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ORIGINAL PAPER

A single-project meta-analysis of multiple threshold public goods games

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Abstract

This paper is a single-project meta-analysis of four experiments that model charitable giving as individual contributions to a multiplicity of competing threshold public goods. We pool 17,136 observations at the individual level to summarize the project and investigate the role of learning, gender, and risk attitude, since the included studies are inconclusive in this regard. We find that equally effective coordination devices are the existence of a single contribution option that stands out on its merits, learning, and delegation as long as the intermediary is formally obliged to pass along a high enough percentage of the transferred resources. Women delegate less than men, and consequently prefer direct contributions. Risk tolerance increases overall donations but decreases individual earnings. We discuss possible implications of our findings.

Keywords: charitable giving; coordination devices; fundraising; meta-analysis; threshold public goods

JEL codes: C90; C91; C92; H40; H41; L31.

1. Introduction

Charitable giving is a phenomenon fulfilling several purposes in society, which range from the alleviation of wealth and health inequalities to the safeguard of the environment and human rights, not to mention the resulting psychological benefits for donors.[1] To mobilize the general public, in the last decades a growing number of organizations have turned to social media fundraising and crowdfunding platforms in search of smaller contributors (Kuppuswamy & Bayus, 2018; Saxton & Wang, 2014). This has gradually led to a change in the nature of charitable giving by which nowadays it is increasingly easy to compare the characteristics of fundraising campaigns. As a consequence, online competition turns out to be greater (Walk et al., 2022), potentially involving better-performing organizations and superior donor identification with the nonprofit (Hou et al., 2014). Nevertheless, the other side of the coin is that competing projects are often hard to distinguish from one another, which reduces the chances of a project reaching the fundraising target (Meer, 2014).

[1]For an overview of the literature on charitable giving and its determinants, we refer the reader to Andreoni (2006) and Bekkers & Wiepking (2011).

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Contributing to a burgeoning line of research on competition for charitable giving, Corazzini et al. (2015) (CCV) devise a novel experimental framework to explore the coordination dilemma between donors, in which donations are modeled as individual contributions to a multiplicity of threshold public goods. After observing lower contributions, coordination rate, and profits as the number of charities increases, the authors also find that miscoordination can be prevented in case one of the public goods stands out on its merits, or even arbitrarily. Examining the role of fundraising intermediaries such as the United Way, Corazzini et al. (2020) (CCR) extend the framework and allow for delegation, showing that the latter is perceived as a coordination device only if a destination rule formally obliges the delegate to direct donations to public goods. Even so, Abraham et al. (2023) (ACFR) point out that the positive effects of the destination rule can be nullified in the realistic case of an intermediary incurring sunk overhead costs, arguably out of donors' overhead aversion. Corazzini et al. (2024) (CCLR) carry on this strand of literature and focus on environments with heterogeneous agents that differ in endowments and preferences, concluding that the wealthiest contributors are capable of imposing their philanthropic agenda on all donors. Although the four aforementioned manuscripts are part of the same project, they investigate the same phenomenon in isolation and leave room for a meta-study that compares the effectiveness of the various coordination devices. In that spirit, we rely on individual participant data (IPD) as widely-recognized "gold standard" meta-analytic approach (Borenstein et al., 2009; Riley et al., 2010), pooling 17,136 observations at the subject level.

The scope of this meta-study is twofold. First, we aim to summarize the project results and outline the bigger picture (Goal 1). In detail, we evaluate the relative performance of the coordination devices separately tested by CCV, CCR, ACFR, and CCLR, as well as describe how such coordination devices work, and their implications for donors in terms of wealth. Second, we aim to extend the project results and address new research questions (Goal 2). These research questions pertain to (a) the relationship between learning and coordination in multiple threshold public goods games, for which the four included studies offer mixed evidence; (b) the relationship between personal characteristics and individual-level outcomes (i.e., contributions, earnings) in multiple threshold public goods games, which remains unexplored in the four included studies.

From a methodological viewpoint, we draw inspiration from so-called *single-paper meta-analysis* that quantitatively summarizes the findings of multiple studies contained in the same paper (McShane & Böckenholt, 2017). Also known as *mini meta-analysis* (Goh et al., 2016), this technique is viewed as a worthy substitute for the final narrative discussion section of such papers. Indeed, not only does it foster the inclusion of studies with null findings conducted by the authors, but it also gives credibility to such null findings by virtue of its increased statistical power originating from data pooling. Also, it allows to settle controversies arising from conflicting claims. In that spirit, the current paper can be regarded as a *single-project meta-analysis*, namely, a meta-analysis of stand-alone experiments conducted by the same research group to summarize and extend the project results. As such, a single-project meta-analysis shares all of the above-mentioned benefits, but at the same time departs from McShane & Böckenholt (2017) and Goh et al. (2016)'s approaches to the extent that it performs IPD meta-regressions, thereby spawning an independent manuscript and pursuing additional goals such as addressing questions not posed by the included studies. In any case, both single-paper and single-project meta-analyses can be defined as *internal meta-analyses* according to a classification by data source (Marini & Ulivieri, 2024). Given that internal meta-analyses do not aim to systematically summarize findings from an entire literature, in this manuscript we refrain from evaluating publication bias in line with related guidelines (Goh et al., 2016). In general, Irsova et al. (2024) find this decision defensible whenever IPD are combined.

We find that competition between public goods implies massive coordination problems that on average originate from fewer contributions and result in lower earnings. This general result adds to a host of recent studies that inquire whether competing charities are substitute for each other (Filiz-Ozbay & Uler, 2019; Krieg & Samek, 2017; Meer, 2017; Reinstein, 2011; Schmitz, 2021). In the

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Table 1 Included studies

Study	Treatm.	Obs.	Subj.	Females	Groups	Country
CCV - Corazzini et al. (2015)	7	4,032	336	49%	84	Italy
CCR - Corazzini et al. (2020)	6	5,184	432	44%	108	Italy
ACFR - Abraham et al. (2023)	9	5,040	420	54%	105	Czechia
CCLR - Corazzini et al. (2024)	4	2,880	240	58%	60	Italy

For each study the columns report number of treatments, number of observations, number of subjects, relative frequencies for gender, number of groups, and country where the experiment takes place.

presence of multiple public goods, one of the effective coordination devices turns out to be the existence of a single contribution option that is more profitable than the alternatives. This outcome tallies with a line of research showing that, when it comes to equilibrium selection in games, groups tend to focus on the payoff-dominant option even when the latter does not correspond to the risk-dominance prediction (Février & Linnemer, 2006; Gold & Colman, 2020; Harsanyi & Selten, 1988; Schmidt et al., 2003). Moreover, we observe an inverted U-shaped trend in the successful provision of public goods, offering evidence for learning as a coordination device peculiar to the multiple-public-good framework. We also come to the conclusion that the effective coordination devices do not leverage greater contributions to solve the coordination dilemma, but they do generate higher earnings. Conversely, risk tolerance does not pay off and decreases individual earnings. Finally, in line with studies showing its effectiveness in comparable settings (Butera & Houser, 2018; Fernández Domingos et al., 2022; Hamman et al., 2011; Kocher et al., 2018), delegation proves to be a sound device for reducing the risk of miscoordination as long as the delegate is formally obliged to pass along a high enough percentage of the transferred resources. Women delegate less than men, thereby preferring direct contributions. This interesting result is consistent with recent meta-analytic evidence of gender differences in trust games, where men are found to be more trusting than women (Van Den Akker et al., 2020).

2. Basic framework and dataset

2.1. Basic framework

As shown in Table 1, our investigation pools 17,136 observations at the individual level from four experiments that are part of the same project and model charitable giving as individual contributions to N threshold public goods indexed $n \in \{1, \ldots, N\}$. This framework aims to reproduce fundraising scenarios where multiple charities indistinguishable from each other compete for limited donor contributions. Therefore, not only do participants have to contribute enough to achieve the threshold, but they also need to choose where to direct their contributions, thereby facing an increased risk of miscoordination.

In each of these studies, J participants are divided into unchanging 4-person groups, whose members are indexed $j \in \{1, \ldots, 4\}$ and play the game throughout 12 sequential rounds. In every round, each of the subjects is endowed with $y_j > 0$ tokens and is asked to independently split the initial endowment between a private account and N collective accounts (i.e., public goods), with $c_j \in [0, y_j]$ being the total contributions made by subject j to the collective accounts. The private account pays an individual profit of 2 points per token assigned, whereas each of the collective accounts potentially benefits the whole group and returns no points, if the tokens therein do not reach the threshold τ. Otherwise, each group member earns one point for every token therein (regardless of who contributes) plus a bonus $b_{j,n}$ that captures efficiency and makes all the collective accounts payoff-dominant as compared with the private account. Unless noted otherwise, (i) the individual endowment is the same across subjects, (ii) the threshold τ is set to 60% of the sum of individual endowments, and (iii) the bonus $b_{j,n}$ is the same for every player j and every public good n. These

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conditions imply that, while each group can fund at most one public good at its threshold, player j is unable to do it unilaterally and unwilling to contribute to a collective account unless she expects others to contribute to the same public good.[2]

Let $C_n = \sum_{j=1}^{4} c_{j,n}$ and $c_{j,n} \geq 0$ indicate the group contributions to collective account n and the contributions made by subject j to collective account n, respectively. As a result, the individual benefit $B_{j,n}$ associated with each public good n is as follows:

$$B_{j,n}(C_n) = \begin{cases} 0 & \text{when} \quad C_n < \tau \\ C_n + b_{j,n} & \text{when} \quad C_n \geq \tau \end{cases}$$

whereas the payoff u_j earned by player j in each round amounts to:

$$u_j(c_j) = 2\left(y_j - \sum_{n=1}^{N} c_{j,n}\right) + \sum_{n=1}^{N} B_{j,n}(C_n)$$

At the end of each round, players are informed of the group contributions received by each collective account.

2.2. Outcome variables

At this point, we define the following three outcome variables:

- *Coordination*, a group-level dummy equal to 1 if the threshold is reached on at least one public good.
- *Rel_contributions*, the sum of individual contributions to all public goods divided by the initial endowment (i.e., c_j/y_j).
- *Rel_earnings*, the individual earnings divided by the initial endowment (i.e., u_j/y_j).

2.3. Independent variables

We now code a battery of independent variables that might represent coordination devices or generally influence coordination, contributions, and earnings. Such covariates are manipulated in the four included studies as shown in Table A1 in Appendix A.

2.3.1. Number of public goods

Typically, the threshold of a given collective account can be achieved only in case the public good is able to collect donations from multiple players, entailing a coordination problem that has been long examined in the literature on single threshold public goods. Importantly, the coordination problem intensifies as the number of public goods increases, since now the players also have to coordinate contributions on the same collective account. Hence, the higher the number of available contribution options, the higher the risk of contributing to a public good that eventually fails. CCV show that the presence of multiple public goods per se reduces the coordination rate as compared with the single-public-good scenario, in the absence of coordination devices. The authors also point out that the lower fundraising success is caused by lower individual contributions and results in lower earnings. Accordingly, we use a dummy variable *Single_PG* equal to 1 in case a single public good is available, with the reference category being the case of four equally efficient contribution options. We hypothesize a positive relationship between *Single_PG* and the three outcome variables. We then use another dummy *Dominated_PG* equal to 1 if the number of public goods is greater than four, which

[2]This applies except for two treatments in CCV that relax the budget constraint by lowering the threshold from 60% to 15% of the sum of individual endowments (see Subsection 2.3.2).

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in our dataset only occurs due to the addition of collective accounts with lower bonus. This dummy is therefore just a control.

2.3.2. Non-binding budget constraint

Two treatments in CCV relax the budget constraint by decreasing the threshold from 60% to 15% of the group endowment, implying that every player can afford to fund one public good by herself. Given that in this condition the coordination problem no longer exists, we view the dummy *No_constraint* as a control and expect it to be associated with a higher provision rate.

2.3.3. Bonus salience

As long as the bonus remains constant across public goods, all collective accounts are payoff-dominant and equally efficient, leaving no room for coordination. Relatedly, in separate treatments CCV test the performance of two coordination devices that consist in making salient one of the collective accounts through bonus manipulation. In the former case, one of the public goods stands out on its merits by offering a higher bonus. In the latter case, a lower bonus distinguishes one of the collective accounts. In line with the findings of CCV, our prior beliefs are as follows: (i) the presence of a single more efficient public good (i.e., dummy *1PG_ME*) boosts contributions, coordination, and earnings; (ii) the presence of a single less efficient public good (i.e., dummy *1PG_LE*) has no impact on the three outcome variables.

2.3.4. Random signal

CCV also examine whether a reliable coordination device can be represented by a non-merit-based signal which is unrelated to efficiency considerations. In this case, the computer randomly recommends one of the otherwise identical public goods by means of a group-level message displayed on the players' screens prior to the contribution stage. Whenever salience is obtained in this fashion, our dummy *R_signal* takes the value 1. However, there is only mild evidence that this manipulation increases coordination.

2.3.5. Delegation

CCR and ACFR study delegation as a coordination device by adding an initial stage to the basic framework of the game. Essentially, in each round one of the group members is randomly appointed as the intermediary to whom the other players can individually decide to transfer any number of tokens between 0 and y_j. In the second stage, all four group members allocate funds to private and collective accounts just as they do in the game without delegation, except that now their endowments are updated on the basis of the first-stage transfers. In particular, by means of a destination rule the two aforementioned studies manipulate the percentage of the transfers that the delegated player is obliged to pass along to the collective accounts. Accordingly, the four treatment-level dummies *Deleg0*, *Deleg20*, *Deleg80*, and *Deleg100* take value 1 in our dataset if the delegate is required to contribute 0%, 20%, 80%, or the 100% of the transferred resources to the public goods, respectively, with the reference category being the game without delegation.[3] In line with previous evidence, we expect delegation to be an effective coordination device provided that the level of the destination rule is high enough to protect non-delegated players from expropriation by the intermediary. Nevertheless, ACFR also find that the benefits of a high destination rule on coordination, contributions, and earnings are wiped out in case it is common knowledge that only the intermediary is to incur unavoidable sunk overhead costs tied to her function. Such destructive effects arise even when the overheads are of negligible size (i.e., one-fifth of the original costs). Therefore, we control for the presence of sunk

[3] Alternatively, we code a continuous variable *Dest_rule* for the size of the destination rule, along with two individual-level dummies *Delegate* and *Non-delegate* denoting the type of player. *Standard* is the omitted type that characterizes players in the game without delegation.

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overhead costs through the treatment-level dummies *High_overheads* and *Low_overheads*, with the omitted category being the case of *No_overheads*.

2.3.6. Donor heterogeneity

CCLR incorporate donor heterogeneity into the basic framework by means of two separate treatments that manipulate endowments and preferences, respectively. In the former case, the design imposes four different wealth levels within group, each level being randomly assigned to one of the subjects at the beginning of the experiment. Importantly, the same initial endowment characterizes player *j* throughout the 12 rounds, and allows her to contribute at least an equal share of the tokens required to achieve the threshold. In the latter case, the group members exhibit different favorite public goods, with the favorite collective account featuring a higher bonus for the duration of the game. As pointed out in CCLR, both types of heterogeneity potentially hinder coordination, contributions, and earnings, since they increase complexity of the donation environment without introducing any obvious coordination device. Relatedly, we control for confounders by using two dummy variables *Het_endow* and *Het_pref*, as well as their interaction.

2.3.7. Personal characteristics

The four included studies incorporate heterogeneous post-experimental questionnaires whose information remains largely unexploited. In detail, only three variables coding gender (i.e., a dummy *Female*), *Age*, and general *Risk_attitude* (Dohmen et al., 2011) are shared by the four questionnaires. While the included studies rely on samples of students and accordingly *Age* is of little importance in our dataset (median = 22), the way gender and risk attitudes impact cooperative behavior is still under debate (Dal Bó & Fréchette, 2018) and a deeper understanding thereof can help better characterize the decision to contribute in multiple threshold public goods games. In line with recent meta-analytic evidence against gender differences in cooperation (Spadaro et al., 2023), we expect men and women to cooperate to a similar extent in our framework. At the same time, given the increased risk of miscoordination in this setting, we have the prior belief that donations are predicted by self-reported *Risk_attitude*, which ranges from 0 ("not willing at all to take risks") to 10 ("very willing to take risks"). We occasionally dichotomize this variable, using a dummy *Risk-lover* equal to 1 if *Risk_attitude* is strictly greater than 5.

2.3.8. Learning

Given the complexity of the multiple-public-good environment, the learning process plays a crucial role in improving coordination, in that subjects need learn to use treatment-specific coordination devices or simply their past contributions as signals. Indeed, in the absence of other coordination devices, players might use contributions in order to signal to the other group members the collective account to opt for in the following round, thereby promoting coordination. Even though it might be tempting to predict a positive relationship between learning process and coordination, the four included studies offer mixed evidence that ranges from a positive link (CCV and CCLR) to a negative link (CCR) to null findings (ACFR), as shown in Figure A1 in Appendix A. Given the sensitivity of this variable even to minor design variations, our meta-analysis can contribute substantially to the solution of the puzzle and draw general conclusions. We study the role of learning through a linear time *Trend* that starts from 0, and its square to detect a possible non-linear relationship. We occasionally use round dummies as an alternative.

2.3.9. Reshuffling

As previously indicated by the dummy *Dominated_PG*, at times the contribution options feature multiple levels of the bonus without any of the collective accounts being salient. For instance, ACFR consider both efficient and inefficient public goods (i.e., two bonus levels), where either category in turn consists of several collective accounts. In this context the authors randomly reselect the efficient

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public goods in rounds 5 and 9, thus deliberately hampering learning-based coordination through a *Reshuffling* of the most profitable options. In this case, we use a binary variable equal to 1 in rounds 5 and 9 only.

3. Analysis and results

Distinguishing between two levels of analysis, Table 2 summarizes the three outcome variables and highlights that the average *Coordination* (M = 0.564), *Rel_contributions* (M = 0.532), and *Rel_earnings* (M = 2.839) in the single-public-good scenario are higher than those in the presence of multiple collective accounts (M = 0.487, M = 0.478, and M = 2.565, respectively).[4]

LOWESS smoothers in Figure 1 indicate that, interestingly, while donations follow a similar declining trend in both settings, differences emerge when it comes to successful coordination and resulting earnings. On the one hand, decreasing contributions are associated with lower coordination rates and earnings when only one collective account is available, reflecting common findings from the single-public-good literature. On the other hand, in the presence of multiple public goods we observe an inverted U-shaped trend in coordination rates and individual earnings that suggests learning as a potential coordination device.

As to the other variables categorized as coordination devices in Table 2, one preliminary remark is that *1PG_ME* (M = 0.806) and *R_signal* (M = 0.753) on average perform better than *1PG_LE* (M = 0.375) and *Delegation* (M = 0.429). Figure A2 in Appendix A provides a few additional insights. First, the presence of a single less efficient public good is arguably not even perceived as a coordination device, since the threshold is never achieved in round 1 and repeated interactions are necessary to develop coordination in this condition. Second, the performance of the random signal visibly deteriorates in case every player can afford to fund one collective account by herself. Third, delegation is increasingly effective as the intermediaries face more restrictions on the destination of the transferred resources, but performs poorly in case the delegates are to bear sunk costs.

To examine statistical significance of these initial insights, in Table 3 we perform multilevel regression models with clustering at both the group and individual level. Following best practices (Borenstein et al., 2009), we include study dummies as covariates to preserve the identity of each study and capture the effect of variables (e.g., cross-cultural differences, online vs lab experiments, exchange rate) that are not coded due to insufficient variation and multicollinearity issues.

Column (1) implements a multilevel probit model to evaluate the relative performance of coordination devices while controlling for confounders. First and foremost, the availability of a single contribution option increases the probability of successful coordination by 33.4% ($p = 0.003$) as compared with the case of four equally efficient public goods, revealing the negative effect of multiplicity on coordination. In addition, Figure 2 shows that the marginal effects of all the round dummies (except for *Round 12* with $p = 0.084$) are positive and significant at the 1% level, highlighting the role of learning in facilitating convergence of donations to the same collective account. There is also evidence for the inverted U-shaped relationship between learning and coordination if we replace the round dummies in model (1) with a linear time *Trend* and its square, whose effects are significantly positive and negative, respectively ($p < 0.001$ in both cases). By using the delta method (Moffatt, 2015) we estimate the number of interactions maximizing the probability of coordination to be 5.818, that is, approximately half of the duration of the experimental session. Another highly powerful coordination device turns out to be the presence of a single more efficient public good, which increases the probability of successful provision by 29.0% ($p = 0.010$). Delegation significantly promotes the chances of coordination (+21.7% and +17.2%) only if a destination rule formally requires the intermediary

[4]Table A2 in Appendix A breaks down coordination rates by treatment.

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Table 2 Summary statistics

	Group level		Individual level		
	Obs. (%)	Coord.	Obs. (%)	Rel_contr	Rel_earn
Overall	4,284 (100)	0.501	17,136 (100)	0.488	2.616
Framework					
Multiple_PG	3,492 (81.5)	0.487	13,968 (81.5)	0.478	2.565
Single_PG	792 (18.5)	0.564	3,168 (18.5)	0.532	2.839
Coordination devices					
1PG_ME	144 (3.4)	0.806	576 (3.4)	0.657	3.412
1PG_LE	144 (3.4)	0.375	576 (3.4)	0.494	2.368
R_signal	288 (6.7)	0.753	1,152 (6.7)	0.501	2.870
Delegation	2,124 (49.5)	0.429	8,496 (49.5)	0.430	2.489
Other	1,584 (37.0)	0.535	6,336 (37.0)	0.548	2.690
Personal characteristics					
Female	–	–	8,628 (50.4)	0.491	2.592
Male	–	–	8,508 (49.6)	0.485	2.640
Risk-lover	–	–	8,280 (48.3)	0.511	2.594
Risk-averse	–	–	8,856 (51.7)	0.467	2.636
Delegate	–	–	2,124 (12.4)	1.357	2.678
Non-delegate	–	–	6,372 (37.2)	0.121	2.425
Standard	–	–	8,640 (50.4)	0.545	2.741
Controls					
High_overheads	576 (13.5)	0.286	2,304 (13.5)	0.365	2.036
Low_overheads	96 (2.2)	0.333	384 (2.2)	0.408	2.365
No_overheads	3,612 (84.3)	0.540	14,448 (84.3)	0.510	2.715
No_constraint	288 (6.7)	0.823	1,152 (6.7)	0.445	2.746
Constraint	3,996 (93.3)	0.477	15,984 (93.3)	0.492	2.606
Het_endow	360 (8.4)	0.553	1,440 (8.4)	0.596	2.894
Hom_endow	3,924 (91.6)	0.496	15,696 (91.6)	0.479	2.590
Het_pref	360 (8.4)	0.456	1,440 (8.4)	0.571	2.519
Hom_pref	3,924 (91.6)	0.505	15,696 (91.6)	0.481	2.625
Reshuffling	318 (7.4)	0.340	1,272 (7.4)	0.378	2.265
No_reshuffling	3,966 (92.6)	0.514	15,864 (92.6)	0.497	2.644

The group-level columns report absolute (relative) frequencies and means for *Coordination*, whereas the individual-level columns report absolute (relative) frequencies, means for *Rel_contributions* and *Rel_earnings*. *Multiple_PG* is a dummy that equals 1 if more than one collective account is available. *Delegation* is a dummy that takes value 1 if the game features the delegation phase.

to pass 80% or the totality of the transfers along to the collective accounts ($p = 0.020$ and $p = 0.008$, respectively). Indeed, in the absence of a destination rule delegation can even hamper coordination ($p = 0.042$). Other potential coordination devices such as *1PG_LE* and *R_signal* do not accomplish the goal. Linear restriction tests show that the marginal effects of the effective coordination devices do not significantly differ from each other, nor do they differ from the marginal effect of *Single_PG*. In sum, the effective coordination devices are able to offset the perils of the multiple-public-good framework represented by miscoordination.

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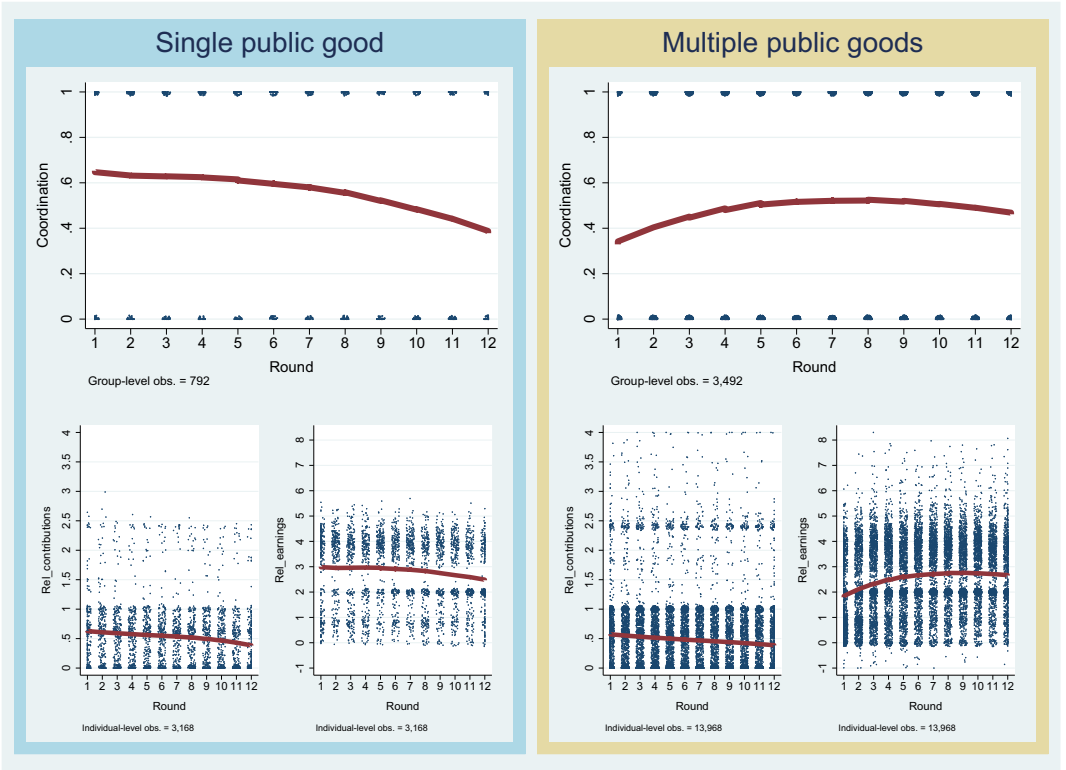


Fig. 1 Time trends of coordination, contributions, and earnings

Result 1. *Equally effective coordination devices in a multiple-public-good environment are* (i) *the presence of a single contribution option that is more profitable than the alternatives,* (ii) *learning, and* (iii) *delegation associated with a destination rule whose level is at least 80%, since they all significantly increase the chances of successful public good provision.*

Column (2) analyzes donations through a multilevel one-limit tobit model.[5] We find that, in addition to solving the coordination dilemma, the availability of a single public good also boosts contributions ($p = 0.041$). In other words, the multiple-public-good environment is associated not only with increased risk of miscoordination, but also with lower contributions. Moreover, the effective coordination devices do not leverage greater contributions to solve the coordination dilemma. Rather, they work in spite of the negative donation trend ($p < 0.001$), and delegation can even decrease contributions if the destination rule is absent ($p < 0.001$) or equal to 20% ($p = 0.021$). Risk tolerance increases overall donations ($p < 0.001$) and women contribute significantly more than men ($p = 0.001$). To further explore the mechanics of delegation, in column (3) we include only observations from non-delegates and treatments implementing delegation, and we estimate a multilevel two-limit tobit model with *Rel_transfers* as dependent variable, namely, the individual amount of tokens transferred to the delegate divided by the initial endowment. The negative significant coefficient of the covariate *Single_PG* ($p = 0.031$) points out that delegation becomes a less and less popular fundraising channel as the risk of miscoordination decreases. Its use follows the same declining trend as direct contributions ($p < 0.001$). In the presence of the two most restrictive destination rules (i.e.,

[5]Figure A3 and Figure A4 in Appendix A report distributions of the outcome variables.

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Table 3 Multilevel regression models

	Coordination		*Rel_contributions*		*Rel_transfers*		*Rel_earnings*	
	(1) MP		(2) M1LT		(3) M2LT		(4) MME	
Variable	M. Eff	(St. E.)	Coeff.	(St. E.)	Coeff.	(St. E.)	Coeff.	(St. E.)
Framework								
Single_PG	0.334***	(0.113)	0.328**	(0.160)	−0.155**	(0.072)	0.756***	(0.277)
Coord. devices								
Round dummies	Yes		No		No		No	
Trend			−0.030***	(0.007)	−0.039***	(0.005)	0.237***	(0.010)
Trend^2			$4.7e^{-4}$	$(6.2e^{-4})$	0.001**	$(4.3e^{-4})$	−0.017***	(0.001)
1PG_ME	0.290***	(0.112)	0.291*	(0.160)			0.710**	(0.277)
1PG_LE	−0.100	(0.112)	−0.010	(0.161)			−0.350	(0.277)
R_signal	0.131	(0.086)	0.108	(0.121)			0.198	(0.209)
Deleg0	−0.133**	(0.065)	−0.479***	(0.095)				
Deleg20	−0.014	(0.095)	−0.315**	(0.137)	0.153*	(0.079)		
Deleg80	0.217**	(0.093)	−0.132	(0.135)	0.346***	(0.078)		
Deleg100	0.172***	(0.065)	−0.010	(0.095)	0.428***	(0.057)		
Dest_rule							0.642***	(0.125)
Personal ch.								
Delegate							−0.043	(0.162)
Non-delegate							−0.298*	(0.161)
Female			0.076**	(0.023)	−0.066**	(0.026)	0.044	(0.028)
Age			0.004	(0.004)	0.001	(0.005)	−0.004	(0.004)
Risk_attitude			0.025***	(0.005)	0.014**	(0.006)	−0.024***	(0.006)
Controls								
High_overheads	−0.204***	(0.057)	−0.132	(0.086)	−0.233***	(0.062)	−0.655***	(0.147)
Study dummies	Yes		Yes		Yes		Yes	
Other controls	Yes		Yes		Yes		Yes	
Constant			0.240*	(0.142)	0.230*	(0.121)	2.333***	(0.216)
Wald χ^2	221.710***		526.580***		566.320***		966.360***	
No. of obs.	4,284		17,136		6,372		17,136	
No. of groups	357		357		177		357	

(1): marginal effects from multilevel probit (MP) model, with standard errors clustered at the group level in parentheses. (2): coefficient estimates from multilevel one-limit tobit (M1LT) model, with lower limit 0 and standard errors clustered at both the group and the individual level in parentheses. (3): coefficient estimates from multilevel two-limit tobit (M2LT) model, with lower limit 0, upper limit 1, and standard errors clustered at both the group and the individual level in parentheses. The latter model includes only observations from non-delegates and treatments implementing delegation. (4) coefficient estimates from multilevel mixed-effects (MME) model, with standard errors clustered at both the group and the individual level in parentheses. The label "Other controls" includes *Dominated_PG*, *No_constraint*, *Low_overheads*, *Reshuffling*, *Het_endow*, *Het_pref*, and the interaction term between the latter two variables.
***p-value < 0.01.
**p-value < 0.05.
*p-value < 0.10.

80% and 100%) non-delegates anticipate a minor risk of expropriation by the intermediary, thus raising transfers by 34.6% and 42.8% of their initial endowment, respectively ($p < 0.001$ in both cases). On the contrary, overheads appear to have the opposite effect ($p < 0.001$). Also, risk-lover donors appear more willing to bear the risk of expropriation and transfer tokens to the delegate ($p = 0.026$).

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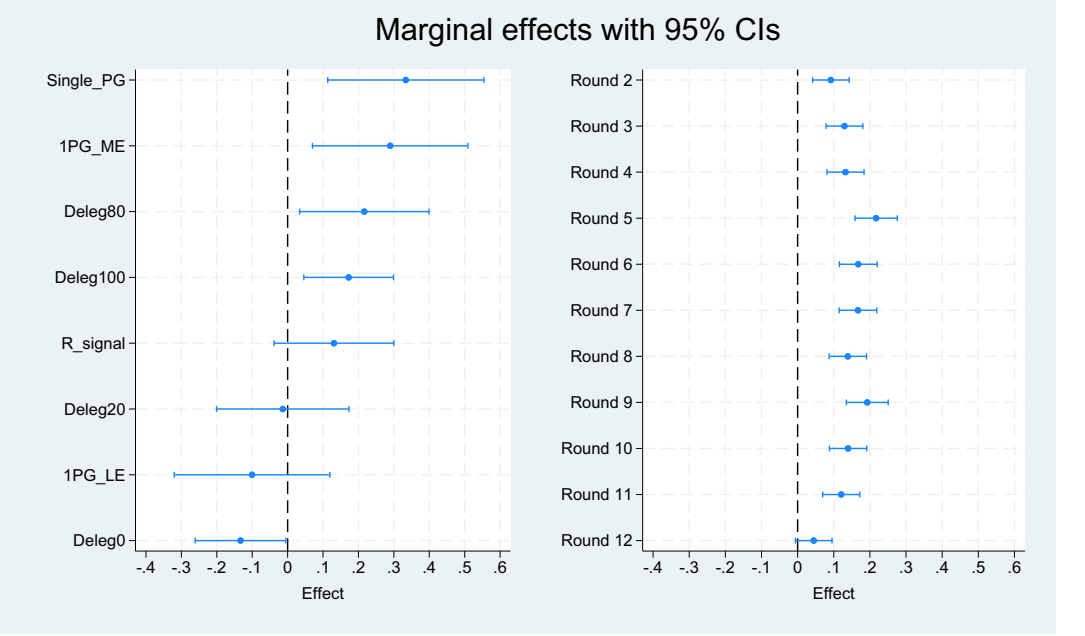


Fig. 2 Comparing marginal effects

In any case, the most interesting result of model (3) is that women delegate less than men ($p = 0.011$), preferring direct contributions.[6] Column (4) investigates the implications for the individual earnings by means of a multilevel mixed-effects model. Since the collective accounts are payoff-dominant, in general it is unsurprising that greater chances to successfully fund a public good correspond to higher individual earnings. We indeed observe that the effective coordination devices generate higher individual profits. In addition, it turns out that being risk-lover does not pay off ($p < 0.001$), leading to significantly waste monetary resources.

Result 2. *The effective coordination devices do not leverage greater contributions to solve the coordination dilemma, but do generate higher individual earnings.*

Result 3. *As to personal characteristics, (i) risk tolerance increases overall donations and transfers, but decreases individual earnings; (ii) women delegate less than men, thereby preferring direct contributions.*

To sum up, Table A4 in Appendix A shows how these results accomplish the two goals of our meta-study.

4. Discussion and conclusions

Meta-analyzing individual participant data, we find that competition between public goods implies massive coordination problems that on average originate from fewer contributions and result in lower earnings. This general result adds to a host of recent studies that inquire whether competing charities are substitutes for each other (Filiz-Ozbay & Uler, 2019; Krieg & Samek, 2017; Meer,

[6]Table A3 in Appendix A clarifies that gender differences in delegation are so strong that they arguably drive those in cooperation, given that the latter vanish ($p = 0.147$) once we conduct regressions including only treatments without delegation (column (2a)).

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2017; Reinstein, 2011; Schmitz, 2021). A possible explanation is that players are fully rational and accordingly anticipate the increased risk of miscoordination, thereby reducing their donations. Indeed, subjects' risk tolerance is positively associated with their contributions, as risk-lovers are more willing to bear the increased risk of miscoordination typical of this framework. In the presence of multiple public goods, one of the effective coordination devices turns out to be the existence of a single contribution option that is more profitable than the alternatives. This outcome tallies with a line of research showing that, when it comes to equilibrium selection in games, groups tend to focus on the payoff-dominant option even when the latter does not correspond to the risk-dominance prediction (Février & Linnemer, 2006; Gold & Colman, 2020; Harsanyi & Selten, 1988; Schmidt et al., 2003). Consequently, competing charities should seek to stand out on their merits by improving features that might be valued by donors, such as transparency and alignment between donors' expectations and charities' actions. Moreover, we observe an inverted U-shaped trend in the successful provision of public goods, offering evidence for learning as a coordination device peculiar to the multiple-public-good framework. This may stem from the combination of an initial learning phase required by the complexity of the framework and, once coordination is achieved, a decline in contributions similar to that one typically observed in the single-public-good literature (Chaudhuri, 2011; Croson & Marks, 2000; Gächter & Thöni, 2005; Marini et al., 2020). We also come to the conclusion that the effective coordination devices do not leverage greater contributions to solve the coordination dilemma, but they do generate higher earnings. Conversely, risk tolerance does not pay off and decreases individual earnings. Finally, in line with studies showing its effectiveness in comparable settings (Butera & Houser, 2018; Fernández Domingos et al., 2022; Hamman et al., 2011; Kocher et al., 2018), delegation proves to be a sound device for reducing the risk of miscoordination as long as the delegate is formally obliged to pass along a high enough percentage of the transferred resources. Women delegate less than men, thereby preferring direct contributions. This interesting result is consistent with recent meta-analytic evidence of gender differences in trust games, where men are found to be more trusting than women (Van Den Akker et al., 2020). Indeed, in our framework the act of delegating involves an element of trust and the willingness to be vulnerable to the intermediary's adverse behavior. Given that this finding emerges while risk attitude is kept constant, we propose an alternative explanation: although delegation can be viewed as both agentic and communal, women tend to associate it with agency and negative emotions more than do men, shying away from gender-role incongruent behaviors (Akinola et al., 2018). If that were the case, reframing delegation as communal would be a sound intervention to promote greater uptake of this coordination device on the part of women. Even so, we also emphasize that subjects are less willing to transfer funds when the delegate is to incur administrative and fundraising costs tied to the function of intermediation, consistent with an extensive body of research documenting donors' overhead aversion (Bowman, 2006; Gneezy et al., 2014; Meer, 2014; Portillo & Stinn, 2018). To fully exploit the advantages of delegation, it would therefore be advisable for intermediaries to use initial donations from major contributors for covering overhead costs, in such a way as to subsequently offer prospective donors an overhead-free donation opportunity (Gneezy et al., 2014).

In conclusion, we believe that further research should clarify the reasons behind overhead aversion, at the same time testing sustainable solutions. Academic efforts could also be directed toward the temporal dimension, to study whether sequential giving can act as a coordination device, as well as to investigate how donors use past contributions to develop coordination in the following interactions. We warmly support broader use of single-project meta-analyses within the experimental community, given their clear benefits for summarizing and extending the project results. Last but not least, we encourage scholars to delve into cross-national differences in charitable giving, considering the insufficient variation in our dataset (only two countries involved) and the well-established role played by cultural factors and economic development in this respect (Cai et al., 2022; Kemmelmeier et al., 2006).

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Competing interests. The authors declare that they have no relevant material or financial competing interests that relate to the research described in this paper.

References

Abraham, D., Corazzini, L., Fišar, M., & Reggiani, T. (2023). Coordinating donations via an intermediary: The destructive effect of a sunk overhead cost. *Journal of Economic Behavior & Organization*, *211*, 287–304.

Akinola, M., Martin, A. E., & Phillips, K. W. (2018). To delegate or not to delegate: Gender differences in affective associations and behavioral responses to delegation. *Academy of Management Journal*, *61*(4), 1467–1491.

Andreoni, J. (2006). Philanthropy. *Handbook of the Economics of Giving, Altruism and Reciprocity*, *2*, 1201–1269.

Bekkers, R., & Wiepking, P. (2011). A literature review of empirical studies of philanthropy: Eight mechanisms that drive charitable giving. *Nonprofit and Voluntary Sector Quarterly*, *40*(5), 924–973.

Borenstein, M., Hedges, L. V., Higgins, J. P., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. John Wiley & Sons.

Bowman, W. (2006). Should donors care about overhead costs? Do they care?. *Nonprofit and Voluntary Sector Quarterly*, *35*(2), 288–310.

Butera, L., & Houser, D. (2018). Delegating altruism: Toward an understanding of agency in charitable giving. *Journal of Economic Behavior & Organization*, *155*, 99–109.

Cai, M., Caskey, G. W., Cowen, N., Murtazashvili, I., Murtazashvili, J. B., & Salahodjaev, R. (2022). Individualism, economic freedom, and charitable giving. *Journal of Economic Behavior & Organization*, *200*, 868–884.

Chaudhuri, A. (2011). Sustaining cooperation in laboratory public goods experiments: A selective survey of the literature. *Experimental Economics*, *14*, 47–83.

Corazzini, L., Cotton, C., & Reggiani, T. (2020). Delegation and coordination with multiple threshold public goods: Experimental evidence. *Experimental Economics*, *23*(4), 1030–1068.

Corazzini, L., Cotton, C. S., Longo, E., & Reggiani, T. (2024). Coordinated selection of collective action: Wealthy-interest bias and inequality. *Journal of Public Economics*, *238*, 105172.

Corazzini, L., Cotton, C., & Valbonesi, P. (2015). Donor coordination in project funding: Evidence from a threshold public goods experiment. *Journal of Public Economics*, *128*, 16–29.

Croson, R. T., & Marks, M. B. (2000). Step returns in threshold public goods: A meta-and experimental analysis. *Experimental Economics*, *2*(3), 239–259.

Dal Bó, P., & Fréchette, G. R. (2018). On the determinants of cooperation in infinitely repeated games: A survey. *Journal of Economic Literature*, *56*(1), 60–114.

Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., & Wagner, G. G. (2011). Individual risk attitudes: Measurement, determinants, and behavioral consequences. *Journal of the European Economic Association*, *9*(3), 522–550.

Fernández Domingos, E., Terrucha, I., Suchon, R., Grujić, J., Burguillo, J. C., Santos, F. C., & Lenaerts, T. (2022). Delegation to artificial agents fosters prosocial behaviors in the collective risk dilemma. *Scientific Reports*, *12*(1), 1–12.

Février, P., & Linnemer, L. (2006). Equilibrium selection: payoff or risk dominance?: The case of the "weakest link". *Journal of Economic Behavior & Organization*, *60*(2), 164–181.

Filiz-Ozbay, E., & Uler, N. (2019). Demand for giving to multiple charities: An experimental study. *Journal of the European Economic Association*, *17*(3), 725–753.

Gächter, S., & Thöni, C. (2005). Social learning and voluntary cooperation among like-minded people. *Journal of the European Economic Association*, *3*(2-3), 303–314.

Gneezy, U., Keenan, E. A., & Gneezy, A. (2014). Avoiding overhead aversion in charity. *Science*, *346*(6209), 632–635.

Goh, J. X., Hall, J. A., & Rosenthal, R. (2016). Mini meta-analysis of your own studies: Some arguments on why and a primer on how. *Social and Personality Psychology Compass*, *10*(10), 535–549.

Gold, N., & Colman, A. M. (2020). Team reasoning and the rational choice of payoff-dominant outcomes in games. *Topoi*, *39*(2), 305–316.

Hamman, J. R., Weber, R. A., & Woon, J. (2011). An experimental investigation of electoral delegation and the provision of public goods. *American Journal of Political Science*, *55*(4), 738–752.

https://doi.org/10.1017/esa.2024.4 Published online by Cambridge University Press

Harsanyi, J. C., & Selten, R. (1988). *A General Theory of Equilibrium Selection in games*. The MIT Press.
Hou, J., Eason, C. C., & Zhang, C. (2014). The mediating role of identification with a nonprofit organization in the relationship between competition and charitable behaviors. *Social Behavior and Personality: An International journal*, *42*(6), 1015–1027.
Irsova, Z., Doucouliagos, H., Havranek, T., & Stanley, T. (2024). Meta-analysis of social science research: A practitioner's guide. *Journal of Economic Surveys, 38*(5), 1547–1566.
Kemmelmeier, M., Jambor, E. E., & Letner, J. (2006). Individualism and good works: Cultural variation in giving and volunteering across the united states. *Journal of Cross-Cultural Psychology*, *37*(3), 327–344.
Kocher, M. G., Tan, F., & Yu, J. (2018). Providing global public goods: Electoral delegation and cooperation. *Economic Inquiry*, *56*(1), 381–397.
Krieg, J., & Samek, A. (2017). When charities compete: A laboratory experiment with simultaneous public goods. *Journal of Behavioral and Experimental Economics*, *66*, 40–57.
Kuppuswamy, V., & Bayus, B. L. (2018). A review of crowdfunding research and findings. In P. Golder, & D. Mitra (Eds.), *Handbook of Research on New Product Development*. Edward Elgar Publishing.
Marini, M. M., García-Gallego, A., & Corazzini, L. (2020). Communication in a threshold public goods game under ambiguity. *Applied Economics*, *52*(53), 5821–5842.
Marini, M. M., & Ulivieri, G. (2024). Meta-analyses in Economic Psychology: A sustainable approach to cross-cultural differences. *MUNI ECON Working Paper n. 2024-01. Brno*: *Masaryk University*.
McShane, B. B., & Böckenholt, U. (2017). Single-paper meta-analysis: Benefits for study summary, theory testing, and replicability. *Journal of Consumer Research*, *43*(6), 1048–1063.
Meer, J. (2014). Effects of the price of charitable giving: Evidence from an online crowdfunding platform. *Journal of Economic Behavior & Organization*, *103*, 113–124.
Meer, J. (2017). Does fundraising create new giving?. *Journal of Public Economics*, *145*, 82–93.
Moffatt, P. G. (2015). *Experimetrics: Econometrics for Experimental Economics*. Macmillan International Higher Education.
Portillo, J. E., & Stinn, J. (2018). Overhead aversion: Do some types of overhead matter more than others?. *Journal of Behavioral and Experimental Economics*, *72*, 40–50.
Reinstein, D. A. (2011). Does one charitable contribution come at the expense of another?. *The B.E. Journal of Economic Analysis & Policy*, *11*(1), 40.
Riley, R. D., Lambert, P. C., & Abo-Zaid, G. (2010). Meta-analysis of individual participant data: Rationale, conduct, and reporting. *British Medical Journal*, 340:c221.
Saxton, G. D., & Wang, L. (2014). The social network effect: The determinants of giving through social media. *Nonprofit and Voluntary Sector Quarterly*, *43*(5), 850–868.
Schmidt, D., Shupp, R., Walker, J. M., & Ostrom, E. (2003). Playing safe in coordination games: the roles of risk dominance, payoff dominance, and history of play. *Games and Economic Behavior*, *42*(2), 281–299.
Schmitz, J. (2021). Is charitable giving a zero-sum game? The effect of competition between charities on giving behavior. *Management Science*, *67*(10), 6333–6349.
Spadaro, G., Jin, S., & Balliet, D. (2023). Gender differences in cooperation across 20 societies: A meta-analysis. *Philosophical Transactions of the Royal Society B*, *378*(1868), 20210438.
Van Den Akker, O. R., van Assen, M. A., Van Vugt, M., & Wicherts, J. M. (2020). Sex differences in trust and trustworthiness: A meta-analysis of the trust game and the gift-exchange game. *Journal of Economic Psychology*, *81*, 102329.
Walk, M., Curley, C., & Levine Daniel, J. (2022). Competition is on the rise: To what extent does traditional fundraising performance research apply in competitive environments? *Nonprofit Management and Leadership*, *32*(4), 651–667.

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