Divided Loyalties or Conditional Cooperation?
An Experimental Study of Contributions to Multiple Public Goods

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Abstract

It is common in organizational life to be simultaneously involved in multiple collective actions. These collective actions may be modeled using public good dilemmas. The developing social dilemma literature has two perspectives – the "divided loyalties" and "conditional cooperation" perspectives – that give opposite predictions about how individuals will behave when they simultaneously play two identical public good games. The current paper creates consensus between these social dilemma perspectives by examining cooperative behavior of participants interacting in two public good games with either different or the same group members. In each round, individuals have a common budget constraint across the two games. In support of the conditional cooperator's perspective of social dilemmas, we find that playing two games with different, rather than same, group members increases overall contributions. Over the course of the experiment, participants playing two games with different group members shift their contributions significantly more often toward more cooperative public good games than participants playing with the same group members.

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1. Introduction

An assistant professor sits at her desk staring at several unfinished projects. Each project is with different co-authors and needs additional data collection. Like her co-authors, she must decide how to disperse her limited research budget, time, and effort across these projects.

A proud parent of an honors student involves himself simultaneously on the boards of his son's Boy Scout Troop and the neighborhood Homeowners' Association. Each week he must decide how much time to allocate between these two groups' activities.

These scenarios remind us that many of the shared benefits enjoyed in organizational settings come from the aggregated prosocial behavior of individuals who face constrained resources (Fuster and Meier 2010). The necessity of prosocial behavior to produce these shared benefits creates a *public goods dilemma*: a situation where individuals experience tension between incurring a private cost in the short-run – e.g., sacrificed time, money, and effort – to generate collective benefits in the long-run – e.g., a publication that gives all co-authors recognition, or greater funding to a charity (Samuelson 1954). The tension between being prosocial and pro-self results in many public goods being under-produced or not produced at all (Olson 1995; Ledyard 1995).

These vignettes also highlight that individuals often straddle multiple collective efforts simultaneously. Cross and Guyer (1980), in their discussion of "hybrid" social dilemmas, were the first to suggest that individuals often face multiple collective actions simultaneously. Despite over three decades of discussion about cooperation (or prosocial) behavior when facing multiple social dilemmas simultaneously (e.g., Janssen and Ostrom 2006; López-Pérez 2012), little empirical work has surfaced. The empirical work that does exist does not allow for transfers of endowments across social dilemmas (e.g., Falk et al. 2013) or considers the effects of participating in multiple different, rather than same, games (e.g., Cason et al. 2012; Bednar al. 2012; Savikhin and Sheremeta 2013). From a pragmatic standpoint, understanding how facing

multiple, simultaneous social dilemmas affects prosocial behavior would be useful for organizations that construct policies for individuals engaging in collective action in different (and same) groups or teams.

From a theoretical standpoint, addressing this question would resolve competing predictions current in the social dilemma literature. Two perspectives in the social dilemma literature give opposite predictions about how individuals will behave when they simultaneously play two identical public good games. One perspective, in organizational behavior and social psychology, suggests that straddling multiple collective efforts simultaneously would negatively affect cooperation because of "divided loyalties" (e.g., McCarter and Northcraft 2007; Wit and Kerr 2002); while a second perspective, from behavioral economics on "conditional cooperation," predicts the opposite relationship (e.g., Fischbacher et al. 2001; Gächter 2007).

The current paper provides resolution and extension to these competing predictions through a laboratory experiment where participants, under a single budget constraint, allocate money between two public good games. These public good games are patterned after Isaac and Walker's (1988) voluntary contribution mechanism (VCM) paradigm. In seeking to "create consensus" between these perspectives (Hollenbeck 2008), we extend both perspectives by examining how prosocial behavior changes depending on whether individuals play two games with either *different* or the *same* group members. We find that prosocial behavior in greater when individuals face multiple social dilemmas with different group members compared to the same group members, and this difference can be explained by the observation that participants act as conditional cooperators. When making choices in two VCMs played with different group members, individuals are influenced by the behavior of fellow group members in both VCMs. However, when making choices in two VCMs played with the same group members, individuals

are influenced to react in each game only to the behavior of group members in that VCM. We also find that over the course of the experiment, participants allocating contributions between public goods with different groups shift their contributions significantly more often towards more cooperative VCMs than in the other condition. These participants in the different group-member condition often choose to contribute more than half of their endowment to only one of the two VCMs. Moreover, the exact contribution to a given VCM depends both on previous individual contributions (*individual disposition effect*) and previous group contributions in both VCMs (*social interaction effect*).

In resolving the competing predictions from the social dilemma literature, the current paper makes three contributions. First, our resolution to the disparate predictions extends beyond the boundary of social dilemmas into group dynamics. We provide one possible answer to an important question (Fried et al. 1988; O'Leary et al. 2011; Postrel 2009): how does the composition *across* groups influence prosocial behavior through indirect social interaction? Second, while the existing social dilemma paradigm often assumes that individuals are involved in one social dilemma, we enhance the ecological validity of the social dilemma paradigm by considering a circumstance ubiquitous to organizational and social life: individuals making interdependent resource allocation decisions while straddling multiple collective actions simultaneously. Third, our findings provide insights for policy makers: a social planner faced with a task of assembling work teams may increase economic and collective welfare by assigning participants to work with *different*, rather than *same*, group members.

2. Literature Review and Theoretical Background

2.1. Theoretical Background and Competing Hypotheses

Social dilemmas are broadly defined as situations in which group and private interests diverge such that everyone doing what is in their own best self-interest results in an outcome that is in the group's worst interest (Dawes 1980). While there is temptation to free ride and *offensively* undercontribute toward the public good, individuals more often undercontribute *defensively*: they fear that others will free ride on their contributions (Rockmann and Northcraft 2008; Yamagishi and Sato 1986). As a consequence of this fear of exploitation, individuals conditionally cooperate and contribute more toward the public good when they know that others are also contributing (e.g., Fischbacher et al. 2001). While there is little dispute among social dilemma researchers about the motivations for cooperation and defection, "there are two clear lines of discrepant thought simultaneously existing in the literature" regarding prosocial behavior as a function of being involved in several social dilemmas simultaneously (Hollenbeck 2008: 20).

Divided Loyalties

Social dilemma scholarship in organizational behavior and social psychology observes that individuals can be "nested" simultaneously within multiple groups who are all facing a social dilemma with a fixed pool of resources (Polzer et al. 1999; Wit and Kerr 2002). Belonging to multiple groups with different members who are each facing a social dilemma may create a tension of allegiances, encouraging an individual to "fear [their partner's] interests no longer rest with only [their group] but with other [groups]" (McCarter and Northcraft 2007: 504). The nested social dilemma literature would predict that, compared to situations where an individual

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faces multiple social dilemmas with the same people, facing multiple social dilemmas with different people may lead an individual to question the others' allegiance to interests (see McCarter and Northcraft 2007, proposition 3). As a consequence the potential for "divided loyalties", an individual is motivated to protect his/her private resources and defensively undercontribute toward the public good (McCarter et al. 2010).[1] Thus, because of fear of stressed allegiances, the divided loyalties perceptive to social dilemmas predicts the following:

> **Hypothesis 1:** *Individuals will contribute less toward multiple public goods when involved in different groups as compared to individuals involved in the same group.*

Conditional Cooperation

Behavioral economics research on "conditional cooperation" in social dilemmas makes a different prediction (Fischbacher et al. 2001). Gächter (2007) points out that the existence of conditional cooperators can explain several puzzles observed in the VCM experiments. For example, it can explain why contributions to the public good decline over time. The reason is that conditional cooperators stop cooperating after they learn that others free ride by not contributing to the public good. This burgeoning research is based on the observation that groups form their own norms that influence individual-member behavior across different situations (Jacobs and Campbell 1961). Ichino and Maggi's (2000) field study on shirking behavior finds that an individual's contribution towards a group's interest is a function of how others in the group behave (also termed social [or group] interaction). In considering the strong normative influence often imposed on an individual by a group (Deutsch and Gerard 1955), working with *different* groups on related tasks (as compared to with the *same* group) provides flexibility not

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[1] Besides divided loyalties, individuals may be reluctant to cooperate in large groups because of mistrust (McCarter and Sheremeta, 2013).

only in where to allocate resources but with whom individuals work (O'Leary et al. 2011). Related literature suggests that roughly 40%-80% of individuals display conditionally cooperative behavior in the lab (Fischbacher et al. 2001; Gächter 2007; Hermann and Thoni 2009; Kocher et al. 2008). This type of behavior is often referred to as a *social interaction effect*: conditional cooperators adapt their behavior in response to the behavior of their group members – they free ride if other group members free ride and they cooperate if others cooperate.

In relation to the current study, being a member of two groups composed of different participants increases the likelihood that conditional cooperators will be able to sustain cooperation (at least in one group that is more cooperative). The increase in likelihood of having more conditional cooperators in one of the two groups increases the likelihood of others following a cooperative signal. In addition, conditional cooperators participating in two groups with *different* fellow group members may use the lower-cooperating group as a reference point with which to compare the higher-cooperating group, always contributing more to the higher-cooperating group. In contrast, conditional cooperators in the treatment with *same* group members do not have this reference point since they know that the level of pro-sociality of fellow members across groups is the same. Thus, the related work on conditional cooperation and social interaction literature would predict:

> **Hypothesis 2:** *Individuals will contribute more toward multiple public goods when involved in different groups compared to individuals involved in the same group.*

2.2. Overview of the Current Study Related to Previous Research

Existing studies on multiple public goods can be broken into two groups. The first group decomposes a single public good into multiple parts, while the second group considers two different public goods. Our experiment is close in design to the former. Similar to our treatment with *same* group members across VCMs, existing studies consider simultaneous interaction in several public goods, either breaking a single public good into parts or presenting multiple public goods (Bernasconi et al. 2009; Biele et al. 2008; Fellner and Lunser 2008; Falk et al., 2013). Bernasconi et al. (2009) investigate an "unpacked" VCM, comparing contributions when a single group contributes to one VCM as compared to multiple VCMs, and find that contributions are greater under the unpacked treatment, although this increase is not sustained for the duration of the session. Biele et al. (2008) introduce a "pairs" treatment by breaking up 4-person groups into two 2-person groups, and find that participants contribute more in the smaller groups. Fellner and Lunser (2008) study a local and a global public good, where the local public good has a higher marginal benefit but fewer group members while the global public good is Pareto optimal but has a greater number of group members. Fellner and Lunser (2008) find that there are initial attempts to cooperate in the global public good, but increased cooperation in the local public good is observed over time – an effect attributed to group size differences. Falk et al. (2013) utilize a design similar to our treatment with *different* group members across groups and compare coordination and contributions in groups of different individuals playing two identical VCM games.

The main difference of our study as compared to previous work is that we investigate simultaneous decision-making both with *same* and *different* group members under a shared budget constraint. The shared budget constraint allows for the possibility of social interactions,

and the direct comparison of same versus different group members allows us to expose participants to a controlled set of fellow group members in order to better understand the role of conditional cooperation. This is the first study to consider the effect of social interactions when groups are different or the same. Unlike most of the work on public good with *same* member interaction, our experiment uses a shared budget constraint, effectively allowing participants to shift their entire endowment to just one of the public goods. This aspect of the design is also more realistic, because in practice individuals participate in many environments simultaneously and are constrained by a single budget constraint when choosing between various activities.

3. Experimental Design and Procedure

The experiment was conducted at a large public university in the Central United States. Participants were recruited from a pool of undergraduate students. We conducted two treatments: a VCM-Same treatment in which two VCMs were played simultaneously by each individual with the same group members in each VCM, and a VCM-Different treatment in which two VCMs were played simultaneously by each individual with one set of group members in one of the VCMs and a set of different group members in the other VCM. A total of 104 participants participated in 6 sessions, with 40 participants participating in 2 sessions of VCM-Same (20 participants per session) and 64 participants participating in 4 sessions of VCM-Different (16 participants per session).

The computerized experimental sessions used z-Tree (Fischbacher 2007) to record participants' decisions and also to record the order of decisions. Participants were given the instructions, shown in the appendix, at the beginning of the session and the experimenter read the instructions aloud. In each session of VCM-Same, 20 participants were randomly assigned to a

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group of 4 players, and played both games with the same group members. In each session of VCM-Different, 16 participants were randomly assigned to a group of 4 players in one game and to a different group of 4 players in the other game, such that no participants played one game with any of their group members from the other game. The group composition remained fixed for all 20 rounds of the experiment in both treatments. All participants participated in only one session of this study. Some students had participated in other economics experiments that were unrelated to this research.

In each round, the two VCMs were displayed side by side on the same screen, see Figure 1. At the beginning of each round, each participant received an endowment of 160 francs, which could be transferred between VCMs. Each participant chose a portion of the endowment to contribute to one or both of the VCMs, and chose to keep the remaining portion of the endowment in a private account. Each player's contribution to the public good was multiplied by 0.4 and the total of all contributions given to each of the 4 players in the group in each VCM. Each participant kept the remainder of the 160-franc endowment that he did not allocate to either VCM. Participants did not know others' decisions before making their own decisions. After all participants made their decisions, the sum of all contributions in each group was displayed on the output screen together with the outcome, and earnings in each round were determined as the sum of the endowment kept in the private account and the earnings from the public good in each game. Participants recorded their results in a record sheet, and then moved on to the next round.

At the end of the experiment, two rounds from the game were selected for payment using a random draw from a bingo cage. Experimental francs were used throughout the experiment, with a conversion rate of 25 francs = $1. Participants earned $17 on average, and sessions

(including instruction time) lasted approximately 70 minutes. Participants also completed a demographic questionnaire at the end of each session.

4. Experiment Results

4.1 Result Overview

Table 1 reports the average contributions and payoffs across both treatments, separately for each VCM. We find that in each treatment, participants make relatively similar contributions to both VCMs on average. Figure 2 displays, by treatment, the average contribution (across both VCMs) over all 20 rounds of the experiment.

[Insert Table 1 about here]

Comparing the two treatments using a two-sample t-test, we find that contributions are significantly higher when group composition is different across both VCMs as compared to when composition is the same across the two VCMs ($M_1 = 17.7$, $SD_1 = 13.2$, $n_1 = 64$ versus $M_2 = 11.3$, $SD_2 = 14.2$, $n_2 = 40$; t-test, $p = 0.02$).[2] The same conclusion is supported even when using a very conservative non-parametric test that treats each group of participants as one independent observation ($M_1 = 17.7$, $SD_1 = 4.4$, $n_1 = 4$ versus $M_2 = 11.3$, $SD_2 = 12.8$, $n_2 = 10$; Wilcoxon rank-sum test, $p = 0.05$).[3] These results provide evidence in support of Hypothesis 2 (derived from conditional cooperators literature) and not Hypothesis 1 (derived from divided loyalties literature), suggesting that individuals contribute more toward multiple public goods when involved in different groups compared to individuals involved in the same group.

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[2] In conducting this t-test, we used the average contribution per subject across both VCMs and over all 20 periods of play as one observation.
[3] In the VCM-Same treatment one independent observation is a group of 4 subjects (40 subjects = 10 groups = 10 independent observations), while in the VCM-Different treatment one independent observation is one session (64 subjects = 4 sessions = 4 independent observations).

4.2. Conditional Cooperation

Hypothesis 2 suggests conditional cooperation as an explanation for the difference in contributions between the VCM-Different and VCM-Same treatments. For this part of the analysis, we define cooperators as participants who contribute more than 75% of the endowment (Andreoni and Petrie 2004; Savikhin and Sheremeta 2013). These are the individuals who either have an intrinsic motivation to be more prosocial or who conditionally cooperate based on observing other cooperators. Table 2 reports the distribution of cooperators as a percentage of total number of individuals. Comparing the two treatments, we find that in the first round of the experiment there are marginally more cooperators in the VCM-Same than in the VCM-Different treatment, but this difference is not statistically significant ($M_1 = 0.203$, $SD_1 = 0.051$, $n_1 = 64$ versus $M_2 = 0.250$, $SD_2 = 0.069$, $n_2 = 40$; t-test, $p = 0.71$). However, in the last 10 rounds of the experiment, there are twice as many cooperators left in the VCM-Different than in the VCM-Same treatment ($M_1 = 0.059$, $SD_1 = 0.017$, $n_1 = 64$ versus $M_2 = 0.025$, $SD_2 = 0.009$, $n_2 = 40$; t-test, $p = 0.07$). This observation provides additional support for Hypothesis 2, suggesting that participants who interact with two different groups of individuals may learn how to maintain cooperation better than participants who interact with only one group of individuals.

[Insert Table 2 about here]

How do participants maintain better cooperation in the VCM-Different as compared to in the VCM-Same treatment? Table 3 displays the average contribution in round t conditional on group contribution in round t-1. When examining the VCM-Same treatment, we find that if the group contribution in round t-1 to the VCM-1 is greater than the group contribution to the VCM-2, participants choose to contribute 40% more in round t to the VCM-1 than to the VCM-2 (12.8 versus 9.1). Similarly, if the group contribution in round t-1 to the VCM-2 is more than the group

contribution to the VCM-1, participants choose to contribute 76% more in round t to the VCM-2 than to the VCM-1 (11.3 versus 6.4). These findings suggest that participants in the VCM-Same treatment shift their contributions to the VCMs with higher contribution rates – thereby acting as conditional cooperators across games. The magnitude of this shift ranges from 40% to 76%. When examining the VCM-Different treatment, we find a similar type of behavior; however, the magnitude of shifts is drastically different. If the group contribution in round t-1 to the VCM-1 (VCM-2) is greater than the group contribution to the VCM-2 (VCM-1), participants choose to contribute 221% (271%) more in round t to the VCM-1 (VCM-2). The finding that participants in the VCM-Different treatment shift their contributions significantly more than participants in the VCM-Same treatment can help explain the difference in overall contribution rates across treatments (t-test, both p-values< 0.01; Wilcoxon rank-sum test, both p-values < 0.05).[4]

[Insert Table 3 about here]

Additional evidence of greater shifting of contributions in the VCM-Different treatment relative to the VCM-Same treatment comes from comparing the number of instances when participants choose to contribute more than half of their endowment to one of the VCMs. Specifically, we find that in 2.3% of instances, participants transfer more than half of their endowment to one of the two VCMs in the VCM-Same treatment. In the VCM-Different treatment, this number is more than doubled to 5.5% of instances (t-test, p = 0.04, n_1 = 64, n_2 = 40; Wilcoxon rank-sum test, p = 0.10, n_1 = 4, n_2 = 10). Note that the number of participants that transfer more than half may be low overall because participants tend to keep a significant portion of their endowment rather than to give it to the public good. Our findings comport with the

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[4] We constructed 10 independent observations in the VCM-Same treatment (40 subjects = 10 groups = 10 independent observations) and 4 observations in the VCM-Different treatment (64 subjects = 4 sessions = 4 independent observations). Each observation was the average difference between the contribution to the VCM-1 (VCM-2) and VCM-2 (VCM-1), conditional on higher group contribution to the VCM-1 (VCM-2) in the previous round.

results of Falk et al. (2013), who looked at participants participating in VCMs with different group members and found evidence for social interactions (i.e., participants contribute more to groups in which others are also contributing).

4.3. Determinants of Contributions

Table 4 reports estimates of panel regressions conducted separately for each treatment and each VCM. In these regressions, the dependent variable is participant's *contribution* to the VCM-1 (regressions 1 and 3) and to the VCM-2 (regressions 2 and 4). The independent variables are *VCM-1-lag* (lagged individual contribution to the VCM-1), *VCM-2-lag* (lagged individual contribution to the VCM-2), *group-VCM-1-lag* (lagged group contribution to the VCM-1), *group-VCM-2-lag* (lagged group contribution to the VCM-2), and a *constant*. All regressions use a random effects error structure for the individual participants to account for repeated measures, and a *period* trend to account for learning. Standard errors are clustered at the matching group level.

[Insert Table 4 about here]

In the VCM-Same treatment, according to the estimation results in regression (1), the main determinants of *contribution* in the VCM-1 are *VCM-1-lag* and *group-VCM-1-lag*, indicating that the two major factors influencing contributions are an *individual disposition* towards cooperation (i.e., tendency of a participant to contribute continually to the VCM) and *social interaction* (i.e., contributing to the VCM-1 conditional on group cooperation level). Similar results are reported in regression (2) for the VCM-2.

In the VCM-Different treatment, the determinants of contribution are more complex. According to the estimation results in regression (3), the determinants of *contribution* in the

VCM-1 are *VCM-1-lag* and *VCM-2-lag*, suggesting strong *individual disposition* effects. More interesting is the fact that the *contribution* in the VCM-1 is positively correlated with *group-VCM-1-lag* and negatively correlated with *group-VCM-2-lag*. This suggests that in the VCM-Different treatment, conditional cooperators are more responsive to the behavior of the two groups. They contribute more to the VCM-1 if they observe a cooperative behavior in the VCM-1 in the previous round, but they contribute less to the VCM-1 if they observe more cooperative behavior in the VCM-2 in the previous round. This is also true when we examine regression (4) for the VCM-2. Overall, these findings reveal a mechanism used by subjects to achieve higher cooperation in the VCM-Different than in the VCM-Same treatment: subjects in the VCM-Different treatment conditionally shift their contributions from a less cooperative group to a more cooperative group (there is no such evidence in the VCM-Same treatment).

5. Discussion and Conclusion

We experimentally investigated simultaneous decision-making in two public good games with same and different group members. In both treatments, participants were limited by a single budget constraint and had to choose how to allocate their endowment across two public goods. Compared to experiments that investigate behavior in single games in isolation, our study may be more relevant to practical contexts, including contributions to volunteer organizations or public projects, and interactions in organizational or social groups. We find that playing two public good games in different groups results in significantly greater overall contributions when compared to playing two public good games in same groups. The difference can be explained by the finding that participants act as conditional cooperators. Although participants have inherent individual disposition towards cooperation (i.e., their contributions are correlated across different

rounds of the experiment), they are also conditionally cooperative (i.e., their contributions are correlated with their group contributions across different rounds of the experiment). Moreover, we find that over the course of the experiment, participants in the VCM-Different treatment shift their contributions significantly more towards more cooperative VCMs than in the VCM-Same treatment.

As the social dilemmas paradigm has developed since Dawes' (1980) seminal paper, two competing lines of social research have emerged regarding cooperation behavior when facing multiple social dilemmas: a "divided loyalties" perspective and a "conditional cooperation" perspective. The purpose of the current research was to create consensus between these competing literatures. The choice of where to contribute resources when facing multiple social dilemmas with different groups led to greater overall cooperation because conditional cooperators were able to band together. This finding supports the conditional cooperation proposition of thought (derived from behavioral economics literature) on cooperation in multiple, simultaneous social dilemmas compared to the divided loyalties proposition (derived from organizational behavior / social psychology literature).

Our findings also push the current social dilemma paradigm by considering the role of discretion. Social dilemma research primarily focuses on the discretion about whether or not to contribute resources toward collective action (Calvert 1992; Zeng and Chen 2003). Even when examining multiple group membership, most social dilemma literature still focuses on discretion over whether to improve collective welfare or individual welfare (Polzer et al. 1999; Wit and Kerr 2002). The current paper introduces a second source of discretion - which collective action to undertake. Indeed, while individuals can always decide *whether* to assist or impede collective action, we observe that individuals can also decide *which* collective action to assist and *which* to

impede. Examining this source of discretion in the conversation of social dilemmas enhances the paradigm's ecological validity and leaves room for answering the trans-paradigmatic question, what can collectives do to look attractive to conditional cooperators?

We conclude with offering several additional avenues for future research. Given that many activities in practice involve simultaneous decision-making in multiple environments, it is important to study how the nature of these environments impacts cooperative behavior. For example, would we still observe higher cooperation when playing two games with different, rather than same, group members if, instead of two public good games, participants played in two tournaments? Investigating different environments will allow for the development of a unifying theory of simultaneous decision-making. Another avenue for future research is to study behavioral processes employed by participants when playing ensembles of games. We have already suggested how social interaction and individual disposition effects can explain the process of individual and group decision-making in our experiment. Obviously, there may be other processes involved that can help explaining behavior in environments with multiple games. Finally, it is important to investigate how behavioral regularities observed in more complex settings can be used to design more efficient economic and management systems. We leave these extensions for future research.

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Table 1: Average Contribution and Payoffs in each VCM

Treatment		Contribution	Payoff
VCM-Same	VCM-1	11.8 (24.2)	7.1 (19.2)
	VCM-2	10.8 (21.2)	6.5 (17.9)
	Average	11.3 (20.1)	6.8 (16.1)
VCM-Different	VCM-1	16.4 (28.1)	9.8 (24.2)
	VCM-2	19.1 (29.9)	11.4 (25.1)
	Average	17.7 (22.3)	10.6 (18.9)

Standard deviation in parentheses.

Table 2: Distribution of Leaders and Laggards

Treatment	Round	Cooperators
VCM-Same	1	25.0%
	2-10	8.3%
	11-20	2.5%
VCM-Different	1	20.3%
	2-10	8.5%
	11-20	5.9%

Table 3: Contribution in Round *t* Conditional on Group Contribution in Round *t*-1

Treatment		Group Contribution in Round t-1	Contribution in Round t
VCM-Same	VCM-1	VCM-1 ≥ VCM-2	12.8 (26.2)
	VCM-2	VCM-1 ≥ VCM-2	9.1 (20.6)
	VCM-1	VCM-1 < VCM-2	6.4 (14.5)
	VCM-2	VCM-1 < VCM-2	11.3 (19.5)
VCM-Different	VCM-1	VCM-1 ≥ VCM-2	19.7 (32.6)
	VCM-2	VCM-1 ≥ VCM-2	8.9 (18.4)
	VCM-1	VCM-1 < VCM-2	10.7 (19.1)
	VCM-2	VCM-1 < VCM-2	29.0 (30.0)

Standard deviation in parentheses.

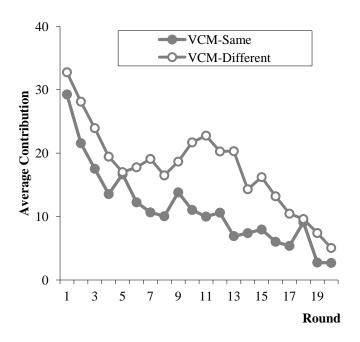**Table 4: Random Effect Models of Individual Participant Contributions**

Treatment	VCM-Same		VCM-Different	
Individual	(1)	(2)	(3)	(4)
Contribution in	VCM-1	VCM-2	VCM-1	VCM-2
VCM-1-lag	0.29**	0.11	0.27***	0.08*
	(0.14)	(0.13)	(0.03)	(0.04)
VCM-2-lag	0.04	0.30***	0.07**	0.47***
	(0.08)	(0.08)	(0.03)	(0.02)
group-VCM-1-lag	0.13***	0.01	0.12***	-0.04***
	(0.02)	(0.02)	(0.01)	(0.00)
group-VCM-2-lag	0.01	0.08***	-0.01**	0.09***
	(0.03)	(0.03)	(0.01)	(0.00)
Period	-9.01	-0.09	-5.76	9.58
	(6.50)	(5.45)	(5.99)	(6.42)
Constant	1.38	1.26	3.16***	1.84**
	(0.86)	(1.20)	(1.01)	(0.80)
Observations	760	760	1216	1216
Number of clusters	10	10	4	4
Overall R-squared	0.49	0.36	0.29	0.47

*** $p<0.01$, ** $p<0.05$, * $p<0.10$. Standard errors in parentheses are clustered at the group level.

Figure 1: Decision-Making Screen

Figure 2: Average Contribution over All Rounds

Appendix – Instructions (VCM-Same Treatment)

In this experiment you will participate in two games. Each of the two games will have four participants, including you. You will not know the identity of the participants you are grouped with. The experiment will consist of **20 periods**. You will participate in a **BLUE GAME** and a **GREEN GAME** at the same time. BLUE GAME and GREEN GAME have exactly the same rules. You will participate in the BLUE GAME with the **same three participants.** You will participate in the GREEN GAME with the **same three participants. All three other** participants you are matched with for the GREEN GAME are **the same** as the participants you are matched with for the BLUE GAME**.** The BLUE GAME will appear on the left side of the screen and the GREEN GAME will appear on the right side of the screen at the same time in all 20 periods.

At the end of the experiment **2 out of 20** periods will be randomly selected for payment. After you have completed all periods two tokens will be randomly drawn out of a bingo cage containing tokens numbered from **1 to 20**. The token numbers determine which two periods are going to be paid.

Each period you will be given **160 francs**. Francs will be converted to U.S. dollars at the end of the experiment at the rate of **25 francs = $1.** Each period, you will select an allocation for BLUE GAME and an allocation for GREEN GAME. When you are ready to make your decision, click on the "input boxes" below "How much would you like to allocate to Group Account in BLUE GAME?" and "How much would you like to allocate to Group Account in GREEN GAME?" and the program will allow you to enter in your number choices. When you are finished making your choices, click "Submit". You can allocate as much or as little of your francs as you like in each period, but remember that **the total francs you choose to allocate must not exceed 160 francs in each period.** You keep any francs which you do not allocate; therefore, your earnings are the sum of the francs you decided to keep, your earnings from BLUE GAME, and your earnings from GREEN GAME.

BLUE (GREEN) GAME

Below, we will read instructions for the BLUE GAME. However, the rules for the BLUE GAME and the GREEN GAME are **exactly the same**.

Each period you will decide how much of your endowment you want to allocate to a **Group Account**. You may allocate any integer number of francs between **0** and **160**, as long as the total number of francs used for allocations in both games does not exceed 160. After all participants have made their decisions, your outcome for the period is calculated.

Your period outcome from BLUE GAME depends on the total number of francs allocated to the Group Account by all 4 group members (including you). In particular, your earnings from the Group Account are **40 percent** of the **total allocation of all 4 group members** (including you) to the Group Account. Therefore, for every franc you allocate to the Group Account, you increase the total allocation to the Group Account by 1 franc. Therefore, your earnings from the Group Account rise by 0.4×1=0.4 francs. And the earnings of the other group members also rise by 0.4 francs each, so that the total earnings of the group from the Group Account rise by 1.6 francs.

In summary, your period outcome in BLUE GAME is determined as follows:

BLUE GAME Outcome = (earnings from Group Account) – (your allocation to the Group Account) =
= 0.4×(allocation of 4 group members to Group Acct.) – (your allocation to Group Acct.)

Example: Suppose that you allocated 40 francs to the Group Account and that the other three members of your group allocated a total of 120 francs. This makes a total of 160 francs in the Group Account. In this case each member of the group receives earnings from the Group Account of 0.4×160 = 64 francs, which is also each member's period outcome in the BLUE GAME.

TOTAL EARNINGS

After you choose how much to allocate to the Group Account in the BLUE GAME and how much to allocate to the Group Account in the GREEN GAME, the remainder of your 160 francs will be allocated to your **Individual Account.** Your earnings from the Individual Account equal to the francs that you keep for yourself and do not depend on the decisions of others. Therefore, for **every franc** you keep for yourself in your Individual Account, you earn **1 franc**.

Your total earnings will be converted to cash and paid at the end of the experiment if the current period is the period that is randomly chosen for payment. Your **total earnings** for each period will be calculated as:

Total Earnings = (160) + (Outcome from BLUE GAME) + (Outcome from GREEN GAME) =
Which is the same as

= 160+(Earnings from Group Account in BLUE GAME)–(allocation to Group Account in BLUE GAME)
 +(Earnings from Group Account in GREEN GAME)–(allocation to Group Account in GREEN GAME)

OUTCOME SCREEN

At the end of each period, your allocation, the sum of all allocations in your group for each of BLUE GAME and GREEN GAME, and the outcome for each of BLUE GAME and GREEN GAME are reported on the outcome screen. The computer will also display your income from the individual account and your total earnings for the period. Once the outcome screen is displayed you should record your results for the period on your **Personal Record Sheet** under the appropriate heading.

At the end of the experiment **2 out of 20** periods will be randomly selected for payment. Your earnings for these two periods will be converted to U.S. dollars at the end of the experiment at the rate of **25 francs = $1.**