and statistically significant only for total and global contributions, and not for local contributions, which is consistent with the fact that contributions to the local public good only benefit members of one’s own group.

Based on the analysis reported in this subsection, we state the following result:

**RESULT 1.**  *Holding social closeness constant, risky marginal returns lead to lower total contributions compared to deterministic returns, with the decline mainly driven by reduced local cooperation.*

To explore whether the effect of risk operates through beliefs, we compare participants’ expectations about others’ contributions across treatments. To make the belief analysis directly comparable to the contribution regressions, we estimate the same specification as in Table 3, replacing contributions with beliefs about others’ contributions as the dependent variable.

Table 4: Summary statistics by treatment and social closeness

	Control		Risk	
	Local	Global	Local	Global
<i>Closer to local = 1</i>				
Mean	6.67	6.96	6.71	6.61
SD	3.37	3.82	2.88	3.25
<i>N</i>	184	184	193	193
<i>Closer to local = 0</i>				
Mean	5.81	6.38	5.43	6.92
SD	3.48	4.32	3.18	4.45
<i>N</i>	136	136	127	127

Table C4 shows that risk significantly reduces beliefs about the amount contributed to the local public good by members of one’s own local group, while it does not affect beliefs about contributions to the global public good, either by members of one’s own local group or by members of the other local group. This is consistent with a conditional-cooperation channel: under risk, participants expect lower local cooperation by others and reduce their own local contributions accordingly, while the absence of changes in beliefs about global contributions is consistent with the lack of a significant treatment effect at the global level.

### 3.2 Social closeness and contributions under risk

Prediction 2 states that the effect of risk on contributions depends on social closeness. In particular, individuals who feel closer to members of their own local group are expected to reduce global contributions more strongly than local contributions when returns are risky.

To test this prediction, we construct a dummy variable, “Closer to local”, equal to one if a participant reports greater closeness to members of her own local group than to members of the other local group, and zero otherwise.

We begin with descriptive evidence. Table 4 reports summary statistics for local and global contributions by treatment, separately for participants who feel closer to the local group and those who do not. Among participants who are closer to the local group, global contributions decline under risk (from 6.96 to 6.61), while local contributions remain essentially unchanged (6.67 vs. 6.71). By contrast, among those who are not closer to the local group, global contributions increase slightly under risk (from 6.38 to 6.92), whereas local contributions decrease (from 5.81 to 5.43). Taken together, these patterns suggest that responses to risk vary with social closeness, particularly for global contributions.

We next estimate treatment effects using OLS regressions, with local and global contributions as dependent variables. The explanatory variables include the treatment indicator, the “Closer to local” dummy, and their interaction. We also control for the same set of de-

Table 5: OLS regressions examining the effect of social closeness on contributions under risk

	Local (1)	Global (2)
Risk treatment	-1.206** (0.600)	0.376 (0.725)
Closer to local	0.761** (0.365)	0.530 (0.441)
Risk treatment $\times$ Closer to local	0.478 (0.516)	-0.707 (0.623)
Constant	3.587*** (0.784)	5.841*** (0.947)
Control variables	✓	✓
$N$	640	640

*Note:* Standard errors in parentheses. Control variables include: age, college graduate, risk tolerance, positive and negative reciprocity, trust, altruism, and session dummies. The p-value from a two-sided test of equality of the interaction coefficients across local and global contributions is 0.058. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

mographic characteristics, individual preferences and session fixed effects as in Section 3.1. Estimation results are reported in Table 5.

Let us consider the coefficient of “Risk treatment”. For local contributions (column (1)), the coefficient is negative and statistically significant, indicating that risk reduces contributions to the local public good. Remarkably, this negative effect is now driven by participants who are not closer to the local group. For global contributions (column (2)), the coefficient is positive but not statistically significant, indicating no systematic effect of risk on global contributions.

The coefficient of “Closer to local” is positive and statistically significant for local contributions, meaning that individuals in the Control treatment who feel closer to their local group contribute more to the local public good. For global contributions, the coefficient remains positive but not statistically significant.

Finally, the interaction term between “Risk treatment” and “Closer to local” is not statistically significant for either local or global contributions, revealing no direct evidence that the effect of risk varies with social closeness within each equation. However, and most importantly for our research hypothesis, the difference between the interaction coefficients across local and global contributions is statistically significant (two-sided p-value = 0.058). This shows that the moderating role of social closeness differs across contribution levels.

This result is further supported by a pooled specification in which local and global contributions are stacked and a triple interaction between “Risk treatment”, “Closer to local”, and a dummy for global contributions is included.<sup>8</sup> Table 6 shows that the coefficient of the triple

<sup>8</sup>The preregistered analysis for Prediction 2 focused on comparing the effect of risk within the subsample

Table 6: OLS regression examining stacked contributions with triple interaction

	Contributions
Risk treatment	-0.880* (0.529)
Closer to local	0.782** (0.392)
Global	0.566 (0.429)
Risk treatment $\times$ Closer to local	0.547 (0.523)
Risk treatment $\times$ Global	0.930 (0.606)
Closer to local $\times$ Global	-0.273 (0.573)
Risk treatment $\times$ Closer to local $\times$ Global	-1.322* (0.781)
Constant	4.431*** (0.690)
Control variables	✓
$N$	1,280

*Note:* Standard errors clustered at the individual level in parentheses. Control variables include: age, college graduate, risk tolerance, positive and negative reciprocity, trust, altruism, and session dummies. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

interaction is negative and statistically significant, implying that the interaction between risk and social closeness is more negative for global than for local contributions.

Overall, the results provide evidence consistent with Prediction 2. While the interaction terms are not individually significant, both the difference in interaction coefficients across contribution levels and the triple interaction specification indicate that social closeness differentially moderates the effect of risk. In particular, among individuals who feel closer to their local group, risk leads to a relatively stronger reduction in global contributions than in local contributions.

This gives our second result:

**RESULT 2.** *Among individuals who feel closer to their local group, risk tends to lead to a relatively stronger reduction in contributions to the global public good than to the local public good.*

of participants who feel closer to the local group. The pooled specification with a triple interaction provides a more direct test of the hypothesis and allows us to exploit the full sample, thereby improving statistical efficiency and mitigating potential power limitations.

## 4 Conclusions

This paper investigates how risk in marginal returns affects cooperation in a multilevel public goods environment and how this effect interacts with social closeness. Using an incentivized online experiment, we compare a standard multilevel public goods game with deterministic returns to an otherwise identical setting in which marginal returns are stochastic but equal in expectation.

Our findings yield three main insights. First, consistent with evidence from standard public goods games (Levati et al., 2009; Levati and Morone, 2013), introducing risk in marginal returns reduces overall contributions. Our results show that the detrimental role of risk extends to multilevel environments, where individuals must simultaneously allocate resources across multiple collective goods. The analysis of first-order belief suggests that this effect is associated with lower expectations about local cooperation by group members, consistent with a conditional-cooperation channel.

Second, the negative effect of risk is not uniform across levels of cooperation. The reduction in total contributions is primarily driven by a decline in local contributions, while global contributions remain largely unaffected. Hence, despite identical expected marginal returns across levels, the multilevel structure itself generates differential responses, highlighting that the organization of collective action matters for how risk translates into behavior.

Third, we show that social closeness plays a key moderating role. The negative effect of risk on local contributions is driven by individuals who do not feel closer to the local group, whereas those who feel closer to their local group do not significantly reduce their local contributions in response to risk. Moreover, the effect of risk on the allocation of contributions differs across levels depending on individuals' attachment to the local group: among those who feel closer to their local group, risk leads to a relatively stronger reduction in contributions to the global public good than to the local public good. This evidence is consistent with theories of social identity and parochial preferences (Bernhard et al., 2006; Gallier et al., 2019; Romano et al., 2021b), according to which some individuals identified as *parochial* place greater weight on the welfare of socially closer others. Our findings also resonate with recent theoretical work suggesting that asymmetries in multigroup environments may influence responses to risk (Cerniglia et al., 2026).

Many real-world public goods, such as climate mitigation and international development programs, are characterized by both multilevel governance structures and the presence of risk in monetary returns. Our results suggest that risk may not only reduce overall contributions, but also concentrate this reduction at more local levels of provision. This effect is driven by individuals who do not exhibit a particularly strong attachment to the local group, as measured by perceived social closeness to local group members. These findings suggest that, in times of uncertainty, efforts to sustain cooperation should particularly target individuals who do not feel strongly connected to the local group—which may correspond, for example,

to the national level within broader cross-country cooperation frameworks.

A potential explanation for the differential effect of risk on local and global contributions relates to differences in the aggregate efficiency of contributions across levels. Although marginal per capita returns are identical, contributions to the global public good generate higher total benefits due to the larger group size. When returns become risky, individuals may therefore be less willing to reduce contributions to the more efficient global public good, while cutting back more on local contributions, which yield lower aggregate returns. This interpretation is consistent with our finding that the decline in local contributions is primarily driven by participants who do not feel particularly close to their local group, suggesting that both efficiency considerations and social closeness jointly shape how individuals adjust their behavior under risk.

Several extensions of our setting could be explored in future research. First, in our design, risk affects local and global public goods symmetrically, in the sense that the distribution of marginal returns is identical across the two contribution levels. In many situations, however, different public goods may be subject to different degrees of risk. For instance, returns to local public goods such as neighborhood services are close to certain, whereas returns to global public goods such as global health initiatives often involve substantially greater risk. Future research could therefore examine how asymmetric exposure to risk across local and global public goods affects contribution behavior.

Second, our experiment considers a one-shot interaction. Extending the analysis to repeated settings would make it possible to study how the effects of risk evolve over time. Evidence from standard public goods games suggests that risk may have stronger effects in repeated interactions. In particular, repeated interaction under perfect-partner matching could reinforce social closeness over time, potentially amplifying behavioral responses. In this sense, our one-shot setting provides a conservative benchmark, as it abstracts from dynamic mechanisms that may strengthen the role of social proximity. Investigating the role of risk in repeated multilevel settings is therefore a promising avenue for future research.

Finally, our analysis focuses on a relatively simple notion of social closeness within minimally defined groups. Notwithstanding the weak and transient nature of these group assignments, we find that perceived closeness moderates responses to risk. An important question for future research is whether and how the interaction between risk and social proximity scales in environments characterized by more salient and persistent social identities, such as those based on nationality or long-term group membership.

# Appendix A Experimental instructions and questionnaire

## Instructions

### *Group formation and exchange rate*

You are randomly matched with other three participants (henceforth, your partners). You and your partners form a group of four. Your group is randomly matched with another group of the same size. All amounts are expressed in Points rather than pounds. The exchange rate is 1 Point = £0.025.

### *Decisions*

You are endowed with 20 Points. You have to decide how many of these Points you want to keep in a **private account** (your personal account), how many Points you want to contribute to a **group account** (the account of you and your partners, i.e., your group), and how many Points you want to contribute to a **collective account** (the account of both your group and the other group). You can divide the Points across the three accounts only in integer numbers (i.e., 0, 1, ..., 20). The other participants face the same decision.

### *Your earnings*

Your earnings are calculated as the sum of:

[*Participants in the Control treatment read:*

- 1) “Points you keep in the private account” = 20 *minus* your contribution to the group account *minus* your contribution to the collective account.
- 2) “Income from the group account” = the contributions to the group account made by you and your partners are added up, and the resulting sum is multiplied by 0.6.
- 3) “Income from the collective account” = the contributions to the collective account made by you, your partners and the members of the other group are added up, and the resulting sum is multiplied by 0.6.]

[*Participants in the Risk treatment read:*

- 1) “Points you keep in the private account” = 20 *minus* your contribution to the group account *minus* your contribution to the collective account.
- 2) “Income from the group account” = the contributions to the group account made by you and your partners are added up, and the resulting sum is multiplied by a number that we call *A*.
- 3) “Income from the collective account” = the contributions to the collective account made by you, your partners and the members of the other group are added up, and the resulting sum is multiplied by a number that we call *B*.

You have to decide about your contributions to the group and collective accounts without knowing the values of  $A$  and  $B$ . All you know is that there are two scenarios:

- $A$  and  $B$  are both equal to 0.3, or
- $A$  and  $B$  are both equal to 0.9.

The two scenarios are equally likely of been selected. The values of  $A$  and  $B$  in the selected scenario apply to you, your partners and the members of the other group.]

## Post-experiment questionnaire

1. What is your age?
2. What is your gender?
  - Male
  - Female
3. What is the highest level of education that you have completed?
  - No formal qualification
  - Secondary education (e.g. GED/GCSE)
  - High school diploma/A-levels
  - Technical/community college
  - Undergraduate degree (BA/BSc/other)
  - Graduate degree (MA/MSc/MPhil/other)
  - Doctorate degree (PhD/other)
4. Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? Please indicate your answer on a scale from 0 to 10, where 0 means “unwilling to take risks” and 10 means “fully prepared to take risks”.
5. Please think about what you would do in the following situation. You are in an area you are not familiar with, and you realize you lost your way. You ask a stranger for directions. The stranger offers to take you to your destination. Helping you costs the stranger about £20 in total. However, the stranger says he or she does not want any money from you. You have six presents with you. The cheapest present costs £5, the most expensive one costs £30. Do you give one of the presents to the stranger as a “thank-you”-gift? If so, which present do you give to the stranger?
  - No present
  - The present worth £5
  - The present worth £10
  - The present worth £15
  - The present worth £20
  - The present worth £25
  - The present worth £30

6. How well do the following statements describe you as a person? Please indicate your answer on a scale from 0 to 10, where 0 means “does not describe me at all” and 10 means “describes me perfectly”.
- If I am treated very unjustly, I will take revenge at the first occasion, even if there is a cost to do so.
  - I assume that people have only the best intentions.
7. Are you willing to give to good causes without expecting anything in return? Please indicate your answer on a scale from 0 to 10, where 0 means “completely unwilling to do so” and 10 means “very willing to do so”.

## Appendix B Balance tests

Table B1: Individual characteristics and preferences

	Control	Risk
Age	39.96 (10.52)	39.60 (11.05)
Female	0.50 (0.50)	0.53 (0.50)
College graduate	0.67 (0.47)	0.63 (0.48)
Risk tolerance	5.50 (2.55)	5.48 (2.67)
Positive reciprocity	15.02 (8.19)	15.20 (8.90)
Negative reciprocity	2.96 (2.76)	2.81 (2.73)
Trust	5.45 (2.32)	5.13 (2.65)
Altruism	7.08 (2.45)	6.83 (2.59)
N	320	320

Table B1 reports summary statistics of demographic characteristics and individual preferences of our sample, divided by treatment. Overall, the average age is around 40 and half of the participants are female. More than 60 percent of participants have a college degree. Based on the participants' responses to the SOEP question, risk tolerance, on a 0-10 scale, is slightly above 5 in both treatments. Finally, our sample is well balanced in terms of pro-social traits.

According to a series of  $\chi^2$  tests, we find no differences in gender and education (p-values equal 0.429 and 0.320, respectively). Similarly, a series of Wilcoxon rank-sum tests do not reveal any differences in age, risk preferences, positive and negative reciprocity, trust, and altruism (p-values equal 0.812, 0.919, 0.837, 0.460, 0.254, and 0.285, respectively).

## Appendix C Additional figures and tables

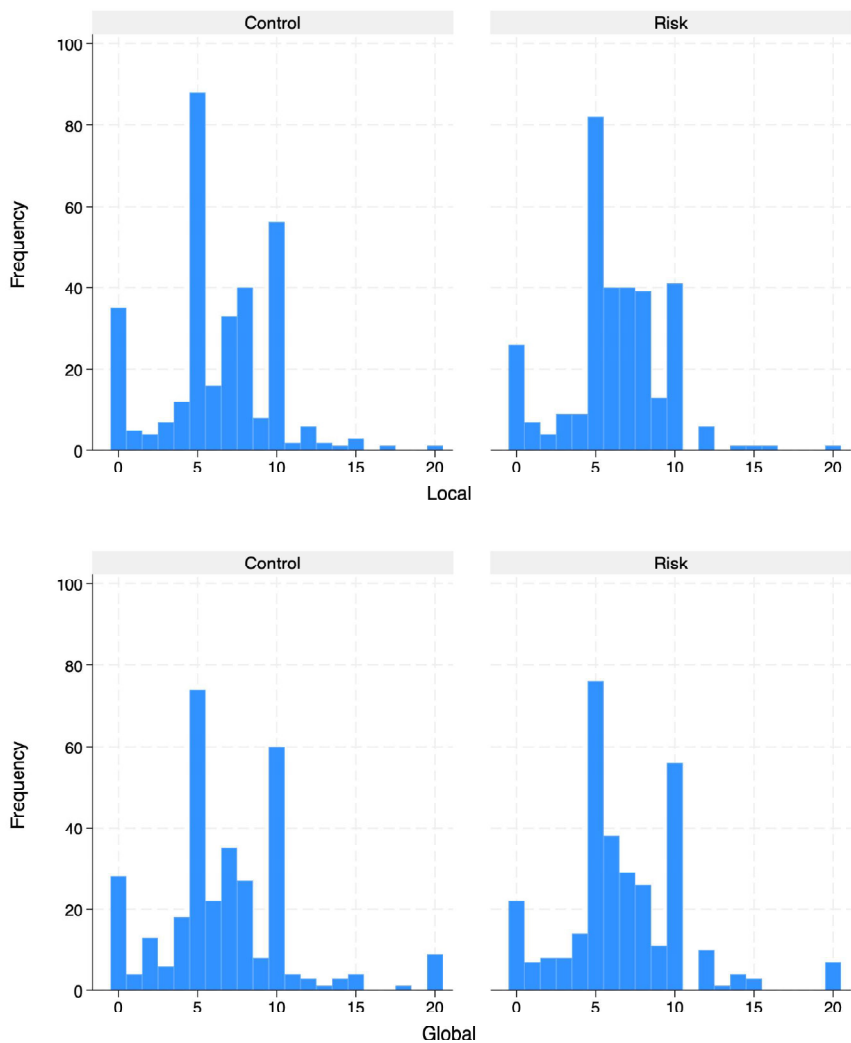


Figure C1: Distribution of local and global contributions by treatment

Table C1: Tobit regressions examining total, local and global contributions

	Total (1)	Local (2)	Global (3)
Risk treatment	-1.592* (0.872)	-1.231** (0.570)	-0.509 (0.655)
Closeness to group members	0.566*** (0.121)	0.391*** (0.079)	0.209** (0.091)
Closeness to other group members	0.258* (0.131)	-0.112 (0.086)	0.379*** (0.099)
Constant	8.149*** (1.277)	2.738*** (0.835)	4.886*** (0.960)
Control variables	✓	✓	✓
<i>N</i>	640	640	640

*Note:* Standard errors in parentheses. Control variables include: age, college graduate, risk tolerance, positive and negative reciprocity, trust, altruism, and session dummies. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table C2: Tobit regressions examining the effect of social closeness on contributions under risk

	Local (1)	Global (2)
Risk treatment	-1.365** (0.657)	0.365 (0.796)
Closer to local	0.866** (0.399)	0.638 (0.485)
Risk treatment $\times$ Closer to local	0.523 (0.564)	-0.754 (0.684)
Constant	3.140*** (0.859)	5.495*** (1.042)
Control variables	✓	✓
<i>N</i>	640	640

*Note:* Standard errors in parentheses. Control variables include: age, college graduate, risk tolerance, positive and negative reciprocity, trust, altruism, and session dummies. The p-value from a two-sided test of equality of the interaction coefficients across local and global contributions is 0.063. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table C3: Tobit regression examining stacked contributions with triple interaction

	Contributions
Risk treatment	-1.018* (0.596)
Closer to local	0.900** (0.442)
Global	0.624 (0.457)
Risk treatment $\times$ Closer to local	0.599 (0.589)
Risk treatment $\times$ Global	0.967 (0.646)
Closer to local $\times$ Global	-0.303 (0.606)
Risk treatment $\times$ Closer to local $\times$ Global	-1.394* (0.827)
Constant	3.973*** (0.784)
Control variables	✓
$N$	1,280

*Note:* Standard errors clustered at the individual level in parentheses. Control variables include: age, college graduate, risk tolerance, positive and negative reciprocity, trust, altruism, and session dummies. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table C4: OLS regressions examining first-order beliefs

	Local contrib. by group members (1)	Global contrib. by group members (2)	Global contrib. by other group members (3)
Risk treatment	-0.880* (0.466)	0.070 (0.524)	0.116 (0.566)
Closeness to group members	0.196*** (0.065)	0.006 (0.073)	-0.035 (0.079)
Closeness to other group members	-0.056 (0.070)	0.292*** (0.079)	0.281*** (0.085)
Constant	5.623*** (0.680)	5.511*** (0.765)	6.669*** (0.826)
Control variables	✓	✓	✓
$N$	640	640	640

*Note:* Standard errors in parentheses. Control variables include: age, college graduate, risk tolerance, positive and negative reciprocity, trust, altruism, and session dummies. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## References

- Aron, A., Aron, E. N., and Smollan, D. (1992). Inclusion of other in the self scale and the structure of interpersonal closeness. *Journal of Personality and Social Psychology*, 63(4):596.
- Artinger, F., Fleischhut, N., Levati, M. V., and Stevens, J. R. (2012). Cooperation in a risky environment: Decisions from experience in a stochastic social dilemma. *Jena Economic Research Papers*.
- Baader, M., Starmer, C., Tufano, F., and Gächter, S. (2024). Introducing ios<sub>11</sub> as an extended interactive version of the ‘inclusion of other in the self’ scale to estimate relationship closeness. *Scientific Reports*, 14(1):8901.
- Balliet, D., Wu, J., and De Dreu, C. K. (2014). Ingroup favoritism in cooperation: a meta-analysis. *Psychological bulletin*, 140(6):1556.
- Beranek, B. and Castillo, G. (2024). Continuous inclusion of other in the self. *Journal of the Economic Science Association*, 10(2):544–568.
- Bernhard, H., Fischbacher, U., and Fehr, E. (2006). Parochial altruism in humans. *Nature*, 442(7105):912–915.
- Bilancini, E., Boncinelli, L., Nardi, C., and Pizziol, V. (2024). Cooperation is unaffected by the threat of severe adverse events in public goods games. *Journal of Behavioral and Experimental Economics*, 108:102145.
- Binzel, C. and Fehr, D. (2013). Social distance and trust: Experimental evidence from a slum in cairo. *Journal of Development Economics*, 103:99–106.
- Bjedov, T., Lapointe, S., Madiès, T., Masclet, D., and Tisserand, J.-C. (2025). The effects of global and local heterogeneity on cooperation in multi-level public goods: Experimental evidence. *Working Paper*.
- 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 & Organization*, 52(1):115–131.
- Blanco, M., Engelmann, D., Koch, A. K., and Normann, H.-T. (2010). Belief elicitation in experiments: is there a hedging problem? *Experimental Economics*, 13(4):412–438.
- Bogardus, E. S. (1926). Social Distance in the City. *Proceedings and Publications of the American Sociological Society*, 20(1926):40–46.

- Böhm, R., Bornstein, G., and Koppel, H. (2014). Between-group conflict and other-regarding preferences in nested social dilemmas. *Jena Economic Research Papers*.
- Brown, T. C. and Kroll, S. (2017). Avoiding an uncertain catastrophe: climate change mitigation under risk and wealth heterogeneity. *Climatic Change*, 141(2):155–166.
- 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.
- Catola, M., D’Alessandro, S., Guarnieri, P., and Pizziol, V. (2025). Norms and efficiency in a multi-group society: An online experiment. *Journal of Public Economic Theory*, 27(1):e70010.
- Catola, M., D’Alessandro, S., Guarnieri, P., and Pizziol, V. (2023). Multilevel public goods game: levelling up, substitution and crowding-in effects. *Journal of Economic Psychology*, 97:102626.
- Catola, M., Guarnieri, P., Marcon, L., and Spadoni, L. (2024a). Real-effort in the multilevel public goods game. *The BE Journal of Economic Analysis & Policy*, 24(3):965–974.
- Catola, M., Guarnieri, P., Pizziol, V., and Rapallini, C. (2024b). Measuring the attitude towards a european public budget: A cross-country experiment. *Journal of Comparative Economics*, 52(4):963–979.
- Cerniglia, F., Longaretti, R., Nardi, C., and Pizziol, V. (2026). Voluntary contributions to risky multilevel public goods with heterogeneous returns. *Mimeo*.
- 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.
- Charness, G., Gneezy, U., and Imas, A. (2013). Experimental methods: Eliciting risk preferences. *Journal of economic behavior & organization*, 87:43–51.
- 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., Howe, E. L., and Murphy, J. J. (2015). Sharing as risk pooling in a social dilemma experiment. *Ecology and Society*, 20(1).
- Cialdini, R. B., Brown, S. L., Lewis, B. P., Luce, C., and Neberg, S. L. (1997). Reinterpreting the empathy–altruism relationship: When one into one equals oneness. *Journal of Personality and Social Psychology*, 73(3):481.
- Cox, J. C. and Harrison, G. W. (2008). *Risk aversion in experiments*. Emerald Group Publishing.
- Crosetto, P. and Filippin, A. (2013). The “bomb” risk elicitation task. *Journal of risk and uncertainty*, 47(1):31–65.
- Dannenberg, A., Löschel, A., Paolacci, G., Reif, C., and Tavoni, A. (2015). On the provision of public goods with probabilistic and ambiguous thresholds. *Environmental and Resource Economics*, 61(3):365–383.
- Dohmen, T., Huffman, D., Schupp, J., Falk, A., Sunde, U., and Wagner, G. G. (2011). Individual Risk Attitudes: Measurement, Determinants, and Behavioral Consequences. *Journal of the European Economic Association*, 9(3):522–550.
- 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., Becker, A., Dohmen, T., Huffman, D., and Sunde, U. (2023). The preference survey module: A validated instrument for measuring risk, time, and social preferences. *Management Science*, 69(4):1935–1950.
- Fellner, G. and Lünser, G. K. (2014). Cooperation in local and global groups. *Journal of Economic Behavior and Organization*, 108:364–373.
- Gächter, S., Starmer, C., Thöni, C., Tufano, F., and Weber, T. O. (2022). Social closeness can help, harm and be irrelevant in solving pure coordination problems. *Economics Letters*, 216:110552.
- Gächter, S., Starmer, C., and Tufano, F. (2015). Measuring the closeness of relationships: a comprehensive evaluation of the inclusion of the other in the self scale. *PLoS one*, 10(6):e0129478.
- 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 & Organization*, 164:500–517.

- Holt, C. A. and Laury, S. K. (2002). Risk aversion and incentive effects. *American economic review*, 92(5):1644–1655.
- Lange, A., Schmitz, J., and Schwirplies, C. (2022). Inequality, role reversal and cooperation in multiple group membership settings. *Experimental Economics*, 25:1–43.
- Levati, M. V. and Morone, A. (2013). Voluntary contributions with risky and uncertain marginal returns: the importance of the parameter values. *Journal of Public Economic Theory*, 15(5):736–744.
- Levati, M. V., Morone, A., and Fiore, A. (2009). Voluntary contributions with imperfect information: An experimental study. *Public Choice*, 138(1-2):199–216.
- Otten, K., Buskens, V., Przepiorka, W., Cherki, B., and Israel, S. (2024). Cooperation, punishment, and group change in multilevel public goods experiments. *European Economic Review*, 164:104682.
- Palan, S. and Schitter, C. (2018). Prolific.ac—a subject pool for online experiments. *Journal of Behavioral and Experimental Finance*, 17:22–27.
- Pilgrim, C., Stewart, A. J., and Raihani, N. J. (2026). Social identity and cooperation co-evolve in a multilevel public goods game. *Scientific Reports*.
- Polzer, J. T., Milton, L. P., and Gruenfeld, D. H. (2001). *Asymmetric subgroup communication in nested social dilemmas*. Citeseer.
- Polzer, J. T., Stewart, K. J., and Simmons, J. L. (1999). A social categorization explanation for framing effects in nested social dilemmas. *Organizational behavior and human decision processes*, 79(2):154–178.
- Quan, J., Huang, X., and Wang, X. (2026). Evolution of cooperative behavior in multi-level groups with multi-stage interactions. *Applied Mathematical Modelling*, page 116780.
- Romano, A., Spadaro, G., Balliet, D., Joireman, J., Van Lissa, C., Jin, S., Agostini, M., Bélanger, J. J., Gützkow, B., Kreienkamp, J., et al. (2021a). Cooperation and trust across societies during the covid-19 pandemic. *Journal of Cross-Cultural Psychology*, 52(7):622–642.
- Romano, A., Sutter, M., Liu, J. H., Yamagishi, T., and Balliet, D. (2021b). National parochialism is ubiquitous across 42 nations around the world. *Nature communications*, 12(1):4456.
- Théroude, V. and Zylbersztejn, A. (2020). Cooperation in a risky world. *Journal of Public Economic Theory*, 22(2):388–407.

Vesely, S. and Wengström, E. (2025). Increased cooperation in stochastic social dilemmas: Can it be explained by risk sharing? *Journal of Behavioral and Experimental Economics*, 114:102309.

Yang, X., Schultz, J., Schmidt, K., Kenny, A. R., Pfuhl, G., Gjoneska, B., Dalgard, I., Lewis, S. C., Exner, A., Buchanan, E. M., et al. (2024). Large-scale cross-societal examination of real-and minimal-group biases. *PsyArXiv*.

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