Voluntary public goods provision using a coalition mechanism: Some experimental results

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Abstract

We test a model of public goods where agents have heterogeneous prosocial preferences that are private information. The model introduces a coalition stage and predicts that those who care more about others will join the coalition and vote to contribute. We find that subjects who give more money in an initial Dictator game are more likely to join the coalition and contribute to the public good. Moreover, the predictions of the theoretical model hold up as well. Thus, coalitions solve the asymmetric information problem by sorting people into contributors and non-contributors. Additionally, we find that unlike in a typical public goods game, contribution remain stable over time in the treatment with coalitions. Finally, increasing the marginal per capita return from the public good leads to both an increase in coalition size and contributions.

Keywords: Coalitions, Social Preferences, Public Goods
JEL Classification: C7, C9, H4

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Introduction

Economic theory tells us that when a public good has to be provided through a voluntary contributions mechanism, selfish individuals will free ride leading to an inefficient outcome. This result has motivated a large literature on mechanism design in public goods games for increasing levels of cooperation and efficiency (Laury and Holt (2008), Ledyard (1995)).[1] This focus of our paper is on coalitions which represent another type of promising mechanism. We investigate a recent theoretical model that uses coalitions to improve public good provision in the lab Ball et al. (2023). Players in the model care about their own payoffs, but have prosocial preferences, i.e., they also care about the payoff of the least well of person in society, which is consistent with other research in this sub-field Charness and Rabin (2002). Moreover, these preferences are private information, i.e., individuals only know their own preferences. Thus the model captures reality by allowing for heterogeneity in preferences and asymmetric information about them. The public good provision takes place in two stages. In Stage I players decide whether to join a coalition or not. In Stage II those who join the coalition then use majority voting to decide whether to provide the public good. The outcome of the vote is binding on all and those who do not join the coalition (fringe members) can independently decide what they want to do regarding the public good. Contributions to the public are binary which captures another important aspect − every player makes the same contribution.

In the lab our subjects first play a Dictator game where we prime subjects to consider giving to the least well-off person in society. We use the Dictator game as a way to measure prosocial preferences of our subjects. Then the subjects play a standard public good game for eight rounds before playing twelve rounds of the model described above. We consider two different marginal per capita return (MPCR) parameters for the public good.

We find that the subject's decision in the dictator game is a good indicator of who will cooperate in the public good game. Subjects who give more money in the dictator game are more likely to join the coalition and contribute to the public good. Our experimental results support the model's predictions suggestion that coalitions might be a good way to improve public good provision by sorting players into contributors and non-contributors or fringe players.[2] Coalitions also

[1]Some well-studied mechanisms include allowing a pre-play communication stage (Isaac and Walker (1988), Ostrom et al. (1994), Haruvy et al. (2017), Reischmann and Oechssler (2018)) prior to making contribution decision and allowing punishment of free riders (Ostrom et al. (1994), Fehr and Gächter (2000), Anderies et al. (2011), Ramalingam, Morales and Walker (2019)) both of which facilitate higher contributions to the public good (Chaudhuri (2011)).

[2]Note that while coalitions have been shown to increase efficiency, the type of cooperation agreement the coalition selects can greatly affect the extent of observed efficiency gains (Hoel

help in sustaining cooperation levels over time, a result different from typical public good games. We also find that increasing MPCR can ensure more people join the coalition and contribute to the public good.

Our work contributes to the literature on mechanisms to increase voluntary contributions to public goods. One difficulty with conventional mechanisms, however, is that they do not credibly signal others' intentions prior to contribution decisions being made. This, plus the incentive to free ride, reduces contributions (Fischbacher and Gachter (2010)). In our setting, the condition for joining the coalition is the same as that for contributing. Since players learn how many others join the coalition prior to making their contribution decision, they know how many others are likely to contribute, and can confidently make their own contribution decisions. This feature is especially useful in heterogeneous groups, and grows more valuable as variation in social preferences increases. This type of sorting function for coalitions is quite different from what exists in the the literature. Some papers that rely on coalitions establish a minimum participation threshold for forming a coalition and once the threshold is satisfied coalitions form (Burger and Kolstad (2009), Kosfeld, Okada and Riedl (2009), McEvoy (2010), Kolstad (2014), Weikard, Wangler and Freytag (2015)). Another studied approach requires coalition members to announce their planned contribution levels and then set a binding rule wherein all coalition members must contribute the minimum of these announced levels (Dannenberg, Lange and Sturm (2014), Schmidt and Ockenfels (2021)). In our experiment coalitions determine the outcome endogenously through majority voting.

Our paper also adds to the literature on social preferences/other-regarding preferences. Existing literature identifies social preferences as one of the reasons to understand cooperation in public good games (Chaudhuri (2011), Fehr and Fischbacher (2002)). Cooperation can increase when individuals reciprocate (Rabin (1993), Fehr and Fischbacher (2002)), when players are altruistic (Andreoni, Harbaugh and Vesterlund (2010)), when players prefer equal payoffs (Fehr and Schmidt (1999)), prioritize equality and efficiency (Engelmann and Strobel, 2004) or when they care about the most disadvantaged player Charness and Rabin (2002), Ball et al. (2023). Yet since individual preferences are private information it is often difficult to rely on social preferences for the provision of public goods. Our experiments shows that a two stage game where we allow for coalition formation in Stage I can sort people according to their prosocial preferences which facilitates the provision of public goods. We find that those who care more about others (based on how much they give in the Dictator game) join the coalition more often and

(1992)). Less ambitious coalitions that have lower costs associated with joining may achieve broader participation and higher levels of cooperation (Finus and Maus (2008)). Coalitions can generate cooperation among coalition members using strategies such as punishing members who fail to uphold the coalition agreement (Barrett (1994), Kosfeld, Okada and Riedl (2009)).

contribute as well.

Third, our approach is compatible with environments with heterogeneity in individual preferences, a feature which has previously been used to explain varied cooperation levels in a society (Gunnthorsdottir, Houser and McCabe, 2007). When players are classified into 'free riders' and 'cooperators' (contributes more than 30 %). We take a similar approach and classify individuals based on their decision in a one-round dictator game, and find that more pro-social participants contribute more to the public good. The decline in contribution level generally observed in public good games can be explained by conditional cooperators updating their beliefs about others heterogeneous preferences (Fischbacher and Gachter, 2010). Interestingly, the decision to join a coalition acts as a signal of people's willingness to cooperate and can serve to provide information about conditional cooperation even in a one-shot game. Moreover, we find that our coalition mechanism stops this decline by sorting players based on whether or not they join the coalition, decisions which are observed prior to making contributions decisions.

Finally, our paper contributes to the literature in understanding the relationship between coalition size and MPCR. Theoretically, there is an inverse relationship between coalition size and MPCR (Barrett (1994), Kolstad (2012)). This result is in contrast to recent experimental evidence which suggests the existence of large sized coalitions even in the presence of high MPCR (Burger and Kolstad, 2009; Kosfeld, Okada and Riedl, 2009). In their paper, Ball et al. (2023) provide conditions required to ensure a positive relationship between coalition size and MPCR. Both in theory model and in these experiments, higher MPCR leads to larger coalition size and more contributors.

The rest of this paper is organized as follows. The next section, Model, summarizes the theoretical predictions of Ball et al. (2023) Following this, in Section 3 we discuss the experimental design and hypotheses. This is followed by a section where we report our experimental results, and finally a discussion of the results in the concluding section.

Model

Our experimental design and hypotheses are based on a public goods game that uses coalitions to sort players so that those who join the coalition will contribute to the public good, but the remaining players will not (Ball et al. (2023)). Below we briefly summarize this model and provide the theoretical predictions for the parameters used in our experiment. Consider a set of $N = \{1, 2, \cdots, n\}$ players with unit endowment. Players will ultimately make a binary decision about whether to contribute to the public good. Hence the action set of a player is denoted by $e_i \in \{0, 1\}$, where $e_i = 1$ implies player i contributes to the public good and $e_i = 0$

implies that they do not. In Stage I of the game each player decides whether or not to join a coalition, denoted by the set M. Players that do not join the coalition are referred to as fringe members and denoted by set F. In Stage II, coalition members use a binding majority vote to decide whether they will contribute to the public good, while fringe members independently decide whether to contribute.

The payoff function for each player is private information, consisting of a convex combination of their "own payoff" (with weight λ_i) and a "social payoff" (with weight $1 - \lambda_i$). We assume that λ_i is drawn from a uniform distribution on [0,1]. For simplicity, the model assumes that social preferences are such that players care about payoff of the least well off player. The MPCR of player $i \in N$ is denoted by $\gamma > 0$. Moreover, let Q be the number of players who contribute to the public good. Then the lowest own payoff is received by those who contribute to the public good and is given by γQ, while those who do not contribute ($e_i = 0$), earn a payoff of $1 + \gamma Q$. Letting e_i and e_{-i} denote the usual objects, and assuming $Q > 1$, the total (weighted) payoff of a player i is given by:

$$\pi_i(e_i, e_{-i}) = \begin{cases} \lambda_i(\gamma Q) + (1 - \lambda_i)\gamma Q = \gamma Q & \text{for } e_i = 1, \\ \lambda_i(1 + \gamma Q) + (1 - \lambda_i)\gamma Q & \text{for } e_i = 0, \end{cases} \tag{1}$$

Backward induction determines the Stage II contribution decision. Recall that in Stage II the coalition contributes to public good if the majority of the members vote to contribute. Let $\lambda_M = \gamma M$ and $\lambda_F = \gamma$. Proposition I establishes the conditions for contributing to the public good.

Proposition I: *In equilibrium, all coalition members whose personal payoff weight does not exceed λ_M will vote to contribute to the public good (hence contribute) and all fringe members whose personal payoff weight does not exceed λ_F will contribute.*

Note that the threshold values in both cases can also be interpreted as the probability that the individuals in the two groups will contribute. Moreover, contributions are increasing both in the size of the coalition (M) and the benefit of cooperation (γ). Using Stage II results we can obtain conditions for joining the coalition, as expressed in Proposition II.

Proposition II: *In equilibrium, all players for whom $\lambda_i \leq \gamma$ is satisfied join the coalition.*

From Proposition II, we see that only individuals with relatively lower weight on their own payoff ($\lambda_i \leq \gamma$) will join the coalition. Thus, for the sorting mechanism to work, we need individuals to be pro-social. Essentially what these propositions say is the following: If individuals have a low selfishness parameter λ_i meaning they significantly care about the well-being others, we expect them to join the coalition and cooperate. An increase in the MPCR γ increases both the probability of joining the coalition and the probability of contributing to the public good. This establishes a positive relationship between coalition size and MPCR.

While this is a highly stylized model, it captures some interesting features which we believe makes it ideal to test in the lab. First, it allows for the fact that players maybe heterogeneous in how much they care for themselves and for others. Second, this knowledge is private information. Finally, when it comes to contributing for the public good, heterogeneity is not permitted − contributions are binary. This makes the model worth investigating in the lab and possibly putting into practice.

Experimental design

Each experimental session consisted of two different economic games: a Dictator game followed by a series of Public Goods games. In the Dictator game one player divides an allocation between themselves and a Recipient. In this case participants divided 25 points between themselves and the Recipient in 2.5 point increments (see Table 2)[3]. The purpose of the dictator game is to get a measure of individual preferences, a strategy that has been previously successfully employed by other researchers (see for instance Dannenberg et al. (2007), Harbaugh and Krause (2000)), though researchers have also relied on first-period VCM results to measure preferences (Gunnthorsdottir, Houser and McCabe (2007)). To match the assumptions of the model, recipients in the Dictator game were described as "a person who participated in a previous experiment but earned the lowest amount of money of anyone in their session." Based on previous research we expect this language to, on average, increase altruistic behavior relative to Dictator games with no information about the recipient, resulting in increased transfers (Brañas-Garza (2006), Brañas-Garza (2007),Eckel and Grossman (1996)). Note that lowest earners from previously conducted experiments were not participants in the current study, but were contacted and truthfully paid an unexpected bonus based on the decision of the Dictators in this experiment.

Following the Dictator game there were two blocks of Voluntary Contribution Mechanism (VCM) games. Participants played 8 rounds of a traditional VCM without coalitions (hereafter the VCM treatment) followed by 12 rounds of a VCM with coalitions (hereafter the Coalition treatment). Each participant in both treatments saw a mix of low MPCR ($\gamma = 0.3$) and high MPCR ($\gamma = 0.7$). Feedback was provided to participants at the end of each round as described below.

In each VCM round participants were assigned to groups consisting of 6 players with group members randomly reassigned after every round. At the start of each round subjects received a 10 point endowment that could be allocated entirely to

[3]The Table shown to participants can be found in the appendix as Table A.5

either their individual account (private good) or a group project (public good.) At the end of the round, each participant learned the total amount contributed by their group, their earnings from both the public and private accounts, and the earnings of the lowest earner in their group. The VCM treatment always preceded the coalition treatment because it is a simpler decision-making environment and we sought to minimize confusion about the task.[4]

Each round of the Coalition treatment had two stages. In Stage I participants decided whether or not to join the coalition. They learned how many others in their group joined the coalition before voting to contribute to the public good in Stage II. Majority voting was used to determine the outcome of the vote which was binding on all players. Fringe members could independently decide either contribute or not contribute in Stage II. At the end of the round, each participant learned the total amount contributed by their group, their earnings from both the public and private good, and the earnings of the lowest earner in their group. Participants know the number of coalition members, so they can deduce whether the vote was positive or negative, although they do not learn the exact coalition vote.

The experiments were conducted at Virginia Tech's Economics Lab using z-Tree (Fischbacher (2007)). All experimental protocols were reviewed and approved by the Virginia Tech Institutional Review Board and participants provided informed consent prior to participating in the experiment. Subjects who were primarily undergraduate students were recruited using the lab's SONA system. Average earnings were \$20, including a \$10 show up fee and the earnings from all parts of the experiment. Experimental instructions used points for payoffs with a conversion rate of 5 points = \$1. Each experimental session included 12 participants to facilitate reassignment to groups between rounds of the public goods game. Power analysis for the difference in proportions indicated that a sample size of 108 was sufficient to achieve a power of 0.8; so we conducted a total of 9 experimental sessions. Our experiments were designed to test the following hypotheses about behavior with particular focus on the Colaition treatment.

Hypothesis 0: *Contributions in our Dictator game that primes players with language about the "least well off individuals" will be higher than in the standard Dictator game.*

The Dictator game provides a measure of selfish vs. altruistic preferences in the experiment. Eckel and Grossman (1996)) argue that when decision-makers do not know each other there is not enough information for altruism to enter their decision. The language "least well-off person" is expected to prime players to think about

[4]We did not counterbalance treatments since Ashley, Ball and Eckel (2010), find no differences in individual behavior between the first half and second half of an experiment consisting of two separate 10-round VCM games.

other group members as relatively disadvantaged, thus increasing the likelihood of altruistic decision-making. This is an important hypothesis because, if supported by data, it suggests that behavior in one domain can be used to predict participant's choices when faced with the opportunity to join a coalition.

Hypothesis 1: *Holding γ constant, players who give away more money in the Dictator game are more likely to*
(a) contribute to the public good in the VCM treatment
(b) join the coalition in the Coalition treatment and
(c) contribute to the public good in the Coalition treatment.

Since all parts of the experiment involve social decision-making with a counterpart referred to as "the least well-off person", we expect preferences across the three parts of the experiment to be consistent. In the VCM treatment, this hypothesis is consistent with previous work. (see for example Dannenberg et al. (2007)), Harbaugh and Krause (2000)). In the Coalitions treatment, the hypotheses follow from propositions I and II above, because players who are more altruistic in the Dictator game have a lower weight on their private financial gain, λ_i, in their utility function. Our next hypothesis is a comparative statics result on equilibrium behavior.

Hypothesis 2: *Holding the distribution of λ_i constant, When the MPCR (γ) increases, we expect larger coalitions and hence more contributions to the public good.*

This hypothesis follows from Proposition 2. Keeping the distribution of λ_i constant, as γ increases, more individuals will satisfy the cutoff for joining the coalition. Therefore, we expect that for $\gamma = 0.7$ coalitions will be larger with more players contributing to the public good than when $\gamma = 0.3$.

Hypothesis 3: *Coalitions maintain contribution levels over time.*

Contributions in experimental VCM games typically decline as the game is repeated (Burton-Chellew and West (2021), Laury and Holt (2008), Ledyard (1995)). The public goods model we test in the lab is static and does not predict what will happen if individuals play the game repeatedly. This hypothesis goes beyond the model and tests an outcome that is quite likely in practice, i.e., people play such a game repeatedly. Recall that coalitions sort individuals into groups based on whether a threshold condition is met, and participants get feedback on the number of other players in their coalition who chose to join prior to voting to contribute to the public good. Since all of the participants who join should contribute, participants do not need to learn about other participants' past behavior. Thus conditional cooperation can be achieved solely based on information from the current period. Hence Hypothesis 3 is a behavioral prediction which argues that coalitions will maintain contribution levels over time.

Hypothesis 4: *Players for whom $\lambda_i \leq \gamma$ will join the coalition and contribute to the public good.*

This hypothesis is motivated by Propositions I and II, that all players who satisfy the threshold condition join the coalition and contribute. This is intended to test how well the theory predicts outcomes for our subjects.

Results

Our strategy for presenting results is to first present summary statistics and related tests, followed by results from regression analysis to appropriately manage the panel nature of our data and other control variables. We begin with a discussion of outcomes from our dictator games (Figure 1). To test Hypothesis 0, we compare our Dictator game results to data from both a standard dictator game (EG pooled) and one where participants divided the money between themselves and a charity (EG Charity) (see Table 2, which contains our data plus results from Table 1 of Eckel and Grossman (1996)).[5] The average amount kept by our participants was 70%, compared to 89% in the standard game, a significant decrease (Kolmogorov Smirnov distributions test, $p = 0.000$). Since we purposely described Recipients as being disadvantaged we expected to see more than the usual amount of altruism, so this result provides support for Hypothesis 0. It also serves as a successful manipulation check. As a consistency check we also compare our data with the EG Charity data. Here, the mean amount kept was 68%, compared to our 70%, and we fail to reject the hypothesis that these results are different (Kolmogorov Smirnov distributions test, $p = 0.542$). This suggests our priming strategy was successful in a way consistent with previous work.

To test Hypothesis 1 that prosocial participants contribute more and join the coalition more frequently, we first implement a median split of the participants based on their Dictator game results. Here participants who gave more than 5 tokens to their counterparts are in the "high" altruism group, while the others are in the "low" group. Table 1 presents descriptive statistics for "low" and "high" subjects in the dictator game. In the VCM treatment (row 1 of the table), we find that contributions (64.1% vs. 55.0%, $p < 0.05$) are significantly higher for "high" players compared to "low" players, providing support for Hypothesis 1, part (a). In the Coalition treatment, we find that both joining the coalition(53.3% vs. 43.8%, $p < 0.001$) and contributions (57.9% vs. 43.8%, $p < 0.001$) are significantly higher for "high" players compared to "low" players, providing support to Hypothesis 1, parts (b) and (c). We find further support for this hypothesis below when we present

[5]We chose to use the Eckel and Grossman (1996) study because of its popularity and the easy availability of data.

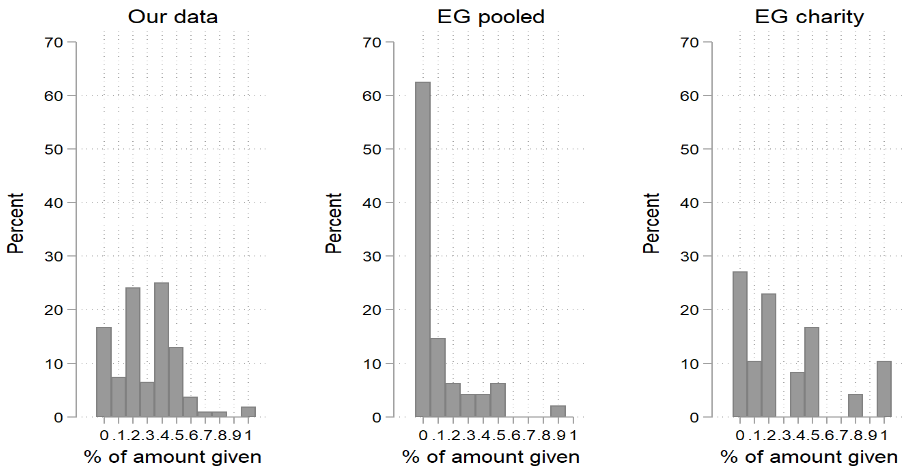

Figure 1: Dictator Game Results

Table 1: Results on joining and contributing by amount given in Dictator game

	High	Low	Difference
Contribute to Public good(VCM)	0.641	0.550	0.0901**
			(0.0333)
Join the Coalition	0.533	0.438	0.0952***
			(0.0277)
Contribute to Public good (Coalition)	0.579	0.438	0.141***
			(0.0275)

Notes: Median split of data where "high" denotes participants who gave more than 5 tokens to their counterpart in the Dictator game and the others are "low". Statistical test is a t-test for the difference of means. Standard errors in parentheses. $***p < 0.01, **p < 0.05, *p < 0.10$.

regression results.

Table 2: Dictator Game Data

Options	% kept	%given	Implied λ_i	Our data	EG Pooled	EG Charity
1	1	0	1	18	30	13
2	0.9	0.1	0.9	8	7	5
3	0.8	0.2	0.8	26	3	11
4	0.7	0.3	0.7	7	2	0
5	0.6	0.4	0.6	27	2	4
6	0.5	0.5	0.5	14	3	4
7	0.4	0.6	0.4	4	0	0
8	0.3	0.7	0.3	1	0	0
9	0.2	0.8	0.2	1	0	2
10	0.1	0.9	0.1	0	1	0
11	0	1	0	2	0	5
Mean % kept				0.70	0.89	0.68

Next, we explore Hypothesis 2, which concerns the effects of increasing MPCR, where Table 3 presents descriptive statistics broken down by treatment and the MPCR level. In the VCM treatment, we find that contributions (76.4% vs. 43.9%, $p < 0.001$) and earnings (34.46 vs. 13.41, $p < 0.001$) are significantly higher when MPCR is high than when it is low. These results are consistent with previous VCM experiments (Laury and Holt (2008), Ledyard (1995)). The MPCR also strongly affects outcomes in the Coalition treatment: the likelihoods of both joining the coalition (61.6% vs. 35.8%, $p < 0.001$) and a coalition member contributing (96.8% vs. 64.9%, $p < 0.001$) are higher for the high value MPCR. Moreover, coalition size is also greater (3.664 vs. 2.151, $p < 0.001$). Interestingly, the contributing frequency is also higher for fringe members (27.6% vs. 13.0%, $p < 0.001$) when MPCR is high. It is, therefore, not surprising that high MPCR means that payoffs are higher for coalition members (31.48 vs. 11.06, $p < 0.001$), fringe members (33.71 vs. 13.35, $p < 0.001$), and the least well-off person in that round of the experiment (29.52 vs. 8.519, $p < 0.001$). The behavior of the fringe members who contribute is suggestive of a form of conditional cooperation. We provide additional support for these MPCR results using regression analysis below.

Let us now explore Hypothesis 3, which suggests that relative to a standard VCM game, having coalitions will lead to stable contributions over time. Recall that in the first 8 periods consisted of a VCM treatment, while the Coalition treatment made up the last 12 periods. Figure 2 illustrates the observed pattern of contributions across the two treatments. Since the treatments had different number of periods we do comparisons of individual periods here, and later report regression re-

Table 3: VCM and Coalition Treatments

	High MPCR	Low MPCR	Difference
VCM Treatment			
Player contributes to public good	0.764	0.439	0.325***
			(0.0315)
Payoffs to participants	34.46	13.51	20.94***
			(0.390)
Coalition Treatment			
Player joins the coalition	0.611	0.358	0.252***
			(0.0269)
Contributions to public good by coalition members	0.968	0.649	0.319***
			(0.0265)
Contributions to public good by fringe members	0.276	0.130	0.146***
			(0.0305)
Payoff to coalition members	31.48	11.06	20.42***
			(0.492)
Payoff to fringe members	33.71	13.35	20.36***
			(0.522)
Payoff to least well off person	29.52	8.519	21.00***
			(0.356)
Coalition size	3.664	2.151	1.513***
			(0.0633)

Notes: Standard errors in parentheses. $***p < 0.01, **p < 0.05, *p < 0.10$
t-test for the difference of means.

sults. Comparing the average contributions in Coalition treatment with the VCM treatment, we find that average contributions are higher in the VCM treatment (Kolmogorov Smirnov test, $p = .000$). If, however, we look at average contributions in the last period of each treatment, we find that contributions are higher in the Coalitions (Kolmogorov Smirnov test, $p = .022$). That VCM treatment contributions are initially high, but decline steadily is a result consistent with other VCM experiments (Burton-Chellew and West (2021), Laury and Holt (2008), (Ledyard, 1995)). Yet, we do not observe this same pattern of declining contributions in the Coalition treatment, suggesting that one role of coalitions in repeated environments (not modeled by the theory) may be to sustain contributions of imperfect conditional cooperators by facilitating belief updating about others' likely choices ((Fischbacher and Gachter, 2010)). For another look at the effect of coalitions we sort players based on whether they joined the coalition in the Coalition treatment and look at behavior in the first period of each treatment. We find that first period contributions from those who join the coalition are significantly higher in the Coalition treatment than the VCM treatment (96% vs. 76%, t-test difference of means, $p < 0.001$). We perform similar analysis comparing the last period in Coalition treatment with the last period of VCM treatment, and find that those who join the coalition are still contributing more in the Coalition treatment than the VCM treatment (87% vs. 30%, t-test difference of means, $p < 0.001$). On the other hand, if we repeat the same analysis of first period contributions by fringe members, we find that they are lower than VCM contributions (21% vs. 76%, t-test difference of means, $p < 0.001$). Similarly, comparing the last period in Coalition treatment with the last period of VCM treatment, and find that those fringe members are still contributing less in the Coalition treatment than the VCM treatment (16% vs. 30%, t-test difference of means, $p < 0.05$).

This result suggests an important possible mechanism through which coalitions are successful. In the VCM treatment, participants do not know whether others are likely to contribute to the public good because social preferences are private information. This means that individuals who prefer to contribute only when they can be assured that others will select strategies consistent with the zero contributions equilibrium. In the Coalitions treatment, however, participants learn how many other have joined the coalition before making a decision to vote to contribute (or contribute, if they are fringe members). Since our model predicts that those who join the coalition also satisfy a contribution threshold, coalition size provides information that is useful because it is tied to voting and contribution behavior.

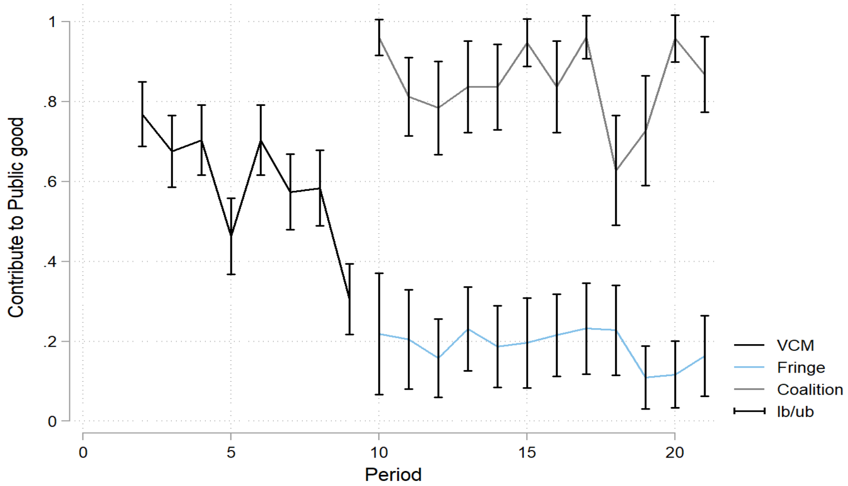

Figure 2: Comparison of percent contributed in VCM and Coalition treatments

We next test the model's prediction (Hypothesis 4) that those who join the coalition contribute, as well as noting the distribution of observed coalition sizes (Figure 3). Recall the threshold condition to join the coalition ($\lambda_i \leq \gamma$) and that those who join the coalition are predicted to contribute. We observe that when there is only one coalition member 13 percent of participants vote to contribute. As the coalition size increases, the percentage of participants voting to contribute increases proportionately, so that 95.8 percent of participants vote to contribute when the coalition size is six. One way to view this result is that when the coalition size is small, then people do not rely on the coalition's ability to sort; rather they

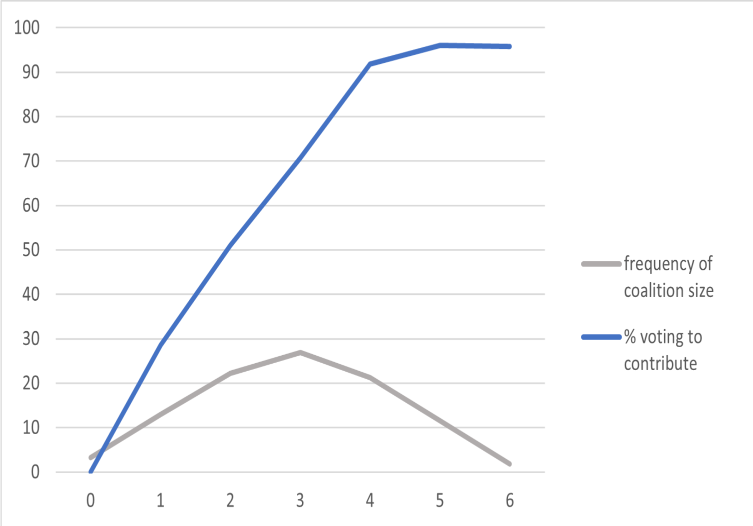

Figure 3: Percentage of votes conditional on coalition size

behave more like fringe members. However, as the coalition size grows, people realize that the coalition is sorting individuals into appropriate groups and therefore contributions increase. Typically, behavior like conditional cooperation can only be examined in a repeated game. However, by allowing for two stages, the model being studied here allows us to examine conditional cooperation even in a one-shot game. Th decision to join the coalition reveals information the same way and can be viewed an the analogue of conditional cooperation in our game. Hence this suggests that participants are conditional cooperators, i.e., people who cooperate when others do, a result observed in other experimental papers like (Reischmann and Oechssler (2018), Oechssler, Reischmann and Sofianos (2022)). Because of the threshold condition, we expect more people to join the coalition when the MPCR is high ($p < 0.001$, see Appendix Figure A.1) and also more likely to contribute with high MPCR($p < 0.001$, see Appendix A Figure A.2). These results are also consistent with previous experimental results establishing a positive relationship between coalition size and MPCR (Burger and Kolstad (2009), Kosfeld, Okada and Riedl (2009)).

To test Hypothesis 4, that participants who are less selfish are more likely to join the coalition and contribute to the public good, we first need to determine λ_i, our measure of selfishness, for each participant. Following (Andreoni and Miller, 2002) we will assume that participants have a CES utility function given by

$$u(\pi_i, \pi_{least}) = (\lambda_i \pi_i^\rho + (1 - \lambda_i)\pi_{least}^\rho)^{1/\rho} \tag{2}$$

where λ_i is the weight on an individual's own payoff, and $1 - \lambda_i$ is the weight on the payoff of the least well-off person. π_i represents the payoff of individual i and π_{least} is thev payoff of the least well off person. Here ρ represents the curvature of the utility function, in particular, for ρ sufficiently close to 1 the CES utility function approximates a linear utility function. The λ_i implied by each possible division in the dictator game is reported in Table 2.

Table 4: Distribution of participants satisfying threshold for low and high MPCR

λ_i	Frequency	Percentage
$\lambda_i \leq 0.3$	4	3.70
$0.3 < \lambda_i \leq 0.7$	52	48.15
$\lambda_i > 0.7$	52	48.15
Total	108	100

Table 5: Average Marginal Effect of key explanatory variables on the decision to join the coalition: Estimates from Probit Regression

	(1) Decision to join	(2) Decision to contribute
Percent given to least well off person	0.327	0.547***
	(0.199)	(0.159)
High MPCR	0.248***	0.396***
	(0.0384)	(0.0331)
Lagged payoff of least well off person	-0.00233	-0.000560
	(0.00155)	(0.00183)
Lagged Coalition Size	0.0316*	0.0124
	(0.0152)	(0.0172)
Controls	Yes	Yes
Observations	1188	1188

Notes: Standard errors in parentheses and clustered at participant level. Dependent variable is decision to join/contribute(1:yes,0:no), margins reported here. Results on High MPCR are in comparison to low MPCR. Controls include gender dummy, political orientation and number of Economics classes taken. Full table available in Appendix A(Table A.1). Standard errors in parentheses and clustered at participant.$***p < 0.01, **$ $p < 0.05, *p < 0.10$

Table 4 presents the distribution of the participants across three ranges of λ_i. Note that of 108 participants, we only had 4 very altruistic participants who contributed at least 70% of their endowment to their counterpart. It is not surprising that we find few very altruistic participants – for comparison consider the (Eckel and Grossman, 1996) results in Figure 1. For these individuals, $\lambda_i \leq 0.3$, meaning that we expect them to always join the coalition and contribute. Similarly, we had

52 participants form whom $\lambda_i > 0.7$, meaning that we never expect them to join the coalition or contribute. The remaining 52 participants should contribute when MPCR is high, but not when it is low.

We now turn to Probit regression results, since our dependent variables, the decision to join or contribute, are binary variables. Table 5 explores the marginal effect of our explanatory variables on the decisions to join the coalition and contribute to the public good. First, we consider Hypothesis 1b and c, that participants who gave away more in the Dictator game are more likely to join the coalition and contribute to the public good. While we do not find that more generous participants are more likely to join the coalition, we do find that they are more likely to contribute to the public good ($p < 0.01$). This is evidence for our primary goal $-$ the ability of colaitions to sort people into contributors and non-contributors. We also find support for Hypothesis 3 that there is a positive relationship between MPCR and coalition size ($p < 0.01$), and therefore, more contributions to the public good ($p < 0.01$). This is consistent with our earlier finding that more people join the coalition and contribute to public good when MPCR is high, as well as findings in the literature (Burger and Kolstad (2009), Kosfeld, Okada and Riedl (2009).

Table 6: Probit estimates of average marginal effect on the decision to join and contribute to the coalition

	(1) Decision to join	(2) Decision to contribute
Threshold satisfied	0.282***	0.436***
	(0.0520)	(0.0390)
Lagged Payoff of least well off person(coal)	-0.00167	0.000130
	(0.00140)	(0.00154)
Lagged Coalition Size	0.0208	-0.00139
	(0.0137)	(0.0147)
Controls	Yes	Yes
Observations	1188	1188

Notes: Dependent variable is the decision to join/contribute (1:yes,0:no), margins reported here. Results on threshold satisfied are in comparison to threshold not satisfied. Controls include gender dummy, political orientation, and number of Economics classes taken. Full table available in Appendix A (Table A.3). Standard errors in parentheses and clustered at the participant level. $***p < 0.01, **p < 0.05, *p < 0.10$

To sum up, while we do not find support for the hypothesis that more altruistic people will join the coalition, we do find some strong support for the notion that coalitions are an excellent sorting device in the sense that people who do join the coalition contribute. This allows players, who may be conditional cooperators, to determine who else will contribute in an environment where individual social preferences are private information. As a final look at this table of results, we tried including the lag of the number of contributors and find no significant results (see also Appendix A Table A.2). This is consistent with the idea that observing one's counterparts join the coalition is such a strong signal of their likely contributions behavior that participants can disregard this aspect of their past experiences. So while we find evidence for conditional cooperation through the sorting mechanism afforded by coalitions, lagged measures of contribution do not seem to matter, quite likely because they do not convey new information.

Table 6 tests Hypothesis 4 concerning the propositions from our model. In support of this hypothesis we find that players who satisfy the threshold condition($\lambda_i \leq \gamma$) are both more likely to join the coalition ($p < 0.001$) and contribute to the public good ($p < 0.001$). We do not find significant lagged effects of "Payoff of the least well-off person" or "coalition size" on either the decision to join or the decision to contribute. (full table-Appendix A Table A.3). [6]

Discussion

We show that a voluntary, two-stage coalition mechanisms facilitates contributions to public goods. We find that three important attributes are attributes are associated with establishing such voluntary coalitions. First, even though there is incomplete information about preferences, this constitutes a simple decision-making environment in the sense that players who should join the coalition and contribute to the public good generally do so. Second, because players correctly make contributions in response to others' expected coalition joining decisions, the conditions are easy to comprehend. Finally, observed outcomes are more efficient, so the coalitions work. We find that more altruistic individuals are more likely to join the coalition and contribute, and that when MPCR is higher players are also more likely to join and contribute. Both of these results are consistent with both intuition and previous VCM research. While our experiment provides a test of only one instance of the theory, the model's results hold for variations in preferences and voting rules (Ball et al. (2023)).

The world currently faces global environmental problems in the form of global warming and climate change, air and water pollution, and loss of biodiversity. While individual countries may choose to reduce their own environmental impacts, the solutions to global environmental problems require collective action in the face of incentives to free-ride (Hoel (1991)). Researchers have studied the possibilities for facilitating cooperation on environmental issues by using coalitions, known as International Environmental Agreements (IEAs) (Hoel (1992), Barrett (1994), Ecchia

[6]Since the lag of the number of contributors is highly correlated with coalition size we explore them in separate regressions. (Appendix A Table A.4)

and Mariotti (1998)). To the extent that it is valid to assume that countries have a single utility function, our work may be useful in understanding instances in which IEAs work. For example, our result that higher MPCR results in more players being willing to join a coalition and contribute suggests that, as the benefit of abating pollution grows, more countries will be willing to join IEAs and act. Importantly for the success of IEAs in solving global environmental problems, we note that our result stands in contrast to other research that found that when MPCR is high the minimum viable coalition is small (Komisar, 1969), (Barrett, 1994)). Perhaps the most important consideration in addressing global environmental problems is cross-country heterogeneity in social preferences and what our paper says about that. Even though one may not be aware of the social preferences of different countries, setting up coalitions where everyone contributes equally will sort countries well into groups of contributors and non-contributors. Moreover, such coalitions will be stable in their repeated contributions to the public good and easier to implement than negotiating repeatedly over climate agreements.

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Appendix A: Experimental results

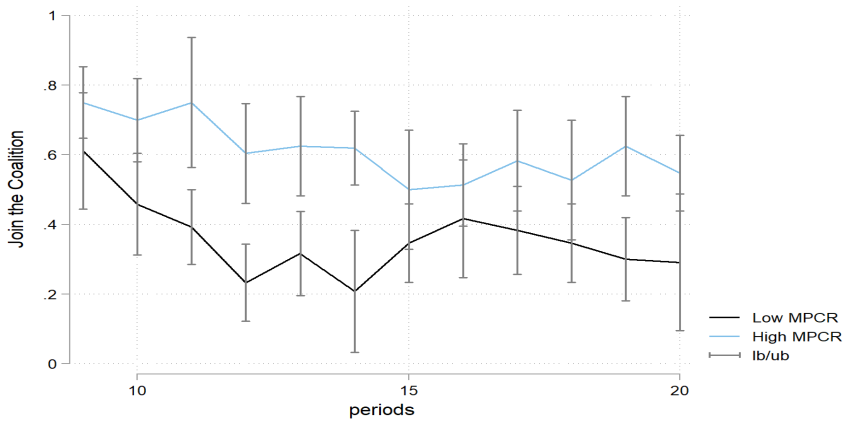

Figure A.1: Effect of MPCR on decision to join coalition in Coalition treatment.

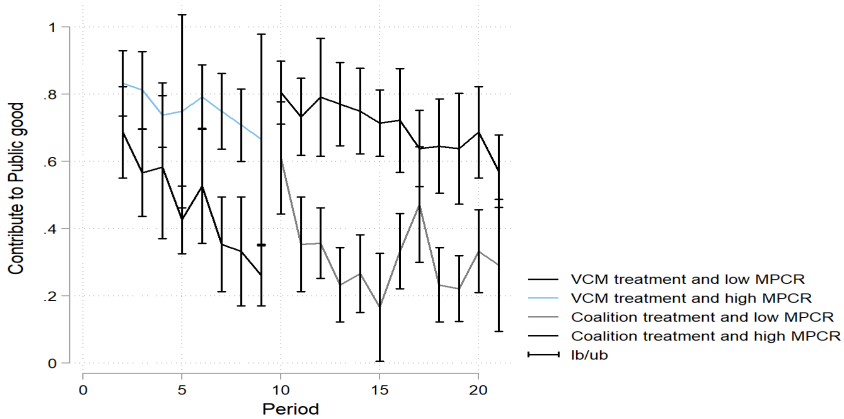

Figure A.2: Effect of MPCR on decision to contribute.

Table A.1: Average Marginal Effect of key explanatory variables on the decision to join the coalition: Estimates from Probit Regression (with coalition size)

	(1) Decision to join	(2) Decision to contribute
Percent given to least well off person	0.327	0.547^{***}
	(0.199)	(0.159)
High MPCR	0.248^{***}	0.396^{***}
	(0.0384)	(0.0331)
Gender	-0.0214	-0.00719
	(0.0601)	(0.0539)
political views	0.00151	-0.00208
	(0.0296)	(0.0282)
Econ classes taken	-0.00468	-0.0155
	(0.0268)	(0.0265)
Lagged payoff of least well off person(coal)	-0.00233	-0.000560
	(0.00155)	(0.00183)
Lagged Coalition Size	0.0316^{*}	0.0124
	(0.0152)	(0.0172)
Observations	1188	1188

Notes: Standard errors in parentheses and clustered at participant level. Dependent variable is decision to join/contribute(1:yes,0:no), margins reported here. Results on High MPCR are in comparison to low MPCR. Political orientation take values from 0 to 4 where 0 is Complete Conservative and 4 is Complete Liberal. Standard errors in parentheses and clustered at participant.$***p < 0.01, **p < 0.05, *p < 0.10$

Table A.2: Average Marginal Effect of key explanatory variables on the decision to contribute to coalition: Estimates from Probit Regression(with contributors)

	(1) Decision to join	(2) Decision to contribute
Percentage given to least well off person	0.320	0.544***
	(0.198)	(0.159)
High MPCR	0.242***	0.395***
	(0.0376)	(0.0329)
Gender	-0.0208	-0.00705
	(0.0603)	(0.0538)
political views	0.000504	-0.00251
	(0.0298)	(0.0282)
Econ classes taken	-0.00356	-0.0150
	(0.0269)	(0.0265)
Lagged Payoff of least well off person(coal)	-0.000705	-0.000316
	(0.00150)	(0.00194)
Lagged Number of Contributers	0.00806	0.00641
	(0.0103)	(0.0126)
Observations	1188	1188

Notes: Standard errors in parentheses and clustered at participant level. Dependent variable is decision to join/contribute(1:yes,0:no), margins reported here. Results on High MPCR are in comparison to low MPCR. Political orientation takes values from 0 to 4 where 0 is Complete Conservative and 4 is Complete Liberal. Standard errors in parentheses and clustered at participant..$***p < 0.01, **p < 0.05, *p < 0.10$

Table A.3: Probit estimates of average marginal effect on the decision to join and contribute to the coalition (with coalition size)

	(1) Decision to join	(2) Decision to contribute
Threshold satisfied	0.282***	0.436***
	(0.0520)	(0.0390)
Gender	-0.0175	-0.00349
	(0.0572)	(0.0468)
political views	0.00408	0.00409
	(0.0267)	(0.0231)
Econ classes taken	-0.000159	-0.00583
	(0.0252)	(0.0222)
Lagged payoff of least well off person	-0.00167	0.000130
	(0.00140)	(0.00154)
Lagged Coalition Size	0.0208	-0.00139
	(0.0137)	(0.0147)
Observations	1188	1188

Notes: Dependent variable is decision to join/contribute (1:yes,0:no), margins reported here. Results on threshold satisfied are in comparison to threshold not satisfied. Political orientation take values from 0 to 4 where 0 is Complete Conservative and 4 is Complete Liberal. Standard errors in parentheses and clustered at participant level. $***p < 0.01, **p < 0.05, *p < 0.10$

Table A.4: Average Marginal Effect of key explanatory variables on the decision to join and contribute to coalition: Estimates from Probit Regression(with contributors)

	(1)	(2)
	Decision to join	Decision to contribute
Threshold satisfied	0.279***	0.436***
	(0.0515)	(0.0389)
Gender	-0.0175	-0.00346
	(0.0575)	(0.0469)
Political views	0.00342	0.00417
	(0.0269)	(0.0231)
Econ classes taken	0.000567	-0.00585
	(0.0253)	(0.0222)
Lagged Payoff of least well-off person	-0.000184	0.000375
	(0.00142)	(0.00164)
Lagged number of contributors	0.00182	-0.00296
	(0.00995)	(0.0108)
Observations	1188	1188

Notes: Standard errors in parentheses and clustered at participant level. Dependent variable is decision to join/contribute(1:yes,0:no), margins reported here. Results on threshold satisfied are in comparison to threshold not satisfied. Political orientation take values from 0 to 4 where 0 is Complete Conservative and 4 is Complete Liberal. Standard errors in parentheses and clustered at participant level. $***p < 0.01, **p < 0.05, *p < 0.10$

Appendix: Instructions

Page 1: Instructions

Welcome to the experimental session. You will be paid $10 for participating, you may earn additional money based on the decisions you make in the experiment. Your earnings will be paid in cash at the end of the session. **You are not allowed to communicate with others during the experiment.**

Violation of this rule will lead to the exclusion from the experiment and all payments. If you have questions, please raise your hand. A member of the experimenter team will come to you and answer them in private. Cell phones are not allowed during the experiment.

Page 2: Instructions

We will not speak of Dollars during the experiment, but rather of points. Your whole income will first be calculated in points. At the end of the experiment, the total amount of points you earned will be converted to Dollars. **Each 5 points is worth** $1.*So, if you earn 50 points you will receive* $10 *in addition to the* $10 *you get for participating.*

Page 3: Instructions for Section 1

You will make a single decision in Section 1. Your task is to allocate points between yourself and a person who participated in a previous experiment but earned the lowest amount of money of anyone in their session. If you allocate points to them then, after today's experiment is over, they will be asked to come back to the lab to get any additional money you allocated to them. They will not, however, find out that you were the person who allocated points to them. The other person does not have a decision to make – the money you both get from your decision depends on you alone.

Page 4: Instructions for Section 1

Your decision will not affect the payoff of any other person in this room and vice versa. You will be asked to allocate 25 points between yourself and the person with the lowest earnings from a previous experiment. The possible payments are given in the table below:

Section 1 begins

This is round 1.

Please divide 25 points between yourself and another person. Remember, the person you will be dividing the points with had the lowest earnings when they participated in a previous experiment. Each 5 points is worth $1

Please select one of the options from the table above- Table A.5 shown again.:

Table A.5: **Dictator game**

Options	Your payment (in points)	Least well of person's payment in points
1	25	0
2	22.5	2.5
3	20	5
4	17.5	7.5
5	15	10
6	12.5	12.5
7	10	15
8	7.5	17.5
9	5	20
10	2.5	22.5
11	0	25

After the experiment, participants will be informed about how many points they made and how many points the least well-off person made.

Page 5: **Instructions for Section II** Let's begin with the second section of the experiment.

The second section of the experiment consists of **2 parts**. In each part there will be a number of rounds. You will be paid for one random round in each part. We will start by explaining the first part. You will receive separate instructions for part 2 after you have finished part 1. Note that your decision from Section 1 of the experiment, which you already completed, will not affect your payoff from this section, but will be added to your total earnings for the experiment at the end.

Page 6:Instructions for Part I

This part will have 8 rounds, and, in each round, you will be required to make a decision.

The decision situation.

You will be a member of a group consisting of **6 people**. In each round everyone in your group will be given 10 points. Each group member has to decide on how to invest their 10 points in each round. You can invest all 10 points into your **private account**, or all 10 points into a group project. The points cannot be split between private account and the **group project**.

Page 7: Instructions for Part I

Your earnings from your**private account**. **You will earn one point for each point you put into your private account**. You can either put 0 points or 10 points into your private account. For example, if you put 10 points into your private account (and therefore do not invest in the group project), your earnings from private account will amount to exactly 10 points. If you put 0 points into your private account, your earnings from private account will be 0 points. Only you earn from your private account.

Page 8: Instructions for Part I

Here is information about your **earnings from the group project. Both group members who do put their points in the group project and those who do not put their points in the group project will receive an equal number of points from the group project**.

The earnings for each group member will be determined through a conversion rate. There will be two conversion rates in the experiment as described below.

Case 1) **Earnings from the project** = 30% multiplied by the sum of all contributions. Example 1: If everyone in your group of 6 participants contributes 10 points then, the sum of all contributions to the project is 60 points. Here the conversion rate is 30%. You and the other members of your group will**each** earn 30% (0.3) multiplied by 60, which is 18 points (30% of 60 points = 0.3x60= 18).

Example 2: If four members of the group contribute 10 points each, then sum of contributions is 40 points. You and everyone in your group each earn 30

Case 2) **Earnings from the project** = 70

Example 1: If everyone in your group contributes 10 points then, the sum of all contributions to the project is 60 points. Here the conversion rate is 70

Example 2: If four members of the group contribute 10 points each, then the sum of contributions is 40 points. You and everyone in your group **each** earn 70

Remember that you also get earnings from your private account, so in any round Total Earnings = earnings from your private account + earnings from the group project

Page 9: Instructions for Part I

Points to remember

Case 1 (30% earnings from the group project) and Case 2 (70% earnings from the group project) will occur in random order for the 8 rounds. Please pay attention to the amount of earnings from the group project in each round.

Your total earning: Your total earnings are the sum of your earnings from your private account and that from the project.

If you contribute to the project: In this case, you would have invested nothing in your private account and your earnings will solely depend on the earnings from the group project. Example 1: Total earnings= Earnings from your private account (0 points) + Earnings from the project (30Example 2: Total earnings= Earnings from your private account (0 points) +Earnings from the project (70

If you do not contribute to the project: In this case, you would have invested the 10 points in your private account and your earnings will include that 10 points in addition to the earnings from the groups project.

Example 1: Total earnings= Earnings from your private account (10 points) +Earnings from the project (30Example 2: Total earnings = Earnings from your private account (10 points) +Earnings from the project (70

To reiterate, income from the project goes up if more people contribute to the project. On the other hand, Income from your private account is only dependent on your contribution. At the end of each round, you will be informed about your earnings and how many people contributed to the project.

Page 10: In the experiment

- Participants will be informed about the conversion rate at the start of each round (30% or 70%).
- At the end of each round you will learn: The number of contributors to the group project and your earnings.

After each round, participants will be informed about how number of contributors, earnings from private account, group projects and earnings of the least well-off person.

Page 11: Instructions for Part II

We now move to the instructions for **Part II**. In Part II, you all will have an option to join a **coalition** which decides together whether every coalition member will contribute to the group project or not. In this part thus, you will make **two decisions** in each round.

In **stage 1**, you will decide whether or not to join a coalition. In **stage 2**, your decision will depend on whether you decided to join the coalition or not.

If you do not join the coalition, your decision is independent of other group members: you decide independently whether to invest 10 points in your private account or in the group project. **If you do join the coalition**, then members of the coalition collectively decide whether all members will contribute or not contribute to the group project.

Page 12: Instructions for Part II

Remember that in stage 1 every group member decides whether or not to join the coalition. At the end of stage 1, you will know how many members in the group of 6 participants have decided to join the coalition.

How do coalitions make decisions in stage 2?

Every group member who **joins** the coalition will vote on whether members of the coalition will invest all 10 points in the group project or not. **If half or more than half the people in the coalition vote to put "points in the group project" then everyone's points in the coalition go into the group project.**

Example 1: If the coalition consists of 5 members and 3 of them vote to contribute their 10 points, then each of the 5 members will put 10 points in the group project. Example 2: If the coalition consists of 4 members and 2 of them vote to contribute their 10 points, then each of the 4 members will put 10 points in the group project.

Once you join the coalition, you remain in it until the round ends. You are free to make a different decision in each round about whether to join the coalition or not.

Remember that you also get earnings from your private account, so in any round Total Earnings = earnings from your private account + earnings from the group project

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Let's give you some scenarios as examples and your earnings in each one of them.

Suppose that the group project's conversion rate is 30%.

Also, suppose three people in the group join the coalition and that two out of these three people vote to contribute to the group project. In this case, **everyone in the coalition contributes their 10 points to the group project.**

Last, suppose that 2 out of the remaining 3 people the group who are not in the coalition also contribute to the group project. Thus, there are now 5 people contributing to the group project. The sum of everyone's contributions is 50 (5 multiplied by 10=5x10).

Scenario 1: you are a member of the coalition of 3 people that collectively decided to contribute to the group project.

Since you contributed to the project, your earnings for the round will be (Earnings from your private account = 0 points) + (Earnings from the group project or 30% of the sum of everyone's contributions= $0.3x50$) **Earnings for the round**= $0 + 15 = 15$ points.

Scenario 2: you are one of the two people who did not join the coalition but decided to contribute to the group project.

The sum of everyone's contributions is 50 (5 multiplied by 10 = $5x10$). In this scenario, your calculation for earnings for the round will exactly be the same as above.

Earnings for the round= (Earnings from your private account = 0 points) + (Earnings from the group project or 30% of the sum of everyone's contributions = $0.3x50 = 0 + 15 = 15$ points

Recall when you contribute to the group project (as in scenarios 1 and 2), your earnings for the round will be the earnings from the group project.

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Let's give you another example of two other scenarios below and your earnings in each one of them.

Suppose that the group project's conversion rate is 30%.

Also, suppose three people in the group join the coalition and that one out of these three people vote to contribute to the group project. In this case, no one in the coalition contributes their 10 points to the group project.

Last, suppose that 2 out of the remaining 3 people the group who are not in the coalition also contribute to the group project. Thus, there are now 2 people contributing to the group project. The sum of everyone's contributions is 20 (2 multiplied by 10=2x10).

Scenario 3: you are a member of the coalition of 3 people that collectively decided not to contribute to the group project.

Since you do not contribute to the project, your earnings for the round will be (Earnings from your private account =10 points) + (Earnings from the group project or 30% of the sum of everyone's contributions=0.3x20)

Earnings for the round=10 + 6 =16 points

Scenario 4: you did not join the coalition and decided not to contribute to the group project

The sum of everyone's contributions is 20 (2 multiplied by 10=2x10). In this scenario your calculation for Earnings for the round will exactly be the same as above.

Earnings for the round will be (Earnings from your private account =10 points) + (Earnings from the group project or 30% of the sum of everyone's contributions= $0.3 * 20 = 10 + 6 = 16$ points

Recall when you do not contribute to the group project (as in Scenario 3 and 4), you earn both from private account and group project.

Page 15: Instructions for Part II Points to remember:

Case 1 (30% earnings from the group project) and Case 2 (70% earnings from the group project) will occur in random order for the 10 rounds. Please pay attention to the amount of earnings from the group project in each round.

In each round you have the option to join a coalition. The coalition decides together whether to contribute to the group project or not. If half or more than half the people in the coalition vote to put "points in the group project" then everyone's points in the coalition go into the group project.

Your total earning: Your total earnings are the sum of your earnings from your private account and that from the project

If you contribute to the project: In this case, you would have invested nothing in your private account and your earnings will solely depend on the earnings from the group project. Example 1: Total earnings= Earnings from your private account (0 points) + Earnings from the project (30% of sum of all contributions). Example 2: Total earnings= Earnings from your private account (0 points) +Earnings from the project (70% of sum of all contributions).

Remember if you join the coalition, you contribute to the project if half or more than half the people in the coalition vote to put "points in the group project".

If you do not contribute to the project: In this case, you would have invested the 10 points in your private account and your earnings will include that 10 points in addition to the earnings from the group project.

Example 1: Total earnings= Earnings from your private account (10 points) +Earnings from the project (30% of sum of all contributions). Example 2: Total earnings = Earnings from your private account (10 points) +Earnings from the project (70% of sum of all contributions).

Remember if you join the coalition, you do not contribute to the project if half or more than half the people in the coalition vote to not put "points in the group project".

To reiterate, income from the project goes up if more people contribute to the project. On the other hand, Income from your private account is only dependent on your contribution.

At the end of each round, you will be informed about your earnings and how many people contributed to the project.

In this part, participants will be informed about the following (not part of the instructions)

- Participants will be informed about the conversion rate at the start of each round (30% or 70%).
- At end of stage 1: whether participants joined coalition, size of coalition.
- At the end of each round you will learn: the number of contributors to the group project and your earnings.
- The payoff of the least well-off person in your group.

Quiz before Part 2 begins:

Suppose the group's conversion rate is 30

Quiz 1: Each group member has 10 points. Assume that none of the six group members (including you) contributes to the project. Will your total earnings be 10 points? Yes or No

Quiz 2: Each group member has 10 points. Four members including you join the coalition. Two amongst you vote to contribute. The coalition does not contribute? Yes or No

Quiz 3: Each group member has10 points. Four members including you join the coalition. Two amongst you vote to contribute. The coalition contributes. Suppose one other member who is not in the coalition also contributes to the group project. Is your earning from private account 10? Yes or No

Quiz 4: Each group member has10 points. Four members including you join the coalition. Two amongst you vote to contribute. The coalition contributes. Suppose one other member who is not in the coalition also contributes to the group project. Is your earning from group project 15 points? yes or no

Quiz 5: Each group member has10 points. Four members including you join the coalition. Two amongst you vote to contribute. The coalition contributes. Suppose one other member who is not in the coalition also contributes to the group project. Are your total earnings for the round 15 points? Yes or No