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DONOR COORDINATION IN PROJECT FUNDING: EVIDENCE FROM A THRESHOLD PUBLIC GOODS EXPERIMENT

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ABSTRACT. We present results from an experiment with multiple public goods, where each good produces benefits only if total contributions to it reach a minimum threshold. The presence of multiple public goods makes coordination among participants more difficult, discouraging donor participation and decreasing the likelihood of any public good being effectively funded. Applied to the case of fundraising, the results show how overall donations and the number of effectively funded projects may both decrease as the total number of projects vying for funding increases. The analysis considers whether making one of the contribution options salient, either through its merits or by arbitrarily choosing one to feature during the experiment, helps overcome the increased coordination problem. The results have implications for the growing popularity of crowdfunding websites, and suggest the benefits to these sites of helping donors compare and identify the most promising projects.

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1. Introduction

Fundraising can make the difference between success and failure for a new non profit or business venture. Although attracting funding is no guarantee of success, failing to attract funding often guarantees failure. Sometimes, an organization attracts a single individual, who alone provides enough capital to bring the organization through the early stages of development, allowing it to establish itself as a viable venture. Other organizations rely on smaller donations from multiple individuals to raise the level of capital necessary to become a viable, successful project. Such "crowdfunding" has become more prominent in recent years as the internet (including websites Kickstarter.com, IndieGoGo.com and Kiva.org) has made it easier for projects to reach out to a broader set of smaller donors in their fundraising efforts. The popularity of these crowdfunding sites has lead to a surge in the number of projects seeking funding from the public.

In August 2013, there were 3,957 separate projects vying for funding on Kickstarter.com (Lau 2013). This number continues to grow, with 6,802 active projects vying for funding in October 2014. These projects range from charity initiatives designed to help a community, to art exhibitions and films, to the production of innovative consumer products. Potential financial backers visit the website and can select projects to which to pledge funding. A project receives its funding only if the total amount pledged reaches a threshold amount. IndieGoGo.com, which follows a similar model, had 4,348 projects seeking funding in August 2013 (Lau 2013). In a related way, Kiva.org brings together individuals to provide micro-finance loans for small business ventures around the world. Projects remain on the site for up to 30 days, and Kiva passes payments along only to those projects for which pledged contributions reach 100 percent of their funding goal. We counted 5,131 separate projects actively seeking funding on the site.

Although some of the projects on these sites stand out due to a particularly creative project design or some other feature that grabs public attention, most of the projects are similar to a number of other initiatives simultaneously seeking funding. For example, on Kiva.org, there are 40 projects seeking less than $350 in funding to purchase clothes for one-person retail clothing businesses in developing countries. Many of these projects are essentially indistinguishable from one another, with the borrowers asking for similar funds, for similar purposes, and providing similar backstories and information on the site.

The large number of projects simultaneously seeking funding raises a variety of concerns. First, it can lead to an inefficient distribution of donations across projects. Successfully funding a project typically requires contributions from multiple donors. As the number of alternative projects increases, coordination among donors becomes increasingly difficult. This increases the likelihood that a donor pledges her donation to a project which eventually fails, an inefficient allocation of funds. Second, the number of projects can discourage donors from giving in the first place. This may result if fully-rational donors recognize the difficulty in coordinating, and choose not to give due to lower expected payoffs. It may also result if donors suffer from the paradox of choice, which suggests that people are less likely to participate as the number of options to choose between increases, even in the absence of coordination problems (e.g. Schwartz 2004). Together, these concerns suggest that the proliferation of giving options will decrease contributions, and result in the less-efficient allocation of the remaining contributions.

This is a real concern on crowdfunding sites where not all beneficial projects reach their fundraising goals. The portion of listed projects that eventually fail to receive funding was approximately 56 percent on Kickstarter.com, and 33 percent on IndieGoGo.com in August 2013 (Lau 2013). By our own estimates using Kiva.org data, 8 percent of projects on Kiva.org failed to receive funding.[1] Although this represents a much higher success rate than the other sites, failure to attract funding remains a sizeable concern.

Our paper explores how the presence of multiple giving options may affect contributions and fundraising success. We conduct a laboratory experiment involving donors contributing across multiple threshold public goods, which represent projects vying for funding. The analysis compares two treatments: in one, donors choose how much of their endowment to contribute to a single good; in another, donors choose how much of their endowment to contribute to each of four similar goods. Because the four goods in the multiple option treatment are ex ante indistinguishable, there does not exist any coordination device to guide donor choice, clearly increasing how difficult it is for donors to achieve coordination. The increased difficulty in coordination in turn may decrease incentives that donors have to contribute and the probability of project success. Consistent with theoretical predictions, we find significant evidence that going from one to four contribution options significantly decreases the coordination rate and total contributions across all projects. That is, increasing the number of projects vying for funding can not only decrease the probability that any given project succeeds, it can also decrease overall contributions and the expected number of successful projects.

In addition to highlighting potential costs of multiplicity using a treatment with four similar public goods, the analysis explores how the results change when one of the goods stands out compared to the alternatives. In a crowdfunding setting, this may be the case if one of the projects stands out on its merits as being more promising than others. It may also be the case if the expected merits of all projects are identical, but one of the projects is arbitrarily highlighted or featured on the fundraising website or by the media. To analyze these possibilities, we consider two additional treatments, in each of which three of the available public goods are identical, and one additional public good is made salient. Depending on the treatment, the salient good may stand out due to it providing higher potential payments than the other three alternatives, or due to it being featured on the experimental computer screen at the time the donors make a contribution decision.

In the treatment in which one of the options stands out on its merits as offering a higher potential benefit, we find that the contribution pattern is almost identical as in the case in which there is a single contribution option. Increasing the number of contribution options does not increase the donor coordination problem, does not decrease overall funding, and does not decrease the

[1] This represents the average monthly rate between June 2013 and May 2014. Estimates have been computed by using data provided to the authors by Kiva.org.

probability that the efficient option succeeds when the additional options are clearly less efficient than the original. When donors can identify the most promising contribution options, the coordination problem that arises from the presence of multiple options disappears.

In the treatment in which all contribution options are identical, and a non-merit-based signal directs donor attention towards one of them, contributions tend to be higher than in the case with four indistinguishable options, but lower than in the case with a single option or where one of the options stands out as most efficient. Although the differences between contributions in the random signal treatment and the other treatments tends not to be significant, the pattern of contributions consistently suggests that randomly featuring one of the contribution options can help reduce the coordination problem, but does not fully overcome it. Importantly, these results suggests that fundraising sites may be able to alleviate some of the coordination problem by directing donor attention to certain projects, even if such projects are selected randomly from a set of otherwise indistinguishable options. When possible, however, the coordination problem is more effectively overcome when donors can identify the most promising projects. This suggests the importance of individual fundraisers emphasizing the merits of their projects and fundraising websites or organizations featuring projects based on their merits rather than any other (random) feature.

Overall, our results show that salience can help overcome coordination problems and lead to greater efficiency in contributions. This is not to say that making one of the options salient is sufficient to facilitate donor coordination. In an additional treatment, we consider the case in which one contribution option stands out as salient because it is less efficient than three indistinguishable alternatives. Importantly, the less efficient good in this treatment is still efficient enough relative to the alternatives that it would be advantageous for donors as a group to focus on the salient option, where uniqueness makes successful coordination relatively easy to achieve. Despite this, the group tends to ignore the salient option and instead direct contributions to options which offer moderately higher payoffs, but where coordination is significantly more difficult to achieve (due to the multiplicity of indistinguishable options). This suggests that donors as a group may focus on potential payoffs rather than expected payoffs when choosing where to donate. Salience fails as a focal point when the salient option does not also offer one of the maximum potential payoffs, even when payoffs are such that the group would be better off focusing on salience.

The majority of the analysis focuses on treatments in which donor groups cannot afford to fully fund all four contribution options. This is based on the general view in fundraising that there is competition for limited donor contributions. As Walter Sczudlo of the Association for Fundraising Professionals explains for the case of charitable giving, "[the] proliferation of charities is creating a huge competition for donor dollars. There are so many charities now going after so few dollars and it's getting parsed out so finely."[2] In alternative settings, however, limited

[2]This quote and others appears in "Each 501c3 is now" by Todd Cohen in *The Nonprofit Times*, May 1, 2005. Online at http://www.thenonprofittimes.com/article/detail/each-501c3-is-now-2949. Similarly, Paul Light argued, "Too many of the new nonprofits are just too weak to have much chance of moving from the organic stage of nonprofit life up

availability of funds may not be an issue. With this in mind, we conducted another experimental treatment in which donor groups can collectively afford to fund all four public goods, and individual donors can afford to fund entire public goods themselves. In order to compare contributions across treatments, we effectively weaken the budget constraint by reducing the relative thresholds and payoffs associated with the four public goods, while keeping endowments constant. This is similar to splitting the public good in the one-good treatment into four independent sub-projects.[3]

In this alternative treatment, weakening the budget constraints effectively makes it easier to achieve the threshold on any given public good, while at the same time increasing concerns about free riding. We find no evidence that weakening the budget constraint leads to higher contributions. If anything, the opposite is true, with total contributions being lower in this alternative treatment than when the group can fund at most one good.

Taken together, our results show that much of the coordination problem introduced by multiplicity may be eliminated if donor attention is directed towards a single contribution option. However, for this to most effectively facilitate coordination, the highlighted option needs to be perceived by donors as the most promising option. This will be the case if fundraising sites feature projects based on their merits. Randomly selecting options to feature does less to solve the coordination problem, and does nothing in the event that the featured option looks less promising than alternatives.

2. Literature review

Andreoni (2006) provides an overview of the literature on philanthropy and charitable fundraising, where philanthropy is typically modelled as giving to a public good. Like Andreoni (1998), we model charities as threshold public goods, incorporating a contribution threshold to account for the minimum amount of fundraising necessary for a project to succeed. Bagnoli and Lipman (1989) first incorporate a contribution threshold into a model of public goods. Several experimental studies analyze the effects that introducing a threshold has on contributions. Most of the literature focuses on the effects of alternative rebate rules (whether contributions above the threshold generate a return, e.g., Marks and Croson 1998) and refund rules (whether contributions are returned to subjects when the threshold is not reached, e.g., Isaac, Schmidtz and Walker 1989) on total contributions.[4] In contrast, we focus on the effects that increasing the number of

the development curve to intentional action, let alone robustness. There is very little venture capital around for these young ones, and we ought to be very careful about where it gets invested" Light and Light (2006, p59).

[3]In many ways, this treatment better matches the model of Kiva.org, where international microfinance organizations use the website to pursue funding for multiple individual projects, instead of seeking project-independent organization-wide funds. There are many instances on Kiva.org of projects requesting total funding less than a few hundred dollars, and occasionally these are funded by an individual donor.

[4]See also Bagnoli and McKee (1991), Cadsby and Maynes (1999), Coats, Gronberg and Grosskopf (2009) and Spencer et al. (2009).

public goods has on contributions, and leave the refund and rebate conditions fixed throughout all of our treatments.[5]

A handful of theoretical models consider fundraising by multiple charities. In Rose-Ackerman (1982), competition between alternative charities to collect donations causes charities to spend too many resources fundraising. In our paper, we abstract from fundraising efforts and costs; increasing the number of charities may be detrimental for other reasons. Other theoretical papers show how the multiplicity of public goods may lead to mis-coordination between donors, leading them to provide too much funding for some organizations and too little funding for others (Bilodeau 1992, Bilodeau and Slivinski 1997, Ghosh, Karaivanov and Oak 2007). These papers make the point that a donation-distribution organization such as the United Way may help improve coordination, and may lead to more effective funding efforts. In our setting with threshold public goods and a no money back condition, there are more significant costs associated with underfunding. However, we share with this theoretical literature the underlying idea that additional options make coordination more difficult.[6] We are the first experimental paper investigating coordination in a setting of multiple threshold public goods, considering different coordination devices, as well as different budget/threshold sizes.

Despite the relevance of the issue in the real world, the experimental literature has devoted little attention to analyzing how contributions are affected by introducing multiple options. A handful of studies analyze contributions in settings in which subjects are divided into several groups, each facing two linear (i.e. no-threshold) public goods: one local good that gives a return only to group members and one global good that generates a return for all participants of the session. Blackwell and McKee (2003) show that contributions to the global public good positively depend on its per capita return. Interestingly, the authors find that when the per capita return of the global good exceeds that of the group-specific public good, subjects contribute more to the former but do not reduce their contributions to the other good.[7] Moir (2006) considers the effects of lotteries in financing multiple public goods and finds that when the lottery supports the less socially desirable public good, overall efficiency decreases. Bernasconi et al. (2009) show that "unpacking" a linear public good into two identical and indistinguishable parts positively affects contributions.[8] A recent strand of empirical contributions has focussed on the degrees of substitutions among donation activities. By using data from donations at the Catholic Masses, Cairns and Slonim (2011) show that when a second donation collection is announced to participants,

[5]Specifically, we adopt a "no money back" condition and a linear rebate rule, assuming that any contribution is forfeited when the threshold is not reached while contributions above the threshold generate a linear return.

[6]Note that coordination could also be affected by binding budgets, as experimentally highlighted by Seely, Huyck and Battalio (2005).

[7]See also Fellner and Lünser (2008) and Falk, Fishbacher and Gaschter (2013) for related experimental findings.

[8]The authors compare results from a benchmark linear public good game with those observed in a setting with two identical linear public goods associated with the same marginal per capita return used in the benchmark. In both treatments and in every period, subjects were randomly rematched in groups of 4 and endowed with the same number of tokens. They find that contributions in the two linear public good games are significantly higher than those in the one public good game. McCarter, Samek and Sheremeta (2014) study how the effects of unpacking a public good change when subjects interact with same rather than different fellow group members. In support of the conditional-cooperator hypothesis, they find greater cooperation when subjects interact with different group members compared to a setting with partner rematching.

the amount given in the first collection (which is typically used for a different cause) decreases significantly. Shang and Croson (2008) found that total public radio fundraising during one fundraising drive did not influence giving at a later date. By investigating blood donations, e.g. a non monetary volunteer activity, Lacetera, Macis and Slonim (2012, 2014) show that economic (material) incentives can positively affect blood donations over time, and donors substitute supply across locations in response to the size of the incentive at and the number of near by blood drives.[9] Our experimental analysis addresses the issue of contribution and coordination in a laboratory setting with multiple public goods and contribution thresholds.

In our experiment, we study how providing a salient alternative facilitates coordination of contributions over multiple public goods. Starting from Schelling (1960), a large number of papers has documented the positive effect of providing focal points in coordination games.[10] Harsanyi and Selten (1988) develop a theory of equilibrium selection in games, and predict that groups will focus on either payoff dominant outcomes (which correspond to outcomes involving the most efficient public goods in our experiment) or risk dominant outcomes (which corresponds to no contributions in our experiment). The experimental literature generally supports the idea that play will converge to either payoff dominant or risk dominant outcomes, which is consistent with our finding that groups tend to ignore (at least in the long run) public goods that are neither payoff nor risk dominant. Huyck, Battalio and Beil (1990) consider a coordination game with several strictly Pareto-ranked equilibria and show that subjects quickly converges to the risk-dominant (but also payoff-dominated) equilibrium. Similar evidence of convergence to the risk-dominant option is also reported by Huyck, Battalio and Beil (1991), Cachon and Camerer (1996), Bornstein, Gneezy and Nagel (2002), and Blume and Ortmann (2007). Convergence to payoff dominant equilibria is reported in alternative settings by Rankin, Huyck and Battalio (2000), Berninghaus and Ehrhart (1998), Huyck, Cook and Battalio (1997), Schmidt et al. (2003), Clark and Sefton (2001), and Brandts and Cooper (2004, 2006). In summarizing the experimental literature, Devetag and Ortmann (2007) conclude that coordination on efficient equilibria is more likely when the game is repeated many periods, the experiment employs a fixed partner matching protocol, participants are given feedback between periods and the action space is more refined. The existing literature almost exclusively focuses on games with strictly Pareto ranked equilibria, while there are multiple payoff (i.e., Pareto) dominant equilibria in our setting. We find that players tend to focus on payoff dominance, even when the payoff dominant public good is not unique.

[9]In two seminal theoretical contributions, Andreoni (1989, 1990) has argued that the extent of crowding out of charitable behavior depends on how much people are influenced by pure motives rather than impure warm glow motives. Recently, Lilley and Slonim (2014) develop and experimentally test a theoretical model showing that agents are more likely to volunteer in stead of providing monetary donations when they are more motivated by warm glow.

[10]Mehta, Starmer and Sugden (1994) consider a coordination game with salient decision labels and symmetric, constant payoffs. Crawford, Gneezy and Rottenstreich (2008) show that even small differences in payoffs can dramatically limit subjects' attitude to use focal points to coordinate their actions.

3. Experimental design and testable predictions

Our experimental design builds on experiments involving a single threshold public good, e.g. Isaac, Schmidtz and Walker (1989), by including treatments with multiple goods. A threshold public good is often used to represent a charitable organization or fundraising project, for which total funding must reach a minimum threshold before the charity can make a difference or the project can be implemented (e.g., Andreoni 1998). By including multiple public goods, we capture the idea that donors not only choose whether to contribute, but also choose to which causes and organizations to contribute.

Our experiment includes five distinct treatments using a between subject design. We first consider a benchmark setting with only one threshold public good, and then we consider four treatments each with four threshold public goods. In the first treatment, subjects choose how much to contribute, and in the other four treatments they must also choose where to direct their contributions. 48 subjects participated in each treatment, giving us a total of 240 participants across the treatments. The subjects within each treatment were divided into unchanging groups of four, resulting in a total of 12 independent groups per treatment. Each group engaged in a threshold public good contribution game in each of 12 sequential periods, with participants receiving feedback about their group's contributions between periods. We describe the five treatments in detail below.

Single Public Good Treatment. In our benchmark treatment, participants choose how much to contribute to a single threshold public good. We refer to this treatment as 1G, for "one good."

At the beginning of the experiment, each participant is randomly assigned to a group of four participants and is told that the composition of her group will remain unchanged throughout the experiment. In every period, each participant is endowed with a per-period individual endowment of 55 tokens. The participants simultaneously and independently choose how many tokens to contribute to a single threshold public good. Formally, each subject chooses how to divide her 55 tokens between a "private account" from which only the individual contributor receives a benefit, and a "collective account" to which all group members may contribute and which potentially pays a benefit to the entire group. The collective account is a public good, and each subject's allocation decision is equivalent to choosing how much to give to the public good (i.e., the collective account), and how much not to contribute (i.e., her private account).

For each token put into her private account, a subject receives a payment of two points. Each token put into the collective account returns a payment for all group members, but only if the total amount contributed by the group equals at least 132 tokens (corresponding to 60% of the total group endowment) that period. That is, 132 tokens is the contribution "threshold" necessary for the public good to be effective. If the overall number of tokens contributed to the collective account is at least 132, each group member (regardless of who contributed) receives one point for every token contributed into the collective account plus an additional bonus of 30 points.[11] If the

[11]The marginal per capita return to the collective account equals 0.5 meaning that the marginal return to a subject from making a contribution (once the threshold is reached) is half the return from the private account.

total number of tokens contributed by the group to the collective account is lower than 132, then the subjects do not receive any points from the collective account, and any contributions to the account are forfeited.[12] Section 5 considers an alternative treatment relaxing the binding budget constraints.

Multiple Public Goods Treatments. We consider four distinct treatments with four public goods each. In these treatments, denoted 4G_EE, 4G_RS, 4G_1ME and 4G_1LE, participants not only choose how much to contribute, they also choose where to contribute.

In all four treatments, participants divide their per period endowments across a private account and four collective accounts (representing four alternative public goods). The private account is identical to the private account in 1G. In the 4G or "four good" treatments, the four collective accounts are identical to the collective account in 1G along every dimension except for (in some cases) the bonus paid when the threshold is reached. They all have a threshold on 132 tokens, above which they pay one point to each group member for each token contributed. By limiting consideration to differences in bonus payments, comparing the efficiency of the alternative collective accounts is straightforward. The most efficient alternative is the one that pays the highest bonus.

In treatment 4G_EE, all four collective accounts are "equally efficient," each identical to the single collective account in 1G and paying a bonus of 30 points when the threshold is reached. In treatment 4G_1ME, one collective account is identical to the single collective account in 1G, and the three additional collective accounts each offer a lower bonus of 20 points at the threshold. In this case, there is "one more efficient" (denoted "1ME") contribution option within the set of otherwise indistinguishable alternatives. In treatment 4G_1LE, one collective account is identical to the single collective account in 1G, and the three additional collective accounts each offer a higher bonus of 40 points at the threshold. In this case, there is "one less efficient" (denoted "1LE") contribution option within the set of otherwise indistinguishable alternatives. In 4G_1LE and 4G_1ME, we say that one account is "salient" in that it stands out by offering either a lower or a higher expected benefit compared to three non salient alternatives.

Finally, treatment 4G_RS is identical to 4G_EE, except that in 4G_RS, a group-specific "random signal" directs attention to one of the four identical collective accounts. In this treatment, one of the accounts is made salient not by its merits, but by being featured on the computer screen prior to subjects making a contribution decision. The random signal makes one collective account salient without modifying its relative efficiency with respect to the non salient alternatives.

[12]The design incorporates a "no money back" condition, where by contributions below a threshold are lost. This is consistent with much of the threshold public good literature including Isaac, Schmidtz and Walker (1989). The assumption increases the costs of failed coordination on behalf of donors, and likely discourages attempts at coordination compared to a full refund assumption. In a setting of direct charitable giving, the no money back assumption captures the idea that even underfunded and ineffective charities spend money on overhead and administrative costs, and rarely return donations even if their overall budget is not large enough to make an impact. Although crowdfunding sites typically refund donations to unsuccessful projects, the pledged payments are typically tied up until the success or failure of a project becomes certain. In a lab setting, this means that a partial refurn assumption may be most appropriate for capturing the refund delay. Under such an alternative assumption, we would expect donors to be more persistent in their coordination attempts, but for the general effects highlighted in our analysis to remain relevant.

3.1. **Procedures.** Upon their arrival, subjects were randomly assigned to a computer terminal. At the beginning of the experiment, instructions were distributed and read aloud (see the online Supplementary Material for the instructions used in 4G_RS). Before the first period started, subjects were asked to answer sample questions at their terminal. When necessary, answers to the questions were privately checked and explained. At the beginning of each period, the computer showed each subject a number of boxes equal to the total number of private and collective accounts (two in 1G, five in the remaining four treatments). In order to avoid frame effects, the four collective accounts in 4G_EE, 4G_RS, 4G_1ME and 4G_1LE were presented to subjects using neutral geometric names: SQUARE, TRAPEZOID, RECTANGLE, and DIAMOND. Also, subjects in these treatments were told that the order of the boxes of the collective accounts on their screen was randomly determined by the computer in every period, although the shape representing each account did not change between periods. Each of the four boxes of the collective accounts showed the threshold and the size of the corresponding bonus.

As already mentioned, the only difference between 4G_EE and 4G_RS concerns a group specific random signal used in the latter treatment to address group members to one specific collective account. In detail, at the beginning of the experiment in 4G_RS, the computer randomly generates a message that is shown to the four members of a group. The message simply contains a non binding suggestion of contributing to one specific collective account over the four (equally efficient) alternatives.[13]

At the end of every period, each subject was informed about the number of tokens allocated by the group to (each of) the collective account(s), whether the corresponding threshold was reached, and any bonus paid. Additionally, following each period subjects learned the number of points they received from each account and in total. At the end of the experiment, subjects were privately paid using a payment rate of one euro per 100 points. On average, they earned 19.58 euro for sessions lasting about 50 minutes, including the time for instructions. The experiment took place in December 2011, March 2013 and May 2014 in the Bologna Laboratory for Experiments in Social Science (*BLESS*) of the University of Bologna. Participants were mainly undergraduate students and they were recruited using *ORSEE* (Greiner 2004). The experiment was computerized[14] using the $z - Tree$ software (Fischbacher 2007).

3.2. **Theoretical framework.** Consider a contribution game with N public goods, indexed by $n \in \{1, ..., N\} \equiv \mathcal{N}$. There are J players, indexed by $j \in \{1, ..., J\} \equiv \mathcal{J}$, each endowed with a budget $y_j > 0$. The players simultaneously and independently choose contributions to each of the N public goods. Variable $c_{j,n}$ denotes the contribution of player j to good n, where $c_{j,n} \in [0, y_j]$ and $\sum_{n \in \mathcal{N}} c_{j,n} \leq y_j$, $\forall j \in \mathcal{J}$. Let $C_n = \sum_{j \in \mathcal{J}} c_{j,n}$ represent the total contribution to public good n.

[13]The following message was shown to group members: "The collective account suggested to your group is X," where X was randomly chosen by the computer across "square", "rectangle", "diamond" and "trapezoid". Our approach is similar to that undertaken in a linear public good setting by Seely, Huyck and Battalio (2005) in that group members are presented with a non binding suggestion about a possible contribution strategy to follow.

[14]Samples of the screenshots in 4G_1ME and 4G_EE/RS are included in the Supplementary Material available online.

Let $B_n(C_n)$ denote the benefit that public good n provides to *each* player conditional on total contribution C_n, where

$$B_n(C_n) = \begin{cases} 0 & \text{when } C_n < \tau_n, \\ \alpha_n C_n + \beta_n & \text{when } C_n \geq \tau_n. \end{cases} \tag{1}$$

Parameter τ_n allows for *threshold* public goods, which provide benefits only when total contributions exceed a given threshold. We refer to parameter $\alpha_n \in (\frac{1}{J}, 1)$ as the *marginal per capita return* (*MPCR*) and parameter $\beta_n \geq 0$ as the *bonus* assigned to the subjects when the threshold is reached.[15]

The players independently and simultaneously choose how much to contribute to each of the n public goods, then payoffs are realized. The total payout earned by player j is given by:[16]

$$u_j(c) = y_j + \sum_{n \in \mathcal{N}} \left(B_n(C_n) - c_{j,n} \right). \tag{2}$$

This formulation is quite general, and when $\tau_n = 0$ and $\beta_n = 0$ it captures the typical public good environment. Our analysis, however, focuses on the case where both τ_n and β_n are positive. We assume

$$\sum_{j \in \mathcal{J}} \frac{y_j}{2} < \tau_n < \sum_{j \in \mathcal{J}} y_j, \forall n \in \mathcal{N}, \tag{3}$$

which implies that thresholds are sufficiently large that subjects in a group can afford to fund only one of the public goods.[17] We also assume that each subject has a large enough budget to fund a $\frac{1}{J}$th portion of any threshold: $y_j \leq \tau_n / J$ for all $j \in \mathcal{J}$ and $n \in \mathcal{N}$. This final assumption guarantees the existence of the entire set of symmetric equilibria we describe below.

The setting admits a (large) number of symmetric and asymmetric pure-strategy Nash equilibria.[18] There are $N + 1$ symmetric Nash equilibria: one equilibrium in which no contributions are provided to any of the public goods, $c_{j,n} = 0 \ \forall j, n$, and one equilibrium corresponding to each public good n, such that n is fully funded and no other good receives contributions, with $c_{j,n} = \tau_n / J$ and $c_{j,m} = 0 \ \forall j \in \mathcal{J}$ and $\forall m \neq n$. There are also many asymmetric equilibria in which players contribute unequal amounts to the same public good such that total contributions exactly equal the threshold, and contribute nothing to the other $N - 1$ goods. In each of these equilibria, $C_n = \tau_n$ for one $n \in \mathcal{N}$, and $C_m = 0$, $\forall m \neq n$.

Our experimental treatments simplify the general model on a number of dimensions. In each of our experimental treatments, players have identical budgets and public goods share a common

[15] Above the threshold, the public good provides marginal returns as if it were a linear public good. This is in contrast to Bagnoli, Ben-David and McKee (1992) who consider a setting in which multiple thresholds are associated with a single good.

[16] For simplicity, we rescale earnings in such a way one token contributed to a public good (and conditional on the threshold being reached) gives α (utility) points, while one token in the private account generates a return of one (utility) point. Of course, this assumption does not affect the theoretical results as implied by the specific parameters used in our experimental setting.

[17] In the majority of the multiple-public-goods treatments discussed in the paper, groups can afford to collective fund at most one good. We weeken this assumption in Section 5, where we consider an alternative treatment in which budget constraints are sufficiently relaxed that groups may fully fund all goods.

[18] Throughout the paper we focus on pure strategy equilibria. Mixed strategy equilibria also exist.

threshold value and MPCR: $y_j = y$, for all $j \in \mathcal{J}$, and $\tau_n = \tau$ and $\alpha_n = \alpha$ for all $n \in \mathcal{N}$. The only difference comes in terms of the bonus β_n associated with the public goods in the different treatments. The efficiency of a public good is determined solely by its bonus, with public good n being "more efficient" than public good m when $\beta_n > \beta_m$.

When choosing between contributing to a public good and not contributing, players face a tradeoff between risk and potential payoffs. Not contributing is the least risky option given the inherent uncertainty about how much and where other players will choose to donate.[19] However, not contributing tends also to be associated with a lower potential payoff than contributing to (and attempting coordination on) one of the public goods. An equilibrium is said to payoff dominate another outcome when it assigns Pareto superior payoffs to every player (Harsanyi and Selten 1988). Due to the large number of asymmetric solutions, ranking all the equilibria described above in terms of payoff dominance is not possible. However, for our purposes there are two considerations that are worth noticing. First, any equilibrium in which the threshold is reached payoff dominates the "no contribution" equilibrium.[20] Second, consider an equilibrium contribution profile c^* such that $C_n \geq \tau_n$. If public good n is one of the most efficient public goods (i.e., $\beta_n = \max\{\beta_m\}_{m \in \mathcal{N}}$), then this c^* equilibrium payoff dominates any equilibrium involving the same payment profile applied to any other, less efficient public good.

In our experimental treatments, participants repeat a threshold public good contribution game T times with the same partners. The fixed partner matching protocol used in our paper (and in much of the literature) best resemble repeated interactions on a fundraising site, or other settings in which donors choose where to contribute month after month or year after year. It means, however, that a complete theoretical model of our public good framework would need to account for the one shot game being repeated across T periods. When we take into account the dynamic structure of the game, the set of subgame perfect equilibria significantly increases. In all periods but the last, a range of contribution profiles that result in total contributions at or above the threshold are consistent with subgame perfect equilibria. Observing total contributions in excess of the threshold is consistent with equilibrium because subgame perfect strategies can credibly threaten to revert to no contributions in future periods if anyone fails to contribute their share in an earlier period.[21] In the last period, however, the equilibrium profiles of contributions coincide with those of the one-shot game described above.[22] It is worth noting that the considerations

[19]See the discussion of the zero contribution equilibrium versus contribution equilibria in Cadsby and Maynes (1999) and the discussion of *risk dominance* in Harsanyi and Selten (1988). Cadsby and Maynes (1999) explain that for any individual, playing a 0-contribution strategy is less risky compared to attempting coordination on a theshold public good: "The threshold increases the riskiness associated with playing a strategy consistent with a theshold equilibrium since more must be contributed and hence put at risk."

[20]This is guaranteed by (3) and the existence of the bonus parameter.

[21]For example, a subgame perfect equilibrium strategy in the final period of the game, T, may involve contributing τ_n / J, if the group has contributed at least $\widetilde{C}_{T-1}$ to good n in $T-1$, where $\widetilde{C}_{T-1} > \tau_n$ is possible, and contributing nothing in period T otherwise.

[22]Offerman (1997) offers an insightful discussion of learning and strategic adaptation in dynamic settings, including linear and threshold public goods games. See Kreps et al. (1982) for application of the "Tit-for-Tat" equilibrium strategy in finitely repeated prisoners' dilemma.

about payoff dominance made above to compare the no-contribution equilibrium with any of the payoff dominant positive contribution outcome can be easily extended to the dynamic setting.

As in any game with multiple equilibria, there exists a coordination problem among the players. A public good provides a benefit only if participants collectively contribute enough to reach its threshold. Contributing to a public good alone or with too few donations from others results in failure to reach the threshold and payments being forfeited. A player has an incentive to contribute to a public good only if her donation is pivotal in reaching the threshold in the current period, or if her giving in some way facilitates coordination in future periods.

The severity of the coordination problem depends on the number of available public goods that participants view as viable alternatives. If only one public good is viewed as viable, then conditional on the group contributing enough, the contributions are certain to go towards the same (only) public good. This is by default the case in 1G, but may also be the case in a multiple public goods setting if one of the goods stands out as being the only viable option. Compare this to treatments with multiple viable public goods, where successful funding not only requires that each player contributes enough, but also requires that they each contribute to the *same* alternative.

In settings with multiple viable alternatives, it may take a group several periods to successfully fund a public good, even if the group consistently contributes enough to achieve a threshold. This is because it may take several repetitions before contributions converge to the same public good. This means that the availability of multiple public goods can increase the difficulty of coordination. In expectation, an increase in the number of viable public goods will increase the expected number of periods it takes to achieve coordination, decrease the probability that successful coordination is ever achieved and decrease the average benefits paid out by the public goods. The resulting decrease in expected payoffs from contributing may in turn undermine the willingness of participants to contribute. Our experiment is designed to test these predictions, which we formulate in the context of our treatments in the following subsection.

The above discussion focuses on a model of fully rational decision making, and suggests that the multiplicity of contribution options may increase coordination problems and, as such, may discourage contributions. It is worth recognizing that additional behavioural effects might arise with the multiplicity of contribution options and also further discourage contributions. In particular, the "paradox of choice" suggests that increasing the number of options may decrease the probability that a decision maker chooses any of the options, and rather opt for the default outcome (Schwartz 2004). This may be because decision makers are more likely to be overwhelmed as the choice set increases in size. In our context, the default outcome is likely seen as not contributing, and as the number of contribution options increases, contributors may be more likely not to contribute. Such an effect would work in the same direction and reinforce the effects that arise due to an increase in the coordination problem.[23]

[23]Scheibehenne, Greifeneder and Todd (2010) fail to find evidence of choice overload in a setting of charitable contributions. In their experiment, participants may donate one euro to a charity on a list of alternatives, or keep the euro for themselves. They find an insignificant, positive relationship between the number of charities on the list and total contributions, which does not support the choice overload hypothesis in the context of charitable giving. This is the opposite direction of the relationship we identify in our analysis. The contrast between their findings and our own is likely due to differences in the potential impact that the donations could have on the viability of the

3.3. **Testable Predictions.** Treatment 1G serves as a benchmark throughout the analysis. It involves a single public good that offers a bonus $\beta_1 = 30$. 1G provides *prima facie* evidence on groups' attitude to contributing above the threshold and attempting coordination when there is only a single contribution option.

Treatment 4G_EE is designed to illustrate the potential detrimental effects of multiplicity. The treatment includes four public goods, each identical to the public good in 1G. The public goods provide the same bonus, eliminating the possibility that any of the goods stands out as the unique viable alternative; this guarantees that the additional contribution options increase the severity of the coordination problem, without changing the payoffs when coordination is successful. As discussed in Section 3.2 above, we expect that increasing the number of viable public goods will decrease the probability of successful coordination and the average benefits paid out by the public goods, and may discourage contributions. We summarize these claims in the first hypothesis.

Hypothesis 1. Increasing the number of public goods has detrimental effects when the new goods are similar to previous options: total contributions, the probability of the threshold on any public good being reached, and total payoffs are lower in 4G_EE than in 1G.

Treatments 4G_1ME and 4G_1LE extend the analysis to consider settings in which one public good offers a unique level of efficiency compared to the alternatives. We refer to the unique good as "salient," and to goods that are ex ante identical to other available goods as "non salient." These treatments allow us to consider whether the availability of a salient alternative can help solve the coordination problem associated with an increase in the number of public goods.

Theory suggests that the availability of a salient public good may fully solve the coordination problem if it stands out as the unique viable alternative. But, it may not solve the coordination problem if other options continue to be viewed as viable. Treatment 4G_1ME allows us to test the first possibility in a setting where the salient public good is also most efficient. Coordinating on any of the three non salient alternatives is more difficult and offers lower payoffs when the threshold is achieved. In this environment, there is no obvious reason why any player would focus on one of the non salient alternatives rather than the more efficient, salient alternative.

Hypothesis 2. The availability of a salient public good solves the coordination problem when the salient public good stands out on its merits: total contributions, the probability of the threshold on any public good being reached, and total payoffs are equal in 4G_1ME and 1G, and are greater in 4G_1ME than in 4G_EE.

Suppose Hypothesis 2 holds. An interesting question is whether the effects of altering bonuses in 4G_1ME is mainly driven by the fact that the salient public good in 4G_1ME is the most efficient or because it is unique, in that it can be distinguished from the other non salient alternatives. In order to shed light on these two potential explanations, we compare results in 4G_1ME with

recipient. Scheibehenne, Greifeneder and Todd (2010) considers one euro donations to major real world charities, and it is unreasonable to believe that the one euro contribution will make or break a charity. Therefore, the threshold effects that drive our results will be absent in the other study.

those in 4G_RS and test whether enhancing salience through the bonus manipulation exerts the same effects of introducing a random signal that addresses group members to one specific public good without modifying its relative profitability.

Hypothesis 3. The availability of a salient public good solves the coordination problem when the salient public good stands out due to a randomly generated signal directing attention to it: total contributions, the probability of the threshold on any public good being reached, and total payoffs are equal in 4G_RS and 1G, and are greater in 4G_RS than in 4G_EE.

In 4G_1LE it is not obvious whether the presence of the salient (but less efficient) public good will help solve the coordination problem. It depends on whether the group views the salient alternative as the clearly dominant option compared to the non salient alternatives.

If the entire group views the salient public good as the only viable alternative, then we expect to observe contributions similar to those in 1G and 4G_1ME, where salient good is identical to that in 4G_1LE. If, however, some or all subjects attempt coordination within the set of more efficient alternatives, then the presence of the additional options will compound the coordination problem. We see this later argument as the more likely possibility, given the past literature on equilibrium selection where groups tend to focus on payoff dominant options. In this case, the presence of the three more efficient but non salient alternatives will increase the expected number of periods it takes before contributions converge to the same public good.

Even if the additional public goods in 4G_1LE make coordination more difficult, it is not guaranteed that the total contributions will be lower or subjects will be worse off. This is because the additional public goods are more efficient than the salient alternative. The higher potential payoff from achieving coordination may in fact encourage additional contributions, and may result in higher payoffs over the 12 periods. We therefore test whether the detrimental effects from Hypothesis 1 apply in 4G-1LE. That is, could the availability of additional, more efficient contribution options discourage contributions and decrease payoffs, even when the initial public good remains a salient, viable alternative?

Hypothesis 4. Increasing the number of public goods can have detrimental effects, even when the additional alternatives are payoff dominant, and the original option remains salient: total contributions, the probability of the threshold on any public good being reached, and total payoffs are lower in 4G_1LE than in 1G.

Hypothesis 4 illustrates that the presence of more, better contribution options may make subjects worse off. If payoffs are lower in 4G_1LE than in 1G, then it is evidence that contributors would be better off if, as a group, they ignored the more efficient but non salient alternatives and focused solely on the salient alternative on which it is easier to coordinate.

Evidence in favor of Hypothesis 4 will also rule out the possibility that the presence of the salient public good in 4G_1LE solves the coordination problem that arises from the multiplicity of public goods. We can still look for evidence that this less efficient salient public good helps solve the coordination problem. To do this, we assess whether contributions, coordination and payoffs are higher in 4G_1LE than in 4G_EE. However, this possible observation is inconclusive, as such effects may be driven either by the availability of a less efficient salient alternative, or by the fact that the three non salient goods offer higher potential payoffs compared to any good in 4G_EE potentially encouraging greater contributions.

4. Experimental results

We are mainly aimed at assessing how multiplicity affects efficiency in a threshold public good setting and whether manipulating salience of one alternative is seen as a viable solution by group members. We first look at differences in overall contributions across treatments. Then, by focusing on 4G_RS, 4G_1ME and 4G_1LE, we study the effects of manipulating salience on subjects' contributions as well as on the probability that a group reaches the threshold. Finally, we analyze differences in subjects' profits across treatments.

The non parametric tests discussed in the analysis are based on 12 independent observations at the group level per treatment. Similarly, in order to account for potential dependence across periods, the estimated coefficients in the parametric regressions are based on standard errors clustered at the group level.

4.1. **Overall contribution.** Figure 1 shows the mean contribution to the collective account(s) over periods for each treatment. The horizontal line set at 33 tokens represents the contribution associated with the symmetric Nash (sub-game perfect) equilibrium in which, in every period, each group member contributes exactly 1/4 of the threshold.

Figure 1. CONTRIBUTIONS BY TREATMENT AND PERIOD

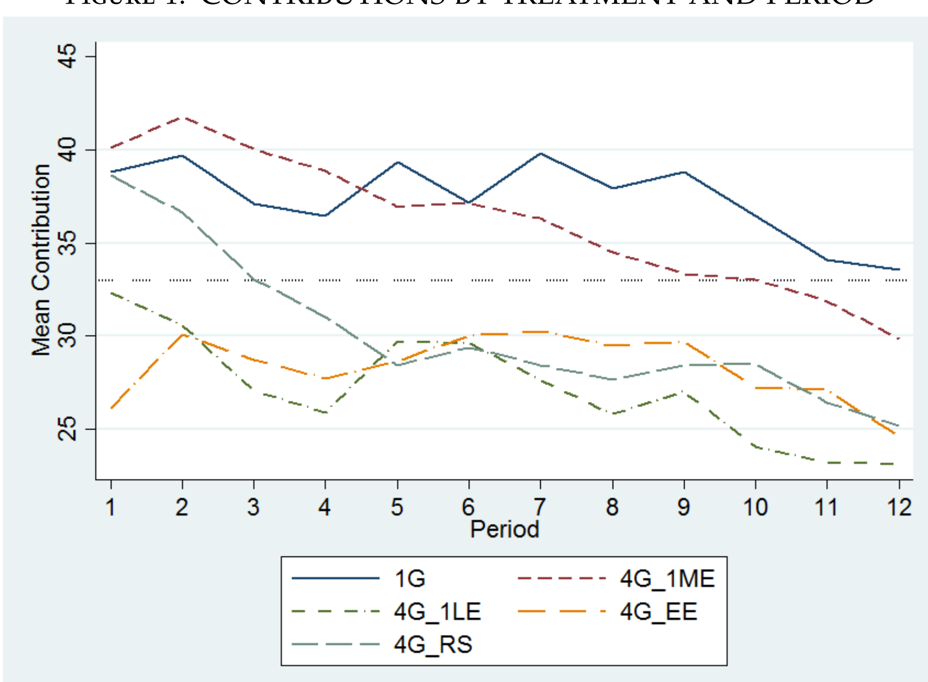


TABLE 1. The determinants of contributions

	Overall Contributions					
	(1)	(2)	(3)	(4)	(5)	(6)
Others(t-1)			0.131***	0.113***		
			(0.019)	(0.012)		
Others(t-1)∗*Coord*(t-1)			0.010	0.021***		
			(0.011)	(0.006)		
Coord(t-1)					7.954***	8.175***
					(1.034)	(0.623)
Trend			−0.332***	−0.494***	−0.557***	−0.829***
			(0.112)	(0.072)	(0.112)	(0.067)
4G_EE	−9.127**	−9.127**	−4.824*	−4.909	−6.214	−6.142
	(4.431)	(4.598)	(2.863)	(3.009)	(3.900)	(3.949)
4G_1ME		−1.286		−1.149		−1.587
		(4.598)		(2.999)		(3.944)
4G_1LE		−10.267**		−6.063**		−7.084*
		(4.598)		(3.013)		(3.953)
4G_RS		−7.281		−4.997*		−6.504*
		(4.598)		(3.005)		(3.945)
Constant	37.444***	37.444***	23.481***	25.469***	34.216***	35.670***
	(3.133)	(3.251)	(2.716)	(2.457)	(2.903)	(2.848)
$\log l$	−4607.2	−11475.9	−4149.0	−10316.0	−4161.7	−10330.1
$Wald - \chi^2$	4.24	8.23	124.51	358.38	74.71	280.47
$Prob > \chi^2$	0.039	0.083	0.000	0.000	0.000	0.000
Obs.	1152	2880	1056	2640	1056	2640

Notes. This table reports coefficient estimates (standard errors in parentheses) from two-way linear random effects models accounting for both potential individual dependency over periods and dependency within group. $Others(t-1)$ is the sum of other group members' contributions in the previous period; $Coord(t-1)$ is a dummy that assumes value 1 if subject's group reached the threshold on one public good in the previous period; $Coord(t-1) * Others(t-1)$ is an interaction term; *Trend* is a linear time trend that starts from 0; 4G_1ME, 4G_1LE, 4G_EE 4G_RS are treatment dummies. Significance levels are denoted as follows: * p < 0.1, ** p < 0.05, *** p < 0.01.

Averaging over all periods, subjects contribute 37.44 tokens in 1G, 28.32 in 4G_EE, 36.16 tokens in 4G_1ME, 30.16 tokens in 4G_RS and 27.18 tokens in 4G_1LE. In every period, contributions in 4G_1LE and 4G_EE are lower than in 1G and 4G_1ME. We do not observe any remarkable difference in contributions between 1G and 4G_1ME. Similarly, contributions in 4G_1LE and 4G_EE follow a similar pattern over repetitions. Moreover, contributions in 4G_RS are very similar to those in 1G and 4G_1ME in early periods, while they tend to converge to those in 4G_1LE and 4G_EE at the end of the experiment. Finally, in all treatments, contributions tend to decline over periods, with this effect being particularly pronounced in 4G_1ME. These preliminary observations are confirmed by Table 1, that reports results from parametric, random effects panel regressions.[24]

Column (1) compares contributions in 1G with those observed in 4G_EE to assess the pure effect of introducing multiple identical public goods. The negative and significant ($p < 0.05$) coefficient of the treatment dummy 4G_EE indicates that multiplicity substantially reduces contributions. Column (2) pools data and compares contributions in 1G with those in the other four

[24] All the regressions in Table 1 are run by pooling data. We do not observe relevant differences when the analysis is conducted by using data from each treatment separately.

treatments with multiple public goods. Again, the coefficient of the treatment dummy 4G_EE is negative and significant ($p < 0.05$). Contributions in 4G_1LE are significantly lower than those observed in the baseline, while no difference is detected by comparing 1G with 4G_1ME. According to a Wald test, we can reject the hypothesis of equality of contributions between 4G_1ME and 4G_1LE ($\chi^2(1) = 3.82$, $p = 0.051$) as well as between 4G_1ME and 4G_EE ($\chi^2(1) = 2.91$, $p = 0.088$).[25] Also, no significant difference is detected by comparing contributions in 4G_1LE with those in 4G_EE ($\chi^2(1) = 0.06$, $p = 0.804$). Finally, contributions are not statistically different between 4G_RS and 4G_1ME ($\chi^2(1) = 1.70$, $p = 0.192$) as well as between 4G_RS and 1G, suggesting that enhancing salience through the bonus manipulation exerts comparable effects of introducing a random signal. This evidence leads us to the first result.[26]

Result 1. Subjects make larger contributions to public goods in 1G and 4G_1ME than in 4G_1LE and 4G_EE. There is no significant difference between 1G and 4G_1ME or between 4G_1LE and 4G_EE. Finally, contributions in 4G_1ME are not statistically different from those in 4G_RS.

Columns (3)-(6) qualifies the previous results by controlling for additional determinants of individual contributions to the public good(s). As suggested by the negative and highly significant coefficient of *Trend* in all the regressions, total contributions generally decrease over time. In line with other public good experiments (e.g., Fischbacher, Gachter and Fehr 2001), we parametrically assess the existence of positive reciprocity among group members in columns (3) and (4). Due to the threshold structure of the public goods and the non money back condition used in our experiment, one can expect this relationship to be non linear and depend on the group having reached the threshold in the previous period. In order to account for this potential non linear relationship, we include two additional covariates in columns (3) and (4): the amount contributed by the other group members in the previous period, $Others(t-1)$, as well as its interaction with a dummy that assumes value 1 if the group successfully reached the threshold on (one of) the public good(s) in the previous period, $Others(t-1) * Coord(t-1)$. The coefficient of $Others(t-1)$ is positive and highly significant. Moreover, in line with the previous intuition, we find reciprocity to be stronger when the group reached the threshold in the previous period, though this effect is statistically significant only when we pool data of the five treatments (Column (4)). Columns (5) and (6) report results when the two covariates used to isolate the effects of positive reciprocity are replaced by $Coord(t-1)$. The coefficient of $Coord(t-1)$ is positive and highly significant suggesting that contributions increase when the group successfully reached the threshold in the previous period.

[25] These results are confirmed by non parametric tests. According to a two-side Mann–Whitney rank-sum test, mean contributions (over all periods) in 1G do not differ from those in 4G_1ME ($z = 0.115$, $p = 0.908$), while they are significantly higher than those in 4G_1LE ($z = 2.021$, $p = 0.043$). Moreover, mean contributions are significantly higher in 4G_1ME than in 4G_1LE ($z = 1.992$, $p = 0.046$).

[26] The above parametric results are robust to different specifications of the econometric model. In particular, we have performed regressions in columns (1) and (2) by using alternative random-effects GLS models on group level observations. Results (included in the Supplementary Material) confirm sign and magnitude of the coefficients attached to the treatment dummies in Table 1.

TABLE 2. Contributions to the salient and non salient public goods in the 4G treatments

Period	1	$1-4$	$5-8$	$9-12$	12	*All*
4G_1ME						
Salient (square)	34.792	38.188	36.208	32.031	29.875	35.476
Non-salient	1.865	0.845	0.008	0.003	0.000	0.285
difference	32.927***	37.343***	36.200***	32.028***	29.875***	35.191***
4G_1LE						
Salient (square)	10.729	5.750	3.469	3.818	3.875	4.345
Non-salient	12.076	16.752	23.699	20.513	19.188	20.321
difference	−1.347	−11.002***	−20.230**	−16.695**	−15.313*	−15.976**
4G_RS						
Salient (RS)	33.063	32.422	28.068	27.010	25.042	29.167
Non-salient	1.854	0.809	0.144	0.044	0.042	0.332
difference	31.209***	31.613***	27.924***	26.966***	25.000***	28.835***
4G_EE						
Square	10.708	12.714	18.302	16.427	14.854	15.814
Other options	8.368	11.066	10.439	10.130	9.104	10.545
difference	2.340	1.648	7.863	6.297	5.750	5.269
Obs. (per treat.)	48	12	12	12	12	12

Notes. This table reports the mean contribution to the salient and non-salient public goods in 4G_1ME, 4G_1LE, 4G_RS and 4G_EE over periods. In order to facilitate comparisons across treatments, the table shows contributions to the square public good in 4G_EE. Moreover, the table shows significance levels from a (two-sided) Wilcoxon signed-rank test for the null hypothesis that the difference between the contribution to the salient public good and the contribution to the non-salient options is null. Significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Interestingly, the inclusion of the additional covariates in the regressions in Table 1 weakens the statistical significance of the treatment dummies, with this effect being particularly evident in columns (5) and (6). Indeed, the significance of both the coefficients of 4G_1LE and 4G_EE drop substantially. Similarly, differences between the coefficients of 4G_1ME and 4G_1LE ($\chi^2(1) = 2.66$, $p = 0.102$ in column (4); $\chi^2(1) = 1.93$, $p = 0.164$ in column (6)) as well as between those of 4G_1ME and 4G_EE ($\chi^2(1) = 1.56$, $p = 0.211$ in column (4); $\chi^2(1) = 1.33$, $p = 0.249$ in column (6)) are no longer significant. Thus, differences in overall contributions are partially driven by the group's past performance in contributing to the public goods. We shed light on these aspects in the next part of the analysis.

4.2. **Salience and successful provision of public goods.** Table 2 reports mean contributions to the salient and non-salient public goods in the four treatments with multiple public goods, 4G_EE, 4G_1ME, 4G_1LE and 4G_RS.[27]

As shown by the table, subjects in 4G_1ME and 4G_RS effectively coordinate their contributions on the salient public good. On the contrary, in 4G_1LE, where the salient public good is associated with the lowest bonus, subjects contribute significantly more to the (non-salient) alternatives. The difference in the level of contributions to the salient public good between 4G_1ME

[27] The mean contribution to the non-salient public goods in a period is given by the ratio between the subject's overall contribution to the non-salient alternatives and the number of public goods to which the subject allocated strictly positive amounts in that period. In 4G_EE no public good can be distinguished from the others in terms of salience and efficiency. In order to compare contributions across treatments, we take the "square" public good as the reference alternative in 4G_EE.

and 4G_1LE as well as between 4G_RS and 4G_1LE is positive and highly significant (in both cases, according to a Mann-Whitney rank-sum test, two-sided, $p < 0.01$ for any subset of periods). Moreover, we find no significant difference in the level of contributions to the salient public good between 4G_1ME and 4G_RS (according to a Mann-Whitney rank-sum test, two-sided, $p > 0.1$ for any subset of periods), confirming that the two salience manipulations exerted the same effect in addressing subjects' contributions. Finally, in 4G_EE, where collective accounts do not differ in the size of the bonus assigned in case of successful contribution, subjects do not exhibit any significant preference across alternatives.[28] We summarize this evidence in the following result.

Result 2. Subjects coordinate their contributions on the salient collective account in both 4G_1ME and 4G_RS. Subjects in 4G_1LE tend to contribute to one of the non-salient but more efficient collective accounts.

When choosing where to contribute, the evidence collected in 4G_1LE suggest that efficiency concerns dominate salience, even when this results in lower payoffs. If subjects had used salience to coordinate their contributions, the expected proportion of groups that reach the threshold should have been equal in 1G, 4G_1ME, 4G_1LE and 4G_RS, but lower in 4G_EE. However, as documented above, while subjects in 4G_1ME and 4G_RS contribute more to the salient public good, the opposite occurs in 4G_1LE where participants seek to coordinate on one of the non-salient (but more efficient) alternatives.[29] Thus, it is reasonable to expect coordination to be more difficult to achieve in 4G_1LE and 4G_EE than in the remaining three treatments. This is confirmed by the experimental data. Over all periods, almost 80.5 percent of groups in 1G and 4G_1ME contributed more than the threshold to one collective account while this percentage drops to 37.5 percent in 4G_1LE and 47.92 percent in 4G_EE, respectively. In 4G_RS, the percentage of groups that contributed above the threshold to one collective account is in the middle between those observed in the other four treatments. Thus, albeit used as a viable coordination device by subjects in 4G_RS, the random signal turns out to be (somewhat) less effective than the efficiency manipulation in 4G_1ME. This evidence is confirmed by Table 3 which shows the

[28] In the online Supplementary Material, we also include additional analysis on the frequencies of both 0-contributors (i.e. subjects who contribute nothing to the collective accounts) and subjects who make positive contributions to more than one collective account in the period. Across periods, the frequency of subjects spreading contributions to more than one collective account is significantly higher in 4G_1LE and 4G_EE than in 4G_1ME. Moreover, the proportion of 0-contributors in 4G_1LE and 4G_EE is about four times higher than in either 1G or 4G_1LE. The previous evidence is coherent with the idea that, in treatments in which salience does not represent an effective coordination device (4G_1LE and 4G_EE), subjects try to minimize the risk of mis-coordination by either spreading contributions over the alternative public goods or free-riding. Interestingly, the frequency of 0-contributors is significantly higher in 4G_RS than in 4G_1ME while the frequency of subjects contributing to more than one public good is relatively small in both treatments and not statistically distinguishable. Thus, while inducing subjects to polarize their contributions to (only) one public good, the random signal in 4G_RS is less powerful than the salience manipulation in 4G_1ME in preventing free riding.

[29] We also conducted formal analysis to check whether subjects in 4G_1LE contribute according the "focus on efficiency" (i.e. they only make positive contributions to the most efficient public good(s)) and "focus on salience" (i.e. they only make positive contributions to the salient public good) strategies over periods. We can reject the null hypothesis of no difference between the frequencies of the two strategies in 4G_1LE (according to a Wilcoxon signed-rank test, two-sided, $p < 0.01$, for any subset of periods). Results are included in the online Supplementary Material.

TABLE 3. Mean proportion of successful provision by treatment

Period	1	$1-4$	$5-8$	$9-12$	12	*All*
1G	0.750	0.771	0.854	0.792	0.750	0.806
4G_1ME	0.750	0.833	0.854	0.729	0.667	0.806
4G_1LE	0.000	0.083	0.563	0.479	0.333	0.375
4G_EE	0.000	0.271	0.604	0.563	0.417	0.479
4G_RS	0.583	0.625	0.604	0.667	0.583	0.632
1G – 4G_1ME	0.000	-0.062	0.000	0.063	0.083	0.000
1G – 4G_1LE	0.750^{***}	0.688^{***}	0.291^{*}	0.313^{*}	0.417^{**}	0.431^{***}
1G – 4G_EE	0.750^{***}	0.500^{***}	0.250^{*}	0.229	0.333	0.327^{***}
1G – 4G_RS	0.167	0.146	0.250^{**}	0.125	0.167	0.174
4G_1ME – 4G_1LE	0.750^{***}	0.750^{***}	0.291^{*}	0.250	0.334	0.431^{***}
4G_1ME – 4G_EE	0.750^{***}	0.562^{***}	0.250^{*}	0.166	0.250	0.327^{***}
4G_1ME – 4G_RS	0.167	0.208	0.250^{**}	0.062	0.084	0.174
4G_1LE – 4G_EE	0.000	-0.188	-0.041	-0.084	-0.084	-0.104
4G_1LE – 4G_RS	-0.583^{***}	-0.542^{***}	-0.041	-0.188	-0.250	-0.257^{*}
4G_EE – 4G_RS	-0.583^{***}	-0.354^{**}	0.000	-0.104	-0.166	-0.153
Obs.(per treat.)	12	12	12	12	12	12

Notes. This table reports mean proportions of successful provision (namely, reaching the threshold on one public good) over periods in the five treatments. The table also shows significance levels from a nonparametric (two-sided) Mann–Whitney rank-sum test for the null hypothesis that the proportion in two treatments is the same. Significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

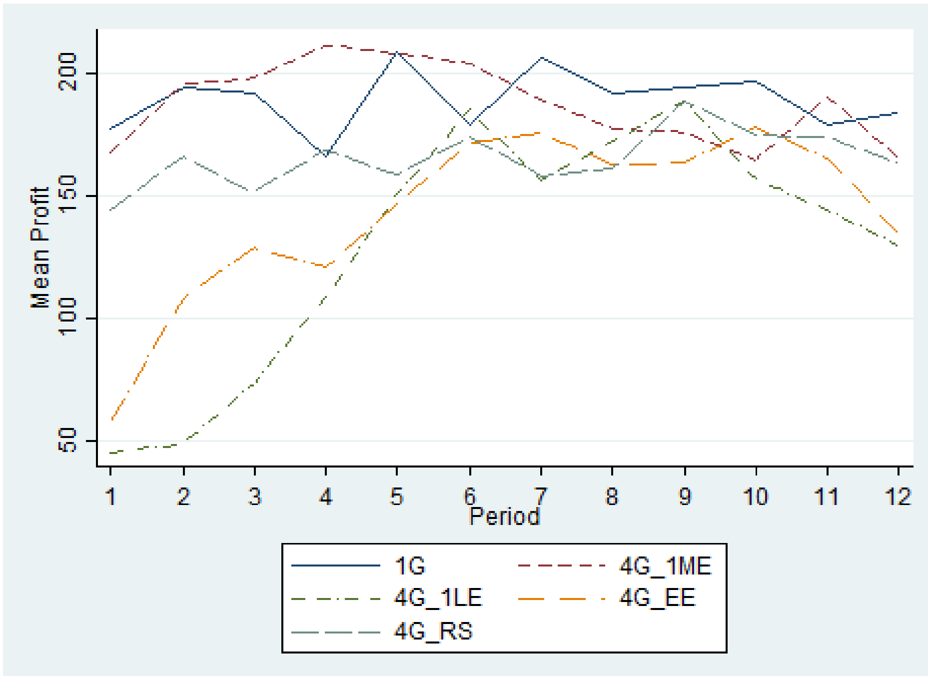
mean proportions of successful provisions in the five treatments over periods. According to a Mann-Whitney rank-sum test (two-sided), the mean proportion of periods a group reaches the threshold is significantly lower in 4G_1LE and 4G_EE than in 1G and 4G_1ME (in all cases, $p < 0.01$), while no significant difference is detected between 1G and 4G_1ME as well as between 4G_1LE and 4G_EE. We summarize these results as follows.

Result 3. The proportion of groups that reach the threshold in 1G, 4G_1ME and 4G_RS is higher than in 4G_1LE and 4G_EE. There is no significant difference in successful provision of public goods between 1G and 4G_1ME or between 4G_EE and 4G_1LE.

It is worth noticing that the proportion of groups that reach the threshold in our experiment is higher than found by other studies. For instance, in their no money back treatments, Isaac, Schmidtz and Walker (1989) observe that the proportion of groups that contribute above the threshold is 31 percent in their low-provision condition (in which the threshold is equal to 44 percent of the group endowment), 27 percent in their medium-provision condition (in which the threshold is 87 percent of the group endowment) and 15 percent in their high-provision condition (in which the threshold coincides with the entire group endowment). This difference might be explained by the (relatively high) bonus that subjects in our experiment receive when their group reaches the threshold.

4.3. **Subjects' earnings.** Next, we explore whether subjects' earnings differ across treatments. As predicted by the theory and confirmed by the previous analysis, subjects that try to coordinate their contributions on one of the non salient collective accounts in 4G_1LE and 4G_EE experience mis-coordination in early periods. Thus, it is reasonable to expect earnings in 4G_1LE and 4G_EE

FIGURE 2. PARTICIPANT EARNINGS BY TREATMENT AND PERIOD



to be lower than in any of the other three treatments. Figure 2 shows mean earnings (expressed in points) in the five treatments over periods.

Profits in 4G_1LE and 4G_EE are lower than those in 1G, 4G_1ME and 4G_RS, with the difference being more pronounced in early periods.[30] As shown by Table 4, earnings in 4G_1LE and 4G_EE are significantly lower than those in 1G and 4G_1ME. Similar considerations hold when looking at 4G_RS, though, in this case, only the difference in earnings with 4G_1LE is significant. In terms of final monetary earnings, subjects earn (on average) 5.30 euro less in 4G_1LE and 4G_EE than in the other three treatments.

Table 4 also compares the mean profits in the five treatments with 110, namely the individual earnings associated with the 0-contribution Nash equilibrium. Interestingly, in the first four periods, subjects in 4G_1LE and 4G_EE earn (on average) significantly less than 110. This is consistent with the idea that it takes a number of periods for groups to achieve coordination when no salient alternative stands out as a focal point. Furthermore, by considering the mean over all periods of subjects' earnings, we find that 35.42 percent of subjects in 4G_1LE and 33.33 percent of subjects in 4G_EE earn less than 110, with this percentage dropping to 10.41 percent in 1G, 6.25 percent in 4G_1ME and 12.5 in 4G_RS. We summarize this result as follows.

[30]It is reasonable that differences across treatments tend to vanish in the final periods of interaction. This is mainly due to two considerations. First, the partner matching protocol increases the probability that, even after experiencing coordination failure, subjects manage to reach the threshold after some repetition. Second, when the coordination failure induces subjects to stop contributing to the public goods, profits tend to increase because of the (riskless) return implied by the private account.

TABLE 4. Subject's earnings by treatment

Period	1	$1-4$	$5-8$	$9-12$	12	*All*
1G	178.000	182.885	196.760	188.667	184.208	189.438
1G – 110	68.000^{***}	72.885^{***}	86.760^{***}	78.667^{***}	74.208^{***}	79.438^{***}
4G_1ME	167.917	193.500	195.104	174.385	165.750	187.663
4G_1ME – 110	57.917^{**}	83.500^{***}	85.104^{***}	64.385^{***}	55.750^{*}	77.663^{***}
4G_1LE	45.333	69.208	166.396	155.146	129.958	130.250
4G_1LE – 110	-64.667^{***}	-40.792^{***}	56.396^{**}	45.146^{***}	19.958	20.250^{*}
4G_EE	57.750	103.927	164.427	160.531	134.500	142.962
4G_EE – 110	-52.250^{***}	-6.073	54.427^{***}	50.531^{***}	24.500	32.962^{***}
4G_RS	144.750	157.927	163.208	175.531	163.667	165.556
4G_RS - 110	34.750	47.927^{**}	53.208^{***}	65.531^{***}	53.667^{***}	55.556^{***}
1G – 4G_1ME	10.083	-10.615	1.656	14.282	18.458	1.775
1G – 4G_1LE	132.667^{***}	113.677^{***}	30.364	33.521	54.250	59.118^{***}
1G – 4G_EE	120.250^{***}	78.958^{***}	32.333	28.136	49.708^{**}	46.476^{***}
1G – 4G_RS	33.250	24.958	33.552^{*}	13.136	20.541	23.882
4G_1ME – 4G_1LE	122.584^{***}	124.292^{***}	28.708	19.232	35.792	57.413^{***}
4G_1ME – 4G_EE	110.167^{***}	89.573^{***}	30.677	13.857	31.250	44.706^{**}
4G_1ME – 4G_RS	23.167	35.573	31.896	-1.146	2.083	22.107
4G_1LE – 4G_EE	-12.417^{*}	-34.719^{*}	1.969	-5.385	-4.542	-12.712
4G_1LE – 4G_RS	-99.417^{**}	-88.719^{***}	3.188	-20.385	-33.709	-35.306^{**}
4G_EE – 4G_RS	-87.000^{*}	-54.000^{**}	1.219	-15.000	-29.167	-22.594
Obs. (per treat.)	12	12	12	12	12	12

Notes. This table reports mean earnings over periods in the five treatments. For each treatment, the table reports results of a Wald test for the null hypothesis that estimates of treatment intercepts from a two-way linear random effects model (accounting for both potential individual dependency over periods and dependency within group) on the corresponding sub-sample of periods are equal to 110. Finally, the table shows results from a nonparametric (two-sided) Wilcoxon rank sum test for the null hypothesis that the mean earnings in two treatments is the same. Significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Result 4. Mean total earnings are significantly higher in 1G, 4G_1ME and 4G_RS than in 4G_1LE and 4G_EE. There is no significant difference between 1G, 4G_1ME and 4G_RS or between 4G_EE and 4G_1LE.

5. Non-binding budget constraint

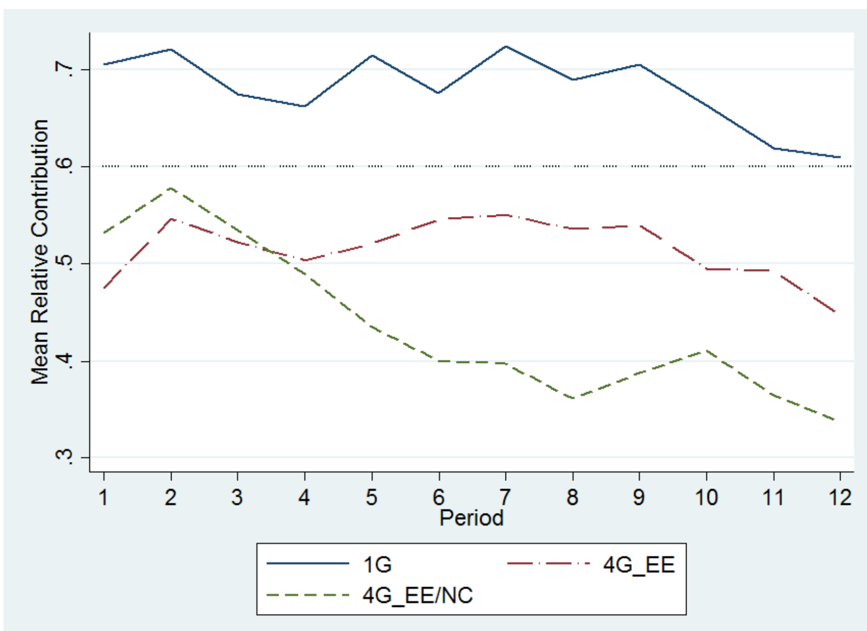
In order to shed light into the interplay between contributions and group coordination in a threshold public good setting with multiplicity, we deliberately designed treatments in such a way that in a generic period, group members could not fully fund more than one public good. An interesting question is how the effects of multiplicity change when this binding (endowment) constraint condition is removed and, more realistically, the group disposes of an (overall) endowment that is high enough to reach the threshold on several public goods.

We investigate this relevant question by running an additional treatment, 4G_EE/NC that coincides with 4G_EE in all respects but for the level of the individual endowment that is now set to 220 tokens. Thus, each group now disposes of an overall endowment of 880 tokens, well enough to successfully reach the threshold on all the four available public goods. Moreover, in order to control for potential income effects across treatments, we set the exchange rate in 4G_EE/NC to be one fourth of that used in the previous treatments. We run two sessions of this new treatment, each involving 24 subjects. Thus, as for the previous treatments, our analysis is based on data from 12 indepedent groups of four subjects. The sessions were run in May 2014 in the *BLESS* laboratory at the University of Bologna. On average, subjects in 4G_EE/NC earned 18.23 euro.

Intuitively, removing the binding constraint faced by groups introduces two competing considerations that are likely to affect subjects' contributions. On the one hand, contributing to public goods becomes less risky. Indeed, since each subject now disposes of an endowment that is higher than the threshold attached to each of the four alternatives, contributing to the public goods becomes less risky as she can effectively neutralize the potential risks introduced by the no money back condition. On the other hand, given the linear rebate rule used in our experiment, removing the binding constraint makes our threshold public good setting more similar to a standard linear public good game. Thus, it is reasonable to expect this new setting to enhance the relevance of the free riding issue relative to that of group mis-coordination over public goods.

We investigate the effects of removing the binding constraint by comparing contributions, the probability of successful provision and earnings across 1G, 4G_EE and 4G_EE/NC. Starting from contributions, the following figure shows the mean relative contribution[31] to the collective account(s) over periods in the three treatments.

FIGURE 3. RELATIVE CONTRIBUTIONS W/ NON-BINDING BUDGET CONSTRAINT



Averaging over all periods, subjects in 4G_EE/NC contribute 43.57% of their endowment, well below what observed in either 1G or 4G_EE. A formal parametric analysis based on the same specification strategy used in Table 1 confirms the previous graphical considerations.

[31]The relative contribution to the public goods in a generic period is expressed by the ratio between the overall contribution to the collective accounts made by the subject in the period and her endowment.

TABLE 5. The determinants of relative contributions in 1G, 4G_EE and 4G_EE/NC

	RelContributions		
	(1)	(2)	(3)
$RelOthers(t-1)$		0.133^{***}	
		(0.014)	
$RelOthers(t-1){*}Coord(t-1)$		0.013	
		(0.009)	
$Coord(t-1)$			0.151^{***}
			(0.018)
Trend		-0.008^{***}	-0.014^{***}
		(0.002)	(0.002)
4G_EE	-0.166^{**}	-0.084^{*}	-0.111
	(0.080)	(0.050)	(0.069)
4G_EE/NC	-0.245^{***}	-0.138^{***}	-0.166^{**}
	(0.080)	(0.050)	(0.069)
Constant	0.681^{***}	0.431^{***}	0.639^{***}
	(0.057)	(0.045)	(0.051)
$\log l$	37.3	160.0	131.4
$Wald-\chi^2$	9.67	240.82	136.50
$Prob > \chi^2$	0.008	0.000	0.000
Obs.	1728	1584	1584

Notes. $RelOthers(t-1)$ is the sum of other group members' contributions in the previous period divided by the endowment; $Coord(t-1)$ is a dummy that assumes value 1 if, in the previous period, (i) the subjects group reached the threshold on one public good in 1G and 4G_EE and (ii) the subject's group reached the threshold on all the four public goods in 4G_EE/RS; 4G_EE/NC is a treatment dummy. The other remarks on Table 1 apply.

In all the regressions presented in Table 5,[32] the coefficient of 4G_EE/NC is negative and always significant, while the difference between 4G_EE/NC and 4G_EE is never statistically significant ($\chi^2(1) = 0.97$, $p = 0.325$ in column (1); $\chi^2(1) = 1.14$, $p = 0.285$ in column (2); $\chi^2(1) = 0.64$, $p = 0.4232$ in column (3)).[33] Thus, removing the binding constraint does not facilitate contributions relative to 4G_EE. It is worth noticing that, as in Table 1, the inclusion of the additional covariates $Others(t-1)$, $Coord(t-1)$, $Others(t-1) * Coord(t-1)$ and *Trend* weakens the statistical significance of the treatment dummies, suggesting that differences across treatments are partially driven by past performance in successfully contributing to the public goods. Table 6 performs the same analysis on the proportion of successful provisions and on subjects' earnings in Tables 4 and 5.

[32]Again, the parametric results in Table 5 are robust to different specifications of the econometric model. In particular, we have replicated column (1) by estimating alternative random-effects GLS models on group level observations. Moreover, we have also replicated columns (2) and (3) by replacing $Coord(t-1)$ with a different variable, $\widetilde{Coord}(t-1)$, that assumes value of 1 if, in the previous period, (i) the subjects group reached the threshold on one public good in 1G and 4G_EE and (ii) the subjects group reached the threshold on at least one public good in 4G_EE/RS. Results (included in the online Supplementary Material) confirm both sign and magnitude of the coefficients attached to the treatment dummies in Table 5.

[33]Again, these results are confirmed by standard non parametric tests. According to a two-side Mann–Whitney rank-sum test, mean contributions (over all periods) in 1G significantly differ from those in 4G_EE/NC ($z = 2.714$, $p = 0.007$), while the difference between 4G_EE and 4G_EE/NC is not statistically significant ($z = 0.751$, $p = 0.453$).

TABLE 6. Successful provision and subject's earnings in 4G_EE/NC

Period	1	$1-4$	$5-8$	$9-12$	12	*All*
Mean proportion of successful provision						
4G_EE/NC(1pg)	0.750	0.854	0.750	0.708	0.667	0.771
4G_EE/NC(4pgs)	0.250	0.229	0.250	0.250	0.250	0.243
4G_EE/NC(1pg) – 1G	0.000	0.083	−0.104	−0.084	−0.083	−0.035
4G_EE/NC(4pgs) – 1G	−0.500**	−0.542***	−0.604***	−0.542***	−0.500**	−0.563***
4G_EE/NC(1pg) – 4G_EE	0.750***	0.583***	0.146	0.145	0.250	0.292
4G_EE/NC(4pgs) – 4G_EE	0.250*	−0.042	−0.354*	−0.313	−0.167	−0.236
Subject's earnings						
4G_EE/NC	1.338	1.430	1.573	1.555	1.539	1.519
4G_EE/NC – 1.10	0.228	0.330**	0.473***	0.455***	0.439***	0.419***
4G_EE/NC – 1G	−0.442	−0.399*	−0.395**	−0.332*	−0.303*	−0.375*
4G_EE/NC – 4G_EE	0.760***	0.391**	−0.071	−0.050	0.194	0.089
Obs.(per treat.)	12	12	12	12	12	12

Notes. The upper part of the table reports mean proportions of successful provision (namely, reaching the threshold on one public good) over periods in 4G_EE/NC. The lower part of the table reports mean earnings (expressed in euro) over periods in 4G_EE/NC. The same remarks on Tables 3 and 4 apply.

In order to facilitate comparisons with the other two treatments, the upper part of the table introduces two alternative definitions of successful provisions in 4G_EE/NC. The first definition is less restrictive and requires the group to contribute above the threshold on at least one public good. The second, more restrictive, requires the group to contribute above the threshold on all the four public goods.[34]

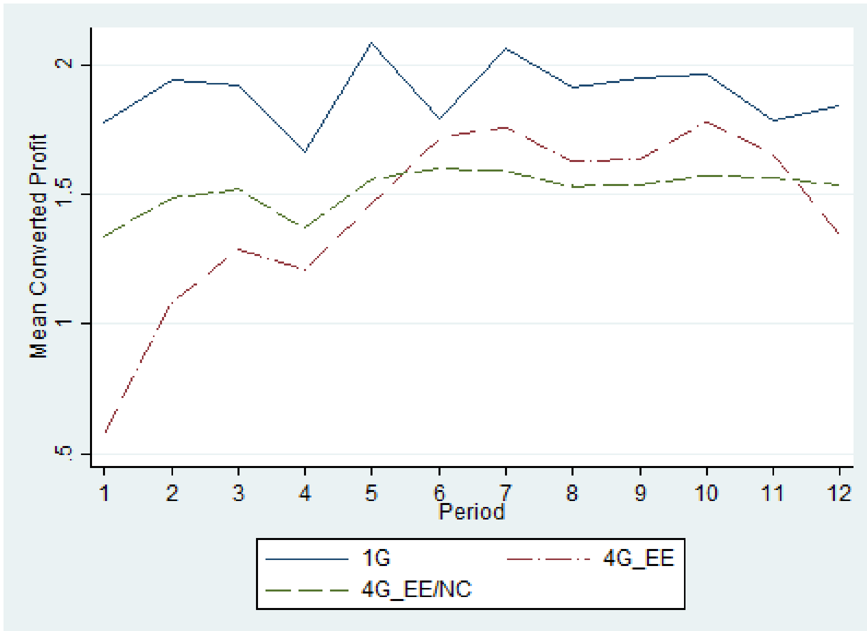
As shown by the table, when considering the less restrictive definition, we do not observe significant differences over periods in the proportion of successful provision between 4G_EE/NC and 1G over periods. However, when the more restrictive definition is used, it emerges a significantly lower ability to reach the threshold in 4G_EE/NC than in 1G. Irrespective of which definition is used, we observe no significant difference between 4G_EE/NC and 4G_EE.

Figure 4 shows mean earnings expressed in euro[35] in 1G, 4G_EE/NC and 4G_EE over periods. It complements the information in the lower part of Table 6.

[34]By requiring groups in 4G_EE/NC to contribute in proportion of their endowment as much as in 1G and 4G_EE (60% of their overall endowment), the more restrictive definition allows for direct comparisons across treatments.

[35]Earnings are expressed in monetary units to facilitate comparisons between 4G_EE/NC and the other two treatments.

FIGURE 4. RELATIVE PROFITS W/ NON-BINDING BUDGET CONSTRAINT



As shown by the graph and confirmed by the non parametric tests reported in Table 6, we observe sizeable differences in earnings between 1G and 4G_EE/NC. It is worth noticing that, due to the lower risk of mis-coordination, 4G_EE/NC does not exhibit the substantial losses registered in early periods in 4G_EE. In line with the previous observation, over all periods, the subject's earnings are significantly higher than the individual payoff associated with the no-contribution Nash equilibrium.

Taken together, the previous evidence suggests that removing the binding constraint faced by groups in our threshold public good game with multiple indistinguishable alternatives does not increase efficiency as expressed by contributions, probability of successful provision, and earnings. We summarize this conclusion as follows.

Result 5. Overall contributions, the proportion of successful provision and earnings in 4G_EE/NC are significantly lower than those in 1G. We observe no significant differences between 4G_EE/NC and 4G_EE.

The result does not support the argument that weakening the budget constraint leads to higher contributions. If anything, the opposite is true, with total contributions being lower in this alternative treatment than when the group can fund at most one good, although this difference is not significant. Although weakening the budget constraint seemingly decreases total contributions, it also has the opposite (insignificant but suggestive) effect on probability of reaching the threshold on at least one of the public goods and average donor payoffs. This is likely due to it being easier to reach thresholds in the game with weakened budget constraints.

Result 5 suggests that removing the binding constraint faced by groups does not reduce the detrimental effects of multiplicity on contributions, successful provisions and earnings. This is reassuring about the robustness of the results in the previous subsections. This conclusion is partially in contrast with the results of the experiment of Bernasconi et al. (2009) discussed in the literature review. There are at least two features of our experimental design that can reasonably account for the discrepancy between the two studies. First, the size of the threshold provides a natural reference for subjects about what is the "right" amount to contribute to the public goods. Second, due to the risk of burning resources implied by the no money back condition, subjects in 4G_EE/NC can consider as satisfactory situations in which only few (rather than all) available public goods are successfully funded.

Of course, these considerations do not extend to the linear public setting considered by Bernasconi et al. (2009) which neither provides reference levels to subjects, nor involves any risk of wasting contributions.

This section provides evidence that the detrimental effects that arise with multiple contribution options is not driven by the assumption that the groups can afford to fund only one project. This suggests that the issues identified in the earlier sections extend to a variety of additional settings. Although the our study does not conduct a thorough assessment of the effects of making one contribution option salient in the weak budget constraint environment, we have no reason to believe that the results would be significantly different than those in the case of a binding budget constraint analyzed earlier. Providing some evidence that this is the case, the online Supplementary Material presents results from an additional treatment that introduces a random signal into the weak budget constraint setting, and shows that the results are consistent with those from the random signal treatment when budget constraints were more strictly binding.[36]

6. Support for our predictions

Taken together the results presented above provide significant support for three of the four hypotheses formulated in Section 3.3, and partial support for the other one.

Hypothesis 1 predicts that total contributions, the probability of funding any public good, and payoffs would be lower in 4G_EE compared to 1G. We expected coordination to become more difficult as the number of indistinguishable alternatives increase, and the results support this conjecture. When the number of identical public goods increases, we observe a decrease in the probability of successful coordination and a decrease in average earnings. The third effect predicted by the hypothesis—that total contributions would decrease—is less intuitive. It comes from the idea that the additional options may discourage participation of donors who recognize

[36]We run two sessions (with 12 independent groups of four subjects) of 4G_RS/NC which simply adds the same random signal used in 4G_RS to the no binding budget constraint, 4G_EE/NC. In other words, while 4G_EE/NC serves to study the effects on contributions and successful provision of making the funding of all the four public goods affordable for the group, 4G_RS/NC qualifies our results by addressing the issue of manipulating the salience of one alternative in the new setting. On average, subjects in 4G_RS/NC earned 18.01 euro. As in 4G_RS, we find that contributions to the salient public good are significantly higher than those to any of the non salient alternatives. Nevertheless, we do not detect any difference between 4G_RS/NC and 4G_EE/NC in overall contributions, the proportion of successful provisions and earnings. Results are included in the online Supplementary Matterial.

that achieving coordination is more difficult, which decreases the expected benefits of contributing. We were uncertain whether this effect would be strong enough to cause a significant decrease in contributions. The empirical analysis confirms this prediction as well, showing that an increase in the number of contribution options causes total contributions to decline. Furthermore, Section 5 shows that the negative effects of multiplicity carries over to an environment in which contributors are not budget constrained, and can afford to fully fund all projects.

Hypothesis 2 predicts that the coordination problem does not arise when one contribution option is clearly more rewarding than the alternatives. It predicts no differences in contributions between 4G_1ME and 1G. In 4G_1ME, there is a salient public good that offers higher payoffs than the three non-salient alternatives. We were fairly certain that the presence of a salient alternative would help overcome the coordination problem that arises with multiple public goods (i.e., we expected coordination to be more likely in 4G_1ME than in 4G_EE). Although supported by the theoretical considerations, we were less certain that the availability of the salient alternative would fully overcome the coordination problem.[37] However, our results clearly support this conjecture.

Hypothesis 3 predicts that making one contribution option salient through the use of a random signal (i.e. by featuring it on the computer screen during the experiment) will similarly help overcome the coordination problem that arises with multiplicity. The hypothesis required insignificant differences between contributions and efficiency in 4G_RS and 1G, and significant differences between 4G_RS and 4G_EE. We find that neither of these measures are significant, a consequence of contributions in 4G_RS falling somewhere between those in 4G_EE, where coordination problems are most significant, and those in 1G and 4G_1ME, where coordination problems are minimize. Because our measures for contributions and efficiency in this treatment consistently fall between those in the other treatments, the differences between the measures in 4G_RS and in the other treatments are less significant than those between 4G_EE and either 1G or 4G_1ME. The analysis rejects Hypothesis 3, as the random signal does not appear overcome the coordination problem to the same extent as having one good stand out on its merits. At the same time, the evidence strongly suggests the random signal helps to *partially*, but not completely, overcome the coordination problem that arises with multiplicity.

Hypothesis 4 predicts that total contributions, the probability of funding any good, and payoffs would be lower in 4G_1LE compared to 1G. This is more interesting than Hypothesis 1 in that the additional contribution alternatives are individually preferable to the original public good, while the original public good remains a viable, salient option. The most interesting aspect of this hypothesis is the prediction that payoffs would be lower in 4G_1LE compared to 1G. If groups in 4G_1LE simply ignored the more efficient but non salient alternatives, expected payoffs would be the same as in 1G. By attempting to coordinate based on efficiency, rather than focusing on the salient alternative, groups are made worse off. The addition of better alternatives decreases

[37]It was possible that the additional alternatives, even though they were less efficient, could confuse or intimidate contributors, or otherwise discourage contributions. It was also possible that the presence of less attractive alternatives would cause the salient alternative to appear more attractive and encourage additional contributions. We observe neither of these effects.

payoffs, even when the salient public good offers the same payoffs as in 1G. This is because in the case of multiplicity, the focal point of the group shifts to the more efficient alternatives; subjects contribute based on efficiency rather than salience.

7. Discussion and Conclusion

We use an experiment with multiple threshold public goods to show how increasing the number of public goods vying for funding can decrease both total contributions across all goods and the probability that any public good receives enough donations to succeed. We go on to show how salience of one contribution option can help overcome the coordination problem and improve efficiency if the salient option offer higher potential returns compared to the alternatives. Calling contributor attention to one good is less effective at facilitating coordination if that good that is made salient does not also stand out based on its merits.

Additionally, the analysis shows that contributors tend to ignore salient public goods when they are not also one of the most efficient. They do this even when payoffs would be higher if, as a group, they instead focused on less efficient but salient option on which coordination and success is easier to achieve.

Our experimental evidence gives insight into the effect that increasing the number of projects fundraising may have on contributions. This is important for the case of crowdfunding sites such as Kickstarter.com, IndieGoGo.com and Kiva.org, which each host thousands of alternative projects vying for funding at any point in time. Our results document that increasing the number of projects not only makes it more difficult for any given project to attract full funding, but also decreases total contributions across all projects. The analysis also suggests that the sites may be able to correct for most of these inefficiencies by helping contributors identify the most-effective or promising projects. However, the evidence also suggests that randomly featuring projects independently of their merits (such as advertising randomly selected projects on a homepage) does less to overcome the coordination problem, and may not help at all if the featured projects are viewed as weaker than non featured alternatives.

These insights may extend to fundraising more generally. In the non profit sector, there is concern that there are too many charities vying for limited donor dollars. The findings clearly suggest that increasing numbers of charities vying for funds can drive down overall contributions. Not only may increasing the number of organizations lead to inefficiency due to donor dollars being spread too thinly across organizations, but it may also decrease the total amount of funding that is shared across all organizations. The analysis also suggests that organizations which direct donor attention to the most effective charities, such as Charity Navigator and other charity rating organizations, may help reduce the problems that arise with multiplicity.

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ONLINE SUPPLEMENTARY MATERIAL FOR

DONOR COORDINATION IN PROJECT FUNDING: EVIDENCE FROM A THRESHOLD PUBLIC GOODS EXPERIMENT

LUCA CORAZZINI, CHRISTOPHER COTTON, AND PAOLA VALBONESI

Abstract. Section A and B contain the experimental instructions and the screenshots used in 4G_RS, respectively. Section C and D report results from performing different econometric specifications of Tables 1 and 5, respectively. Section E reports additional results on contribution strategies and successful public good provision in treatments 1G, 4G_1ME, 4G_1LE, 4G_EE, 4G_RS. Finally, Section F reports results from the additional treatment 4G_RS/NC mentioned in the paper.

A. Instructions in 4G_RS

Note to the reader: The instructions were originally written in Italian. The differences between the instructions for 4G_RS and those for 4G_1ME (4G_1LE) are: (i) the size of the bonus of the three identical public goods TRAPEZOID, RECTANGLE and DIAMOND is set to 20 (40); (ii) 4G_1ME (4G_1LE) does not contain any reference to the random signal.

The only difference between the instructions for 4G_RS and those for 4G_EE is that the latter treatment does not contain any reference to the random signal.

The differences between the instructions for 4G_RS and those for 1G are: (i) 1G does not contain any reference to the random signal; (ii) 1G references a single collective account. The bonus associated with the collective account equals 30 points.

The differences between the instructions for 4G_RS and those for 4G_EE/NC are: (i) 4G_EE/NC does not contain any reference to the random signal; (ii) the endowment in 4G_EE/NC is set equal to 220 tokens.

Introduction. Welcome. Thanks for participating in this experiment. If you follow the instructions carefully you can earn an amount of money that will be paid to you in cash at the end of the experiment. During the experiment you are not allowed to talk or communicate in any way

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with the other participants. If you have questions raise your hand and one of the assistants will come to you. The rules that you are reading are the same for all participants.

General rules. In this experiment there are 24 persons who will interact for 12 periods. At the beginning of the experiment you will be randomly and anonymously assigned to a group of four people. Therefore, of the other three people in your group you will know neither the identity nor the earnings. Finally, the composition of your group will remain unchanged throughout the experiment.

How your earnings are determined. In each of the 12 periods you and each other subject in your group will be assigned an endowment of 55 tokens. Thus, the group will have a total of 220 tokens. In each period of the experiment, you have to decide how to allocate your endowment of tokens between a PRIVATE ACCOUNT and four COLLECTIVE ACCOUNTS denominated SQUARE, TRAPEZOID, RECTANGLE and DIAMOND. The five accounts generate a return expressed in points according to the following rules.

PRIVATE ACCOUNT: For each token allocated by you to the PRIVATE ACCOUNT, you receive 2 points.

COLLECTIVE ACCOUNTS (SQUARE, TRAPEZOID, RECTANGLE, DIAMOND): You receive points from any of the four COLLECTIVE ACCOUNT if and only if the number of tokens allocated to it by your group is greater than or equal to a pre-specified number that is called "threshold". The threshold is the same across the four collective accounts and is represented by 132 tokens. In particular:

- If the number of tokens allocated to a COLLECTIVE ACCOUNT by your group is less than or equal to the threshold on 132 tokens, then you do not receive any point from those tokens.
- If the number of tokens allocated to a COLLECTIVE ACCOUNT by your group is equal to or greater than the threshold of 132 tokens, then:
  (1) for each token allocated to the COLLECTIVE ACCOUNT by you or any other group member, you receive 1 point;
  (2) additionally, you receive an additional number of 30 points as "bonus." Notice that the size of the bonus is the same for all the four collective accounts.

How to make your choice. At the beginning of the first period, before you and the other members of your group make your choice, the computer will randomly draw one of four signals:
- "The collective account suggested to your group is the *SQUARE*";
- "The collective account suggested to your group is the *TRAPEZOID*";
- "The collective account suggested to your group is the *RECTANGLE*";
- "The collective account suggested to your group is the *DIAMOND*".

The drawn signal will be shown to all the members of your group and will remain the same throughout the 12 periods of the experiment.

At the beginning of each period, the computer will display your endowment, the signal randomly drawn by the computer for your group and four input fields, one for the one for the PRIVATE ACCOUNT, one for the collective account SQUARE, one for collective account RECTANGLE, one for collective account TRAPEZOID, and one for collective account DIAMOND. For each subject in the group, the order in which the four input fields for the four COLLECTIVE ACCOUNTS are displayed on the screen is randomly determined by the computer. The number of tokens you allocate to each of the accounts cannot be greater than your endowment and your allocations must add up to 55 tokens.

At the end of each period the computer will display how many tokens you have allocated to the PRIVATE ACCOUNT, how many tokens you have allocated to each of the four COLLECTIVE ACCOUNTS, how many tokens have been allocated by your group to each of the four COLLECTIVE ACCOUNTS, how many points you have obtained from the PRIVATE ACCOUNT, how many points you have obtained from each of the four COLLECTIVE ACCOUNTS, and how many points you have obtained in total in the period.

At the end of the experiment the total number of points you have obtained in the 12 periods will be converted into Euro at the rate 100 points = 1 Euro.

B. Screenshots

As follows, we include the English version of the screenshots (computerized using the $z-$ *Tree* software) in 4G_RS. The original screenshots were written in Italian. The only difference between the screenshots shown for 4G_RS and those for 4G_EE is that, in the latter, the random signal is not shown. The differences between the screenshots shown for 4G_RS and those for 4G_1ME (4G_1LE) are: (i) the size of the bonus of the three identical public goods TRAPEZOID, RECTANGLE and DIAMOND is set to 20 (40); (ii) 4G_1ME (4G_1LE) does not contain any reference to the random signal. The differences between the screenshots shown for 4G_RS and those for 4G_EE/NC are: (i) 4G_EE/NC does not contain any reference to the random signal; (ii) the endowment in 4G_EE/NC is set equal to 220 tokens. The differences between the screenshots shown for 4G_RS and those for 1G are: (i) 1G does not contain any reference to the random signal; (ii) in 1G only two boxes are shown: one for the private account and one for the collective account.

FIGURE 1. SCREENSHOT OF CONTRIBUTION PAGE

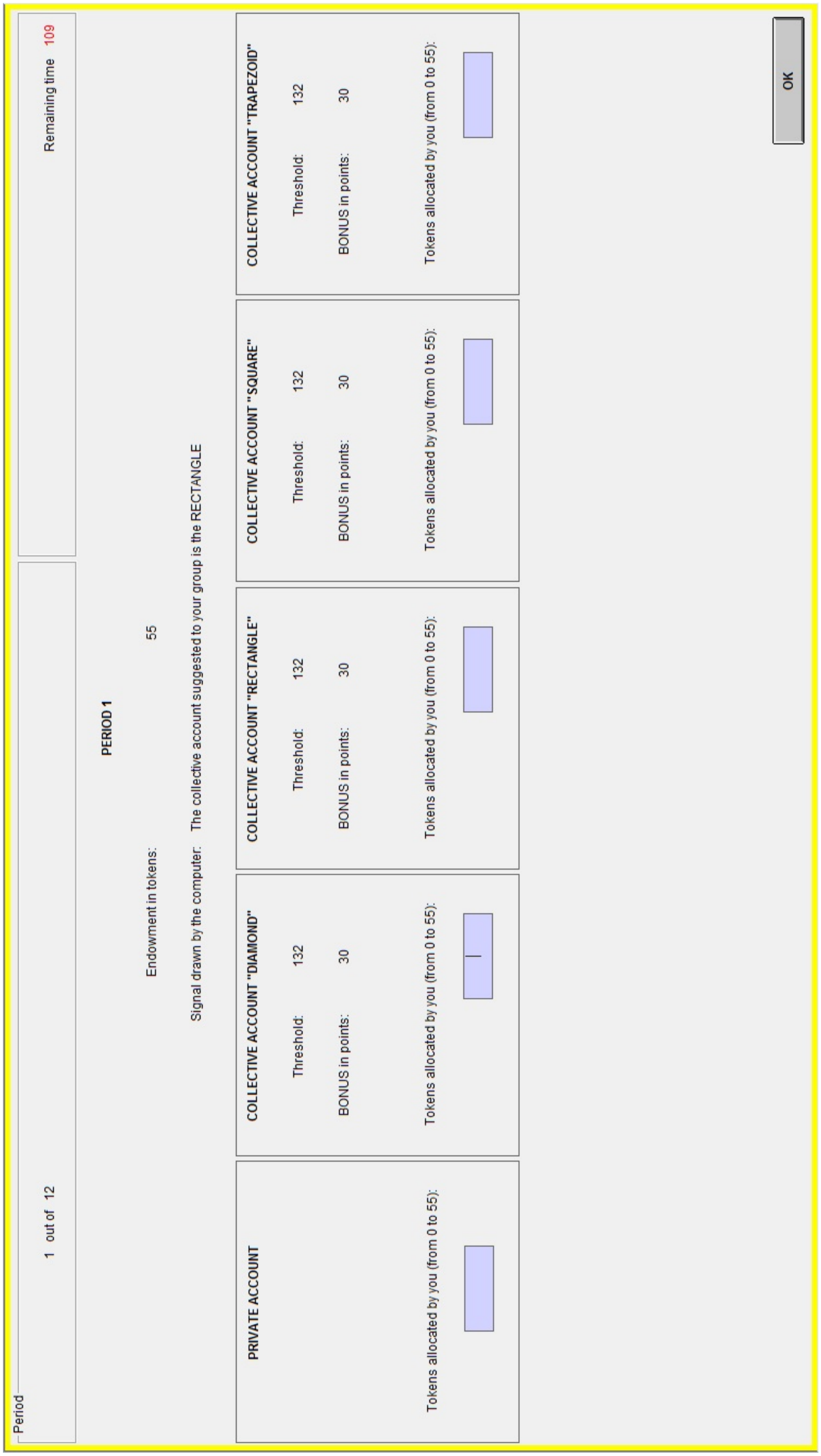
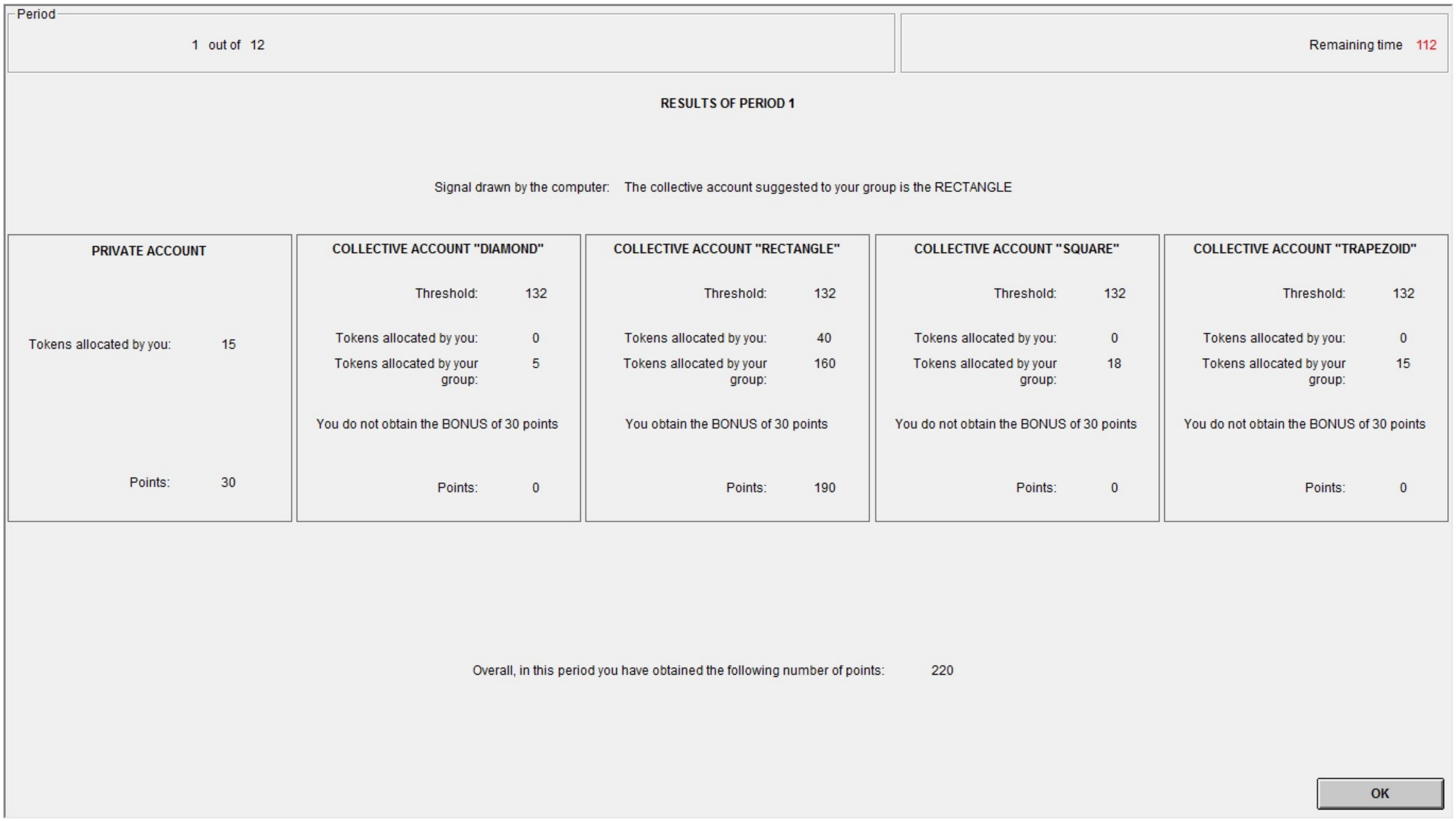


FIGURE 2. SCREENSHOT OF RESULTS PAGE



C. Performing different econometric specifications of Table 1: GLS with Random Effects

In order to check for robustness of the results in columns (1) and (2) of Table 1 concerning differences in overall contributions across treatments, Table C.1 reports estimates from alternative specifications based on group level observations.

In particular, columns (1) and (2) reports estimates from GLS regressions with one observation per group (averaging contributions overall periods) and random effects at the session level. Columns (3)-(6) of Table C.1 reports estimates from GLS regressions with 12 observation per group and random effects at the group level.

TABLE C.1. GLS with random effects for results in Table 1

	Overall Contributions					
	(1)	(2)	(3)	(4)	(5)	(6)
Trend				-0.251^{**}		-0.640^{***}
				(0.126)		(0.076)
4G_EE	-9.127^{*}	-9.127^{*}	-9.127^{**}	-9.127^{**}	-9.127^{*}	-9.127^{*}
	(4.833)	(4.802)	(4.628)	(4.628)	(4.802)	(4.802)
4G_1ME		-1.286			-1.286	-1.286
		(4.802)			(4.802)	(4.802)
4G_1LE		-10.267^{**}			-10.267^{**}	-10.267^{**}
		(4.802)			(4.802)	(4.802)
4G_RS		-7.281			-7.281	-7.281
		(4.802)			(4.802)	(4.802)
Constant	37.444^{***}	37.444^{***}	37.444^{***}	38.823^{***}	37.444^{***}	40.965^{***}
	(3.417)	(3.396)	(3.272)	(3.345)	(3.396)	(3.421)
R^2	0.150	0.121	0.110	0.114	0.090	0.115
$Wald-\chi^2$	3.57	7.55	3.89	7.86	7.55	78.68
$Prob > \chi^2$	0.059	0.110	0.049	0.020	0.110	0.000
Obs.	24	60	288	288	720	720

Notes. This table reports coefficient estimates (standard errors in parentheses) from random-effects GLS regressions accounting for random effects at either the session (columns (1) and (2)) or the group (columns (3)-(6)) level. The other remarks regarding Table 1 apply.

As shown by the table, results are comparable (in terms of both sign and magnitude of the treatment dummies) to those reported in Table 1. Also, according to a Wald test, we can reject the hypothesis of equality of contributions between 4G_1ME and 4G_1LE (in columns (2), (5) and (6): $\chi^2(1) = 3.50$, $p = 0.062$). Similarly, we cannot reject the hypothesis of equality of contributions between 4G_1ME and 4G_RS (in columns (2), (5) and (6): $\chi^2(1) = 1.56$, $p = 0.212$).

D. Performing different econometric specifications of Table 6

GLS with Random Effects. Table D.1 reports results from the above-mentioned robustness checks applied to Table 5 in the paper. In particular, columns (1) reports estimates from GLS regressions with one observation per group (averaging contributions overall periods) and random effects at the session level.

Columns (2) and (3) report estimates from GLS regressions with 12 observation per group and random effects at the group level.

TABLE D.1. GLS with random effects for the results in Table 5

	RelContributions		
	(1)	(2)	(3)
Trend			-0.010^{***}
			(0.002)
4G_EE	-0.166^{*}	-0.166^{**}	-0.166^{**}
	(0.098)	(0.084)	(0.084)
4G_EE/NC	-0.245^{**}	-0.245^{***}	-0.245^{***}
	(0.098)	(0.084)	(0.084)
Constant	0.681^{***}	0.681^{***}	0.733^{***}
	(0.069)	(0.059)	(0.060)
R^2	0.21	0.16	0.18
$Wald - \chi^2$	6.52	8.86	37.65
$Prob > \chi^2$	0.038	0.012	0.000
Obs.	36	432	432

Notes. This table reports coefficient estimates (standard errors in parentheses) from random-effects GLS regressions accounting for random effects at either the session (column (1)) or the group (columns (2) and (3)) level. The other remarks on Table 5 apply.

Again, results of the robustness checks are comparable (in terms of both sign and magnitude of the treatment dummies) to those in Table 5 in the paper. Also, according to a Wald test, we cannot reject the hypothesis of equality of contributions between 4G_EE and 4G_EE/NC (in column (1): $\chi^2(1) = 0.65$, $p = 0.419$; in columns (2) and (3): $\chi^2(1) = 0.89$, $p = 0.346$).

Using a different definition of Coord$(\mathbf{t}-\mathbf{1})$. Table D.2 reports results from regressions that are based on the same parametric specification used in columns (2) and (3) of Table 5 introducing a different definition of $Coord(t-1)$. Indeed, in the following table, $\widetilde{Coord}(t-1)$ assumes value 1 if, in the previous period, (i) the subject's group reached the threshold on one public good in 1G and 4G_EE and (ii) the subject's group reached the threshold on at least one of the available public goods in 4G_EE/RS.

TABLE D.2. Resuls in Table 5 using a different definition of $Coord(t-1)$

	RelContributions	
	(1)	(2)
$RelOthers(t-1)$	0.129^{***}	
	(0.016)	
$RelOthers(t-1)*\widetilde{Coord}(t-1)$	0.013	
	(0.010)	
$\widetilde{Coord}(t-1)$		0.139^{***}
		(0.015)
Trend	-0.008^{***}	-0.013^{***}
	(0.002)	(0.002)
4G_EE	-0.086^{*}	-0.115
	(0.051)	(0.072)
4G_EE/NC	-0.150^{***}	-0.247^{***}
	(0.052)	(0.072)
Constant	0.437^{***}	0.642^{***}
	(0.046)	(0.053)
$\log l$	159.9	139.1
$Wald-\chi^2$	237.11	150.54
$Prob > \chi^2$	0.000	0.000
Obs.	1584	1584

Notes. $\widetilde{Coord}(t-1)$ assumes value 1 if, in the previous period, (i) the subject's group reached the threshold on one public good in 1G and 4G_EE and (ii) the subject's group reached the threshold on at least one over the four public goods in 4G_EE/RS. The other remarks on Table 5 apply.

Results in Table D.2 are comparable (in terms of both sign and magnitude of the treatment dummies) to those reported in Table 5.

E. Additional results

Contributions to zero, one or more than 1 public good. Following the theoretical considerations in Section 3, we further investigate the subjects' contributions in two steps. First, we look at whether subjects in the treatments with multiple public goods tend to polarize their contributions on one public good, or if they split their resources over the four alternatives. Tables E.1-E.3 report, for each treatment and over periods, the frequencies of subjects who contribute to zero, one or more than one public good.

TABLE E.1. Frequencies of 0-contributions

Period	1	1 – 4	5 – 8	9 – 12	12	*All*
1G	0.042	0.052	0.052	0.083	0.125	0.063
4G_1ME	0.042	0.047	0.052	0.099	0.125	0.066
4G_1LE	0.083	0.182	0.266	0.318	0.375	0.255
4G_EE	0.229	0.188	0.266	0.266	0.271	0.240
4G_RS	0.063	0.104	0.203	0.281	0.312	0.196
1G – (4G_1ME)	0.000	0.005	0.000	−0.016	0.000	−0.003
1G – (4G_1LE)	−0.041	−0.130**	−0.214	−0.235	−0.250	−0.192
1G – (4G_EE)	−0.187***	−0.136**	−0.214	−0.183	−0.146	−0.177
1G – (4G_RS)	−0.021	−0.052	−0.151	−0.198	−0.187	−0.133
(4G_1ME) – (4G_1LE)	−0.041	−0.135**	−0.214*	−0.219	−0.250*	−0.189**
(4G_1ME) – (4G_EE)	−0.187***	−0.141***	−0.214**	−0.167	−0.146	−0.174**
(4G_1ME) – (4G_RS)	−0.021	−0.057**	−0.151**	−0.182	−0.187	−0.130*
(4G_1LE) – (4G_EE)	−0.146*	−0.006	0.000	0.052	0.104	0.015
(4G_1LE) – (4G_RS)	0.020	0.078	0.063	0.037	0.063	0.059
(4G_EE) – (4G_RS)	0.166**	0.084	0.063	−0.015	−0.041	0.054
Obs.(per treat.)	48	12	12	12	12	12

Notes. This table reports, for each treatment, the (mean) frequencies of subjects contributing nothing to the public goods over periods. The table also provides results from a (two-sided) Mann–Whitney rank-sum test for the null hypothesis that the frequency of one category in two treatments is the same. Significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE E.2. Frequencies of subjects who contributed to only one public good

Period	1	1 – 4	5 – 8	9 – 12	12	*All*
1G	0.958	0.948	0.948	0.917	0.875	0.938
4G_1ME	0.667	0.833	0.938	0.896	0.875	0.889
4G_1LE	0.417	0.521	0.677	0.672	0.604	0.623
4G_EE	0.292	0.521	0.656	0.693	0.688	0.623
4G_RS	0.646	0.714	0.719	0.672	0.646	0.701
1G – (4G_1ME)	0.292***	0.115**	0.010	0.021	0.000	0.049
1G – (4G_1LE)	0.542***	0.427***	0.271**	0.245*	0.271	0.314***
1G – (4G_EE)	0.667***	0.427***	0.292**	0.224	0.188	0.314***
1G – (4G_RS)	0.312***	−0.234**	0.229*	0.245*	0.229*	0237**
(4G_1ME) – (4G_1LE)	0.250**	0.313***	0.260***	0.224*	0.271*	0.266***
(4G_1ME) – (4G_EE)	0.375***	0.313***	0.281***	0.203	0.188	0.266***
(4G_1ME) – (4G_RS)	0.021	−0.119	0.219**	0.224**	0.229	0.188*
(4G_1LE) – (4G_EE)	0.125	0.000	0.021	−0.021	−0.083	0.000
(4G_1LE) – (4G_RS)	−0.229**	−0.427**	−0.042	0.000	−0.042	−0.078
(4G_EE) – (4G_RS)	−0.354***	−0.427**	−0.063	0.021	0.042	−0.078
Obs.(per treat.)	48	12	12	12	12	12

Notes. This table reports, for each treatment, the (mean) frequencies of subjects who contributed to (only) one public good over periods. The same remarks of Table E.1 apply.

TABLE E.3. Frequencies of subjects who contributed to more than one public good

Period	1	$1-4$	$5-8$	$9-12$	12	*All*
4G_1ME	0.292	0.120	0.010	0.005	0.000	0.045
4G_1LE	0.500	0.297	0.057	0.010	0.021	0.121
4G_EE	0.479	0.292	0.078	0.042	0.042	0.137
4G_RS	0.292	0.182	0.078	0.047	0.042	0.102
(4G_1ME) – (4G_1LE)	-0.208^{**}	-0.177^{*}	-0.047	-0.005	-0.020	-0.076^{*}
(4G_1ME) – (4G_EE)	-0.188^{*}	-0.172^{**}	-0.068^{*}	-0.036	-0.042	-0.092^{***}
(4G_1ME) – (4G_RS)	0.000	-0.062	-0.068	-0.042	-0.042	-0.057
(4G_1LE) – (4G_EE)	0.021	0.005	-0.021	-0.031	-0.020	-0.016
(4G_1LE) – (4G_RS)	0.208^{**}	0.115	-0.021	-0.037	-0.021	0.019
(4G_EE) – (4G_RS)	0.187^{*}	0.110^{*}	0.000	-0.005	0.000	0.035^{*}
Obs.(per treat.)	48	12	12	12	12	12

Notes. This table reports, for each treatment, the (mean) frequencies of subjects who contributed to more than one public good over periods. The same remarks of Table E.1 apply.

The frequency of subjects who contribute to more than one public good is significantly higher in 4G_1LE and 4G_EE than in 4G_1ME, with this effect being more pronounced in the first four periods of the experiment. Moreover, the proportion of 0-contributors in 4G_1LE and 4G_EE is about four times higher than in either 1G or 4G_1LE. The previous evidence is coherent with the idea that, in treatments in which salience does not represent an effective coordination device (4G_1LE and 4G_EE), subjects try to minimize the risk of mis-coordination by either spreading contributions over the alternative public goods or free-riding. Interestingly, the frequency of 0-contributors is significantly higher in 4G_RS than in 4G_1ME while the frequency of subjects contributing to more than one public good is relatively small in both treatments and not statistically distinguishable. Thus, while inducing subjects to polarize their contributions to (only) one public good, the random signal in 4G_RS is less powerful than salience manipulation in 4G_1ME in preventing free-riding.

Contributions based on salience and contributions based on efficiency. Second, by focusing on 4G_1LE, 4G_1ME and 4G_RS, we classify subjects' contributions according to the following two categories.

(1) *"Contributions based on salience"*: subjects only make positive contributions to the salient public good.

(2) *"Contributions based on efficiency"*: subjects only make positive contributions to the most efficient public good(s).

Table E.4 reports the frequencies of the two contribution categories in the three treatments.

TABLE E.4. Contributions based on saliences and efficiency

Period	1	$1-4$	$5-8$	$9-12$	12	*All*
4G_1ME	0.667	0.828	0.938	0.896	0.875	0.887
4G_RS	0.646	0.714	0.719	0.672	0.646	0.701
4G_1LE(eff)	0.354	0.467	0.625	0.589	0.521	0.561
4G_1LE(sal)	0.146	0.104	0.057	0.083	0.083	0.082
4G_1ME-4G_RS	0.021	0.114	0.219^{**}	0.224^{**}	0.229^{*}	0.186^{*}
(4G_1ME)-(4G_1LE(eff))	0.313^{***}	0.359^{***}	0.313^{***}	0.308^{***}	0.354^{***}	0.326^{***}
(4G_1ME)-(4G_1LE(sal))	0.521^{***}	0.724^{***}	0.880^{**}	0.813^{*}	0.792^{**}	0.806^{***}
(4G_RS)-(4G_1LE(eff))	0.292^{**}	0.247^{**}	0.094	0.083	0.125	0.140
(4G_RS)-(4G_1LE(sal))	0.500^{***}	0.610^{***}	0.662^{***}	0.589^{***}	0.563^{***}	0.619^{***}
(4G_1LE(eff))-(4G_1LE(sal))	0.208^{**}	0.365^{***}	0.568^{***}	0.505^{**}	0.438^{**}	0.479^{***}
Obs. (*per treat.*)	48	12	12	12	12	12

Notes. This table reports the frequencies of subjects in 4G_1ME, 4G_1LE and 4G_RS who contributed according the "focus on efficiency" and "focus on salience" strategies over periods. The table also provides results from both a (two-sided) Mann–Whitney rank-sum test for the null hypothesis that the frequency of one category in two treatments is the same and a (two-sided) Wilcoxon signed-rank test for the null hypothesis that the difference between the frequencies of the two strategies in 4G_1LE is null. Significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

As indicated by Table E.4, by averaging over all periods, the frequency of subjects focusing on salience in 4G_1ME and 4G_RS is higher than the frequency of subjects focusing on salience in 4G_1LE. Moreover, in line with results in Table 2 in the paper, subjects in 4G_1LE tend to focus significantly more on efficiency than on salience (according to a two-sided Wilcoxon signed-rank test, $p < 0.05$ for any subgroup of periods and $p < 0.01$ overall periods).

Number of groups that successfully contributed above the threshold, by period. Table E.5. reports the number of groups reaching the threshold in each period (and overall) in the four treatments.

TABLE E.5. Number of groups that reach the threshold

Period	1	2	3	4	5	6	7	8	9	10	11	12	*All*
1G	9	10	10	8	11	9	11	10	10	10	9	9	116
4G_1ME	9	10	10	11	11	11	10	9	9	8	10	8	116
4G_1LE	0	0	1	3	6	8	6	7	8	6	5	4	54
4G_EE	0	4	5	4	6	8	8	7	7	8	7	5	69
4G_RS	7	8	7	8	7	8	7	7	9	8	8	7	91
1G – 4G_1ME	0	0	0	-3	0	-2	1	1	1	2	-1	1	0
1G – 4G_1LE	9***	10***	9***	5**	5**	1	5**	3	2	4*	4*	5**	62***
1G – 4G_EE	9***	6**	5**	4	5**	1	3	3	3	2	2	4*	47***
1G – 4G_RS	2	2	3	0	4*	1	4*	3	1	2	1	2	25***
4G_1ME – 4G_1LE	9***	10***	9***	8***	5**	3	4*	2	1	2	5**	4*	62***
4G_1ME – 4G_EE	9***	6**	5**	7***	5**	3	2	2	2	0	3	3	47***
4G_1ME – 4G_RS	2	2	3	3	4*	3	3	2	0	0	2	1	25***
4G_1LE – 4G_EE	0	-4**	-4*	-1	0	0	-2	0	1	-2	-2	-1	-15*
4G_1LE – 4G_RS	-7***	-8***	-6***	-5**	-1	0	-1	0	-1	-2	-3	-3	-37***
4G_1EE – 4G_RS	-7***	-4	-2	-4	-1	0	1	0	-2	0	-1	-2	-22***

Notes. This table reports, in each treatment and in each period, the number of groups (from 0 to 12) reaching the threshold. The table also provides results from a two-sample test of proportions for the null hypothesis of equality of frequency of groups reaching the threshold in two treatments. Significance levels are denoted as follows: *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

While the proportion of groups in 1G and 4G_1ME that reach the threshold is greater than 50 percent in every period, in 4G_1LE and 4G_EE it is more volatile. Indeed, in 4G_1LE it remains below 50 percent in the first 4 periods, goes above 50 percent between period 5 and 10, and drops back to less than 50 percent in the last 2 periods. Similarly, in 4G_EE it remains below 50 percent in the first 4 periods and goes strictly above 50 percent between period 5 and 12. According to recursive partitioning, two splitting periods, 5 and 11, explain the greatest change in the probability of a group to reach the threshold in 4G_1LE (both the splitting periods are highly significant, $p - value < 0.01$). Similarly, in 4G_EE, we find only one significant splitting period, namely $t = 5$ ($p - value < 0.01$). By applying the same methodology to 1G and 4G_1ME, we do not find any significant splitting period.

F. Contributions in 4G_RS/NC

In this section, we report analysis on contributions, proportions of successful provisions and subject's earnings in 4G_RS/NC. The following figure shows the mean relative contribution to the collective account(s) over periods in 1G, 4G_EE, 4G_EE/NC and 4G_RS/NC.

Averaging over all periods, subjects in 4G_RS/NC contribute 45.44% of their endowment, below what observed in 1G, 4G_EE and not dissimilar from contributions in 4G_EE/NC. Table F.1 reports results from the same parametric analysis implemented in Table 1.

Figure 3. CONTRIBUTIONS IN NC TREATMENTS

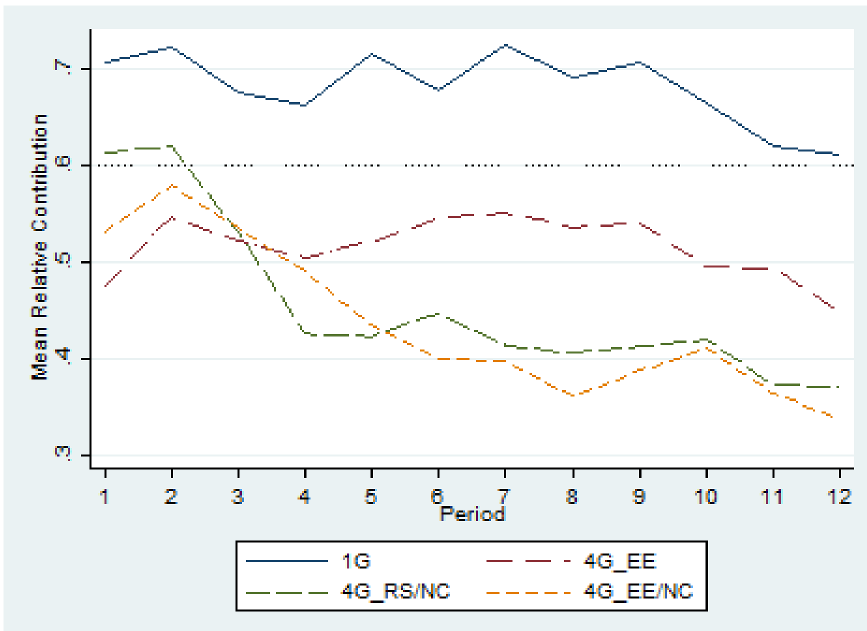


TABLE F.1. Determinants of relative contributions including NC treatments

	RelContributions		
	(1)	(2)	(3)
$RelOthers(t-1)$		0.127^{***}	
		(0.012)	
$RelOthers(t-1)*Coord(t-1)$		0.012	
		(0.008)	
$Coord(t-1)$			0.138^{***}
			(0.016)
Trend		-0.009^{***}	-0.015^{***}
		(0.001)	(0.001)
4G_EE	-0.166^{**}	-0.088^{*}	-0.115^{*}
	(0.077)	(0.050)	(0.068)
4G_EE/NC	-0.245^{***}	-0.144^{***}	-0.173^{**}
	(0.077)	(0.050)	(0.068)
4G_RS/NC	-0.226^{***}	-0.134^{***}	-0.143^{**}
	(0.077)	(0.051)	(0.069)
Constant	0.681^{***}	0.447^{***}	0.657^{***}
	(0.055)	(0.043)	(0.050)
$\log l$	-5.2	163.5	123.4
$Wald-\chi^2$	12.52	309.23	172.24
$Prob > \chi^2$	0.006	0.000	0.000
Obs.	2304	2112	2112

Notes. The same remarks on Table 1 apply.

In line with the graphical evidence, column (1) shows that contributions in 4G_RS/NC are significantly lower than those in 1G and not significantly different from what contributed in 4G_EE ($\chi^2(1) = 0.61$, $p = 0.433$) as well as in 4G_EE/NC ($\chi^2(1) = 0.06$, $p = 0.809$). These differences between treatments preserve their sign and statistical significance after the inclusion of additional covariates.

Performing different econometric specifications of Table F.1: GLS with Random Effects. Table F.2 reports results from the above mentioned robustness checks of Table F.1. In particular, columns (1) reports estimates from GLS regressions with one observation per group (averaging contributions overall periods) and random effects at the session level.

Columns (2) and (3) reports estimates from GLS regressions with 12 observation per group and random effects at the group level.

TABLE F.2. GLS with random effects for results in Table F.1.

	RelContributions		
	(1)	(2)	(3)
Trend			-0.0123^{***}
			(0.002)
4G_EE	-0.166^{*}	-0.166^{**}	-0.16594^{**}
	(0.088)	(0.081)	(0.081)
4G_EE/NC	-0.245^{***}	-0.245^{***}	-0.2450^{***}
	(0.088)	(0.081)	(0.081)
4G_RS/NC	-0.226^{**}	-0.226^{***}	-0.2263^{***}
	(0.088)	(0.081)	(0.081)
Constant	0.681^{***}	0.681^{***}	0.749^{***}
	(0.062)	(0.057)	(0.058)
R^2	0.207	0.149	0.178
$Wald - \chi^2$	9.60	11.48	72.83
$Prob > \chi^2$	0.022	0.009	0.000
Obs.	48	576	576

Notes. The same remarks on Table C.1 apply.

Again, results of the robustness checks are comparable (in terms of both sign and magnitude of the treatment dummies) to those reported in Table F.1.

Using a different definition of Coord$(\mathbf{t-1})$. Table F.3 reports results from regressions that are based on the same parametric specification used in columns (2) and (3) of Table F.1 but use a different definition of $Coord(t-1)$. Indeed, in the following table, $\widetilde{Coord}(t-1)$ assumes value 1 if, in the previous period, (i) the subject's group reached the threshold on one public good in 1G and 4G_EE and (ii) the subject's group reached the threshold on at least one over the four public goods in 4G_EE/RS.

TABLE F.3. Results in Table F.1 under an alternative definition of $Coord(t-1)$

	RelContributions	
	(1)	(2)
$RelOthers(t-1)$	0.122^{***}	
	(0.015)	
$RelOthers(t-1){*}\widetilde{Coord}(t-1)$	0.013	
	(0.010)	
$\widetilde{Coord}(t-1)$		0.131^{***}
		(0.014)
Trend	-0.008^{***}	-0.013^{***}
	(0.001)	(0.001)
4G_EE	-0.090^{*}	-0.118^{*}
	(0.051)	(0.070)
4G_EE/NC	-0.156^{***}	-0.248^{***}
	(0.051)	(0.070)
4G_RS/NC	-0.151^{***}	-0.249^{***}
	(0.051)	(0.070)
Constant	0.456^{***}	0.651^{***}
	(0.044)	(0.051)
$\log l$	163.3	132.4
$Wald-\chi^2$	304.53	189.47
$Prob > \chi^2$	0.000	0.000
Obs.	2112	2112

Notes. The same remarks on Tables D.2 and F.1 apply.

As shown by the table, results are comparable (in terms of both sign and magnitude of the treatment dummies) to those reported in Table F.1.

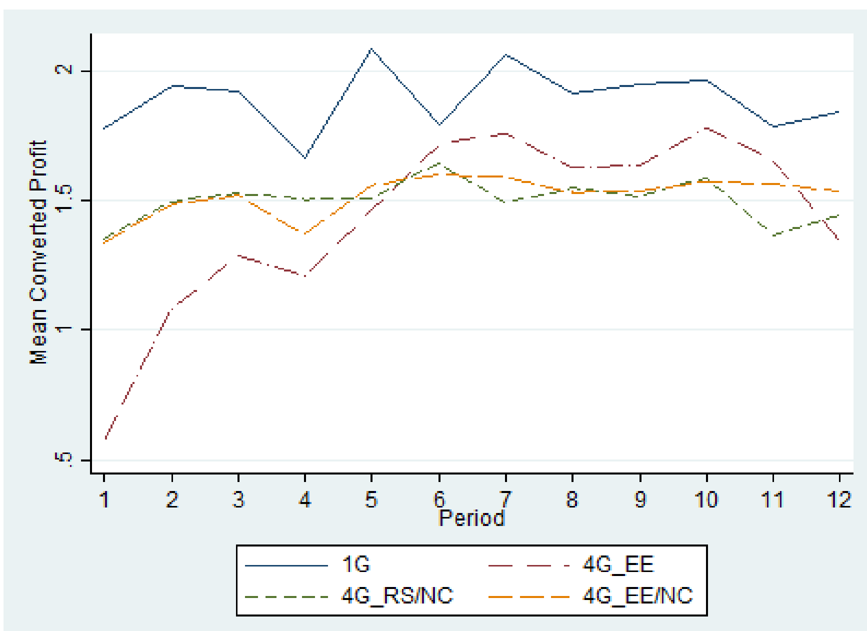
Proportions of successful provisions and subject's earnings in 4G_RS/NC. Table F.4 reports results on proportion of successful provision and earnings by running the same analysis of Table 6 in the paper.

Results are very similar to those observed in 4G_EE/NC and discussed in the paper. Indeed, the upper part of Table F.4 shows that, when using the less restrictive definition of successful provision, no significant differences between 4G_RS/NC and 1G are detected over periods. However, when the more restrictive definition is used, we find a significantly lower ability to successfully contribute above the threshold in 4G_RS/NC than in 1G. Instead, irrespective of which definition is used, we find no significant differences in successful provisions between 4G_RS/NC and 4G_EE as well as between 4G_RS/NC and 4G_EE/NC.

Figure 4 shows mean earnings (expressed in euro) in 1G, 4G_EE, 4G_EE/NC and 4G_RS/NC over periods.

As shown by the graph and confirmed by the non parametric tests reported in the lower part of Table F.4, we observe differences in earnings between 1G and 4G_RS/NC that are significant at the 5% level. Moreover, we observe no significant differences in subject's earnings between 4G_RS/NC and 4G_EE as well as between 4G_RS/NC and 4G_EE/NC. Thus, making one public good salient[1] through a random signal in the non binding constraint setting does not improve efficiency relative to 4G_EE and 4G_EE/NC.

FIGURE 4. EARNINGS IN NC TREATMENTS



[1]As in 4G_RS, we find that subjects in 4G_RS/NC contribute significantly more to the salient (i.e. featured by the random signal) alternative. According to a Wilcoxon signed-rank test, the difference between the amount contributed to the salient public good and the amount contributed to any of the non salient public goods is positive and higly significant ($p < 0.01$) for any subset of periods.

TABLE F.4. Proportion of successful provision and earnings in 4G_RS/NC

Period	1	1 − 4	5 − 8	9 − 12	12	*All*
Mean proportion of successful provision						
4G_RS/NC(1pg)	0.917	0.938	0.896	0.792	0.750	0.875
4G_RS/NC(4pgs)	0.000	0.063	0.125	0.167	0.167	0.118
4G_RS/NC(1pg) – 1G	0.167	0.167	0.042	0.000	0.000	0.069
4G_RS/NC(4pgs) – 1G	-0.750^{***}	-0.708^{***}	-0.729^{***}	-0.625^{***}	-0.583^{***}	-0.688^{***}
4G_RS/NC(1pg) – 4G_EE	0.917^{***}	0.667^{***}	0.292^{**}	0.229	0.333	0.396^{***}
4G_RS/NC(4pgs) – 4G_EE	0.000	-0.208^{*}	-0.479^{***}	-0.396^{**}	−0.250	-0.361^{**}
4G_RS/NC(1pg) – 4G_EE/NC(1pg)	0.167	0.084	0.146	0.084	0.083	0.104
4G_RS/NC(4pg) – 4G_EE/NC(4pg)	-0.250^{*}	−0.166	−0.125	−0.083	−0.083	−0.125
Subject's earnings						
4G_RS/NC	1.354	1.472	1.551	1.482	1.449	1.502
4G_RS/NC – 1.10	0.254^{**}	0.372^{***}	0.451^{***}	0.382^{***}	0.349^{**}	0.402^{***}
4G_RS/NC – 1G	-0.426^{**}	-0.357^{*}	-0.417^{***}	-0.405^{**}	-0.393^{**}	-0.392^{**}
4G_RS/NC – 4G_EE	0.776^{***}	0.433^{**}	−0.093	−0.123	0.104	0.072
4G_RS/NC – 4G_EE/NC	0.016	0.042	−0.022	−0.073	−0.090	−0.017
Obs.(per treat.)	12	12	12	12	12	12

Notes. The same remarks on Table 6 apply.