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AID DISTRIBUTION AND COOPERATION IN UNEQUAL COMMUNITIES

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We experimentally study aid distribution and cooperation in a field lab in rural Nicaragua. In the first stage of the experimental game, participants contribute to a collective effort that determines the amount of aid given to the group, which is distributed among the players in a second stage. We find that in a treatment where a group representative, selected as the highest contributor, distributes aid, contributions are higher compared to a treatment where aid is equally distributed. The higher amounts of aid attracted, however, benefit representatives only. At the same time, representatives do care about fairness. They give higher aid shares to players with low endowments and lower shares to low contributors. Moreover, representatives with lower relative wealth or who contribute relatively more, keep higher aid shares. With our experimental game simulating community-based development (CBD) schemes, we discuss the implications of our results for elite capture in such schemes.

JEL Codes: C93, D31, D70

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1. INTRODUCTION

Over the last two decades governmental and non-governmental aid resources have been increasingly distributed through community-based development (CBD) schemes (Mansuri and Rao, 2004). On some occasions, the benefits are equally distributed irrespective of people's contribution. This is the case for the construction of local public goods, such as a school or a common water well, or the maintenance of local roads or irrigation systems. In other cases, private goods are distributed, such as seeds or tools, which are not necessarily distributed equally. In the latter case, the mandate to distribute aid resources among community members is often devolved to local community representatives. This has several

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advantages. In comparison with the officers of aid programs, local representatives tend to have better access to local information, which might increase the efficiency and sustainability of the program. At the same time, however, participatory programs are vulnerable to aid capture by community representatives (Galasso and Ravallion, 2001; Conning and Kevane, 2002; Platteau and Abraham, 2002; Platteau and Gaspart, 2003; Ravallion, 2003; D'Exelle, 2009; Takasaki, 2011). Such capture is commonly modeled as the autonomous decision of community representatives, who act as brokers between their community and the outside aid community. The underlying models, however, ignore two important elements.

First, a community-based development approach requires community members to get mobilized and organized, on which aid provision is made conditional. Setting up new community-based development projects therefore requires sufficient contributions from community members, in terms of time and labor. If aid resources are equally distributed irrespective of people's contribution, such "community mobilization" can be modeled as a public good, and free-riding behavior is to be expected. Giving local community representatives a mandate to distribute aid resources among the community members internalizes the externalities inherent in community mobilization. The distributive implications of doing so are not clear though. It is well-known from the literature that increased individual incentives and the possibility for punishment increase contributions in public good games (Fehr and Gächter, 2000; Masclet *et al.*, 2003; Sefton *et al.*, 2007). Hence, the devolution of aid distribution may reduce free-riding behavior and lead to higher amounts of aid attracted. Yet, community representatives may capture a substantial proportion of the attracted aid resources, thus discouraging contributions or at least limiting the benefits remaining for the other community members.

Second, little attention has been paid to the importance of "fairness" considerations. Growing evidence from experimental and behavioral economics, however, shows that people are not only driven by narrow self-interest, but often also take account of fairness when distributing scarce resources.[1] To accommodate this, models incorporating concerns for fairness through "inequity aversion" have been developed (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000; Charness and Rabin, 2002). This interacts with aid distribution in several ways. Inequity aversion may influence how community representatives distribute aid as well as how aid recipients react to such aid distribution. Moreover, equity may also take account of any pre-existing inequalities among community members, as well as individual contributions to aid mobilization. Consequently, it may be fair that community representatives get a larger part of the provided aid resources as they are most active in community mobilization. Similarly, an unequal distribution of aid resources is not necessarily "unfair" if it corrects any pre-existing economic inequalities among community members. Finally, we need to be aware that often there is no consensus on what is fair, as there is a human tendency to use fairness considerations in a self-serving way (Neale and Bazerman, 1992; Thompson and Loewenstein, 1992; Babcock *et al.*, 1995; Babcock and Loewenstein, 1997; Konow, 2009).

[1]For instance, in take-it-or-leave-it ultimatum games it is regularly observed that responders reject unfair offers in favor of lower but more equal outcomes (Güth *et al.*, 1982; for an overview see Camerer, 2003).

In this study, we will come to a more nuanced picture of elite capture in community-based development schemes by investigating the role of community mobilization and fairness considerations in aid distribution. For this, we use an artefactual field experiment that simulates the distribution of development aid channeled through a participatory scheme. In the experimental game the amount of aid attracted depends on the level of community mobilization, simulated by individual contributions to a collective effort. (The details of our experimental design are provided in Section 2.) Two treatments are organized that differ in the way the attracted aid is distributed among the players. In the first treatment, aid resources are distributed equally irrespective of individual contributions. In the second treatment, the player with the highest contribution distributes the aid resources. Comparing both treatments allows us to hypothesize about the influence of devolving the distribution of aid to the community level. To study the effects of inequality, we ran two between-subject treatments. In one treatment, all players receive equal endowments, while in a second treatment half of the players receive a high endowment and the other half a low endowment.

An important reason for organizing experiments to study cooperation and aid distribution is that we can do it in a controlled way. The controlled environment of a field lab is also very helpful to investigate the effect of economic inequality. In real life it is virtually impossible to observe how people behave under different institutional and economic conditions, in otherwise identical situations. Furthermore, simulating an intervention in a field lab instead of relying on a real intervention, as is done with a randomized control trial (RCT) experiment for example, involves lower costs.

The results of our analyses can be summarized as follows. We find that in a treatment where aid is distributed by a representative, selected as the highest contributor, contributions are higher compared to a treatment where aid is equally distributed. This leads to larger amounts of aid attracted, but as representatives keep high aid shares it does not lead to more aid for the other players. Representatives, however, do not capture all resources, but take fairness considerations into account when distributing aid. They give higher aid shares to players with low endowments and lower shares to players who contribute little. Moreover, representatives with lower relative wealth or who contribute relatively more keep higher aid shares. Finally, we find that endowment inequality leads to higher levels of mobilization when aid resources are equally distributed but not when aid is distributed by representatives. We end the article with a discussion of the implications of our results for elite capture in community-based development schemes.

2. Experimental Design

To simulate the distribution of development aid through a participatory development scheme, we designed an artefactual field experiment, the structure of which closely simulates the actual experiences of our subjects. We organized the experiment in November–December 2009, in six rural villages in the Pacific and Interior regions of Nicaragua, where in recent years substantial amounts of aid resources have been distributed through participatory development projects. Nicaragua is one of the most aid-dependent countries in Latin America. In 2009, official development aid amounted to 13 percent of its gross national income—a figure similar to countries such as Burkina Faso, Uganda, Mali, and Zambia (OECD, 2012). Its high dependence on aid dates back to the 1980s and has not changed since, making aid a quasi-permanent institution, at both government and grassroots levels (D'Exelle, 2009).

The six villages in this study are a subsample of 33 villages selected for an earlier study as a representative sample of the socio-economic and geographical variations of the Pacific and Interior regions of Nicaragua. In each of the 33 villages between 3 and 14 development programs were active, many of which were working according to participatory principles. On average, 79 percent of the population participated in at least one of these programs. This assures wide familiarity of the population with the principles of participatory aid programs. To avoid selection bias participants were randomly selected from a village census, and almost all of them eventually participated. After the experiment, participants were asked to answer a series of questions, which allowed us to capture important socio-economic characteristics, including economic inequality. The main questions involved household size and composition, land and livestock ownership, and program participation.

2.1. *A Field Experiment with Community Mobilization as Public Good*

Potential aid donors that follow a participatory approach expect the community to identify needs, elaborate plans and budget, get organized, etc. As this is an important aid condition, aid donors will be more willing to provide aid resources in communities that manage to mobilize successfully. Such mobilization requires that community members pool sufficient amounts of resources, often in the form of time and labor. After aid has been obtained, the distribution can take different forms: as a public good equally accessible to everyone or as an individual good distributed by the community.

Our field experiment is an abstract version of this two-stage process. Groups of $n = 8$ subjects interact for $t = 10$ rounds split in two consecutive treatments. We decided to use a within-subject design instead of a between-subject design as it requires fewer participants. Moreover, it leads to lower measurement error due to variation in participant disposition, since there are fewer participants and participants' predisposition is likely to be consistent across both treatments. Importantly, we do not anticipate any order effects. Fehr and Gächter (2000) analyzed the effect of a punishment option on public good provision and did not detect any influence of the order of the punishment treatment. As the treatment effect in our public goods game works partly through a punishment effect, this evidence suggests that order effects might be limited in our experiment as well.

The participants do not know how many rounds will be played nor that a second series of rounds with different rules will follow. The experiment starts as a repeated public goods game with a partner design. After five rounds, the distribution mechanism changes and five rounds are played in which the highest contributor distributes the aid. While five rounds per treatment is relatively low, from a practical point of view it is difficult to repeat the experiment over more rounds. The experiment is played with pencil and paper, which, together with the fact that many of the participants are lowly educated, means that considerable amounts of time are needed. Moreover, participants in these countries are not used to such experiments, so that it is unrealistic to ask them to remain disciplined and focused for a long period of time. However, we do not expect this to affect our analysis. If we were not to have a stable equilibrium after five rounds, at least the downward trend often observed in repeated public good games would be continued (as shown by several studies, such as Fehr and Gächter, 2000). Because of this and the fact that the second treatment is expected to counteract or even reverse the downward trend, only using five rounds would lead to an underestimate, hence conservative estimate, of the treatment comparison.

At the start of each round, all group members get an endowment y_i and are asked to simultaneously and privately decide on their contribution g_i to a public account.[2] The amount of aid attracted is calculated as the total contribution to the public account, multiplied by an efficiency factor $b = 1.6$. In a second stage, the attracted aid is distributed among the group members, each receiving a share s_i so that the pay-off of individual i in round t is equal to: $\pi_{it} = y_i - g_{it} + s_{it} \cdot b\sum_{j=1}^{n} g_{jt}$. In the first treatment—called the "equal-sharing" treatment—$s_{it} = 1/n$, so that everyone receives the same share of the attracted aid. In the second treatment—called the "representative-sharing" treatment—the highest contributor distributes the attracted aid among the group members after the individual contributions g_{it} have been made public.[3] In particular, he decides on the vector $[s_{1t}, s_{2t}, \ldots, s_{nt}]$, with $\sum_{i=1}^{n} s_{it} = 1$ and $s_{it} \geq 0$.[4] Comparing both treatments allows us to hypothesize how devolving aid distribution to community representatives affects aid distribution and community mobilization.

To study the effect of endowment inequality on community mobilization and aid distribution, we organize an additional between-subject treatment comparison. In one treatment all group members receive equal endowments, $y = 10$ units, while in a second treatment half of the group members receive a high endowment of $y = 12$ and the other half a low endowment of $y = 8$. Combining all treatments leads to the design depicted in Table A1 in Appendix 1, which also presents the detailed experimental procedures and the instructions. The table also shows the number of sessions in each treatment.

In each village we organized a maximum of three sessions in a maximum of two days. In total 128 persons participated in 16 sessions; 72 participants were female (56.25 percent). None had participated in a similar experiment before. Each session lasted between 90 and 120 minutes and average earnings were 117.7 C$ (i.e., equal to US$5.7, being more than two days' average income), with the highest earnings being 200.0 C$ and the lowest 70.0 C$. To make sure all participants understood the instructions, we proceeded in the following way. First, we used several control questions when explaining the instructions. Instead of asking

[2]While information on the decisions of the individual participants is made public, participants remain anonymous to each other.

[3]In case of more than one highest contributor, we randomly select one of the highest contributors to become the representative.

[4]To facilitate the decision-making by community representatives, we asked them to decide first on the amount of aid to keep for themselves, and second on the distribution of the remaining resources among the other group members. For each group member they were asked to decide whether to give nothing, a low share, or a high share; with high shares being twice as high as low shares. $S_t = 0, 1, 2$ with 0 = nothing, 1 = low, and 2 = high. $s_i = S_i \cdot \frac{(1 - s_r)}{\sum_{i \neq r} S_i}$ and s_r is the share kept by the representative.

control questions individually after having explained all the instructions, we asked control questions in public as we explained the instructions. This has the advantage that we could make sure that the participants understood each step of the instructions. Second, people were also allowed to ask questions individually; and third, participants received additional individual support during the session when they requested this or when we observed they were struggling with the instructions.

2.2. *Theoretical Considerations*

In this section, we elaborate theoretical predictions for individual behavior in terms of contributions to the public account and aid distribution; and how this may differ across the treatments. We start with the equal-sharing treatment and the representative-sharing treatment, after which we continue with a reflection on the possible effect of economic inequality, induced by experimental treatments or real-life heterogeneity.

Equal-Sharing Treatment

Note that the equal-sharing treatment, where all group members receive an equal aid share, is similar to the standard public goods game (Ledyard, 1995). From $b > 1$ follows that it is socially optimal to contribute everything as this maximizes the group pay-off. However, as $b/n < 1$ and with people having selfish preferences, each player has a dominant strategy to free ride for any given allocation of the other group members, leading to a Nash equilibrium where everyone contributes nothing at all. As confirmed by several experimental studies, however, the assumption of selfish preferences is commonly rejected. In reality, many people are conditional cooperators, that is, they cooperate if they expect others to do the same. Consequently, contribution levels will commonly be higher than predicted by the Nash equilibrium of zero-cooperation. With repeated play, however, cooperation levels tend to deteriorate over time as conditional cooperators reduce their contribution when they realize other group members free-ride (on this see, e.g., Fischbacher *et al.*, 2001).

Representative-Sharing Treatment

In the representative-sharing treatment, we come to the following predictions. With standard preferences a player who expects to be the only highest contributor will opt for full contribution and keep all resources. He does so since the attracted aid resources will always be strictly larger than his individual contribution (as $b > 1$ and $s_i = 1$). The other members, knowing that the highest contributor will keep all aid, do not have any incentive to increase their contribution. As a consequence, a strategy combination where one group member contributes everything and all others do not contribute anything will be an equilibrium. Furthermore, a strategy combination where all group members contribute the same (non-zero) amount can never be an equilibrium. The individual (expected) pay-off is then equal to: $\pi_i = y - g_i + p_{repr}\, b \sum_{j=1}^{n} g_j$. With the probability to become the representative $p_{repr} = 1/n$, we have the same situation as the standard public goods game, and with $b < n$, it is an optimal strategy to contribute nothing to the public good. Consequently, a strategy combination where no one contributes anything is also an equilibrium.

With social preferences, people will be more inclined to contribute—as we predicted in the equal sharing treatment. Moreover, social preferences may stimulate representatives to punish non-cooperative group members by giving them lower aid shares. As shown by several experimental studies (Fehr and Gächter, 2000; Masclet *et al.*, 2003; Sefton *et al.*, 2007), introducing a punishment option leads to higher contribution levels. Therefore, if group members anticipate that the representative gives less to less generous contributors they may be willing to contribute more. In sum, compared to the equal-sharing treatment, there are two additional mechanisms that stimulate individual contributions: through competition for the representative's role, and anticipation of punishment by the representative.

The Influence of Economic Inequality

There is a large literature on the effect of economic inequality in standard public goods games (remember that with equal-sharing our game is actually a public goods game), but the evidence is inconclusive (for example, see the literature review in Anderson *et al.*, 2008). Relying on models of inequality aversion and altruism, Buckley and Croson (2006) predicted low and high endowment subjects to contribute differently in absolute terms, but this was not confirmed by their experimental results. However, other studies found a negative effect of inequality on contributions to public goods. Cardenas (2003), for example, found that real-life inequality reduces contributions in a public goods game, but only when participants were allowed to communicate with each other.

In the representative-sharing treatment of our game, introducing endowment inequality does not change the existence of the equilibrium where one group member is the highest contributor and keeps all aid resources while all other group members do not contribute anything. Players with higher endowments, however, are more capable of overbidding the players with lower endowment, and therefore have a higher chance of becoming the representative.

Besides the experimentally induced inequality through differences in endowments, real-life inequality may be brought into the experiment. As the participants knew the other group members in the experiment, they were able to compare their individual wealth with the average group wealth. It is assumed that participants bring this variation spontaneously into the game. This is a realistic assumption for participants from populations where heterogeneity is substantial and who frequently interact with each other in their daily life (Cardenas and Ostrom, 2004).

Both sources of inequality may have a different effect on individual behavior though. Whereas endowment inequality leads to variation in the technical upper bound of contributions, real-life economic inequality does not have an influence on the range of feasible options in the experiment. It is not clear what the overall effect of real-life inequality will be on individual behavior in the representative-sharing treatment, as there may be two opposing effects. First, because of social preferences, poorer (richer) people may expect richer (poorer) people to contribute more (less). Second, socio-economic heterogeneity may also translate into differences in risk aversion as suggested by some experimental studies (Miyata, 2003; Wik *et al.*, 2004). Richer people tend to be less risk averse and may therefore be more inclined to compete for the representative's role.

3. Analyses

In this section, we present the empirical results. We start with an analysis of descriptive statistics that look at treatment effects and time trends. Thereafter, we report the results of regression analyses that investigate the effect of economic inequality, induced by the experiment and from real-life.

3.1. *Contributions*

Table 1 shows the average contribution in each round, separately for the equal and unequal endowment treatments. As explained before, in the first five rounds the attracted aid is distributed equally ("equal-sharing" treatment) whereas in the last five rounds a representative distributes the resources ("representative-sharing" treatment). We observe that in the equal-sharing treatment average contributions decline over time. This is consistent with existing evidence from experimental public good games (Fischbacher *et al.*, 2001). After a while people start to realize that others free ride, and as a reciprocal reaction reduce their contributions. In the representative-sharing treatment, in contrast, average contributions slightly increase over time. The same patterns are observed in the equal and unequal endowment treatments. As discussed before, this is the result of (anticipation of) punishment by the representative and/or competition among group members to become the representative.

To analyze whether these observations are statistically meaningful, we take the average contribution in each group across all rounds as the independent unit of observation. Calculating Spearman correlation coefficients between the average contribution per session and the round number we find that the average contribution decreases in the equal-sharing treatment (first five rounds), both with endowment equality (Spearman's rho –0.619, two-sided $p = 0.000$; $N = 40$) and endowment inequality (Spearman's rho –0.651, two-sided $p = 0.000$; $N = 40$). In the representative-sharing treatment, average contributions increase over time

TABLE 1
Average Contribution per Round and per Treatment

Round	Equal Endowments	Unequal Endowments
(a) Equal-sharing		
1	5.33 (2.70)	6.20 (2.80)
2	4.13 (2.36)	5.61 (2.63)
3	3.53 (2.24)	4.55 (2.15)
4	3.33 (2.21)	4.38 (2.24)
5	2.89 (2.04)	4.22 (2.54)
Average	3.84 (2.46)	4.99 (2.59)
(b) Representative-sharing		
6	5.09 (2.74)	5.75 (2.44)
7	5.23 (2.83)	5.61 (2.53)
8	5.95 (2.69)	5.48 (2.80)
9	6.11 (2.99)	5.72 (2.90)
10	6.36 (2.90)	6.56 (3.07)
Average	5.75 (2.86)	5.83 (2.77)

Note: Standard deviations in parentheses.

with endowment equality (Spearman's rho 0.453, two-sided p = 0.003; N = 40) and endowment inequality (Spearman's rho 0.319, two-sided p = 0.045; N = 40).

Comparing the average contributions between the first five rounds and the last five rounds, it appears that contributions are higher in the representative-sharing treatment than in the equal-sharing treatment. Applying a Wilcoxon signed ranks test to the average contributions of each group, we find that the distribution of group averages is statistically different between the equal-sharing and representative-sharing treatments, both in the equal endowment treatment (two-sided p = 0.012; N = 16) and the unequal endowment treatment (two-sided p = 0.017; N = 16). Furthermore, we observe that in the equal-sharing treatment contributions are lower in the equal endowment treatment than in the unequal endowment treatment, but that such difference is absent in the representative-sharing treatment. Applying a Mann–Whitney test to compare the average contributions of each group between the equal and unequal endowment treatments, we find that this difference is statistically significant in the equal-sharing treatment (two-sided p = 0.016; N = 16), but not in the representative-sharing treatment (two-sided p = 1.000; N = 16).

To analyze this further, we calculate averages separately for low and high endowment players. Figure 1 pools both treatments and shows the average contribution separately for equal, high, and low endowment players. We observe that both high and low endowment players contribute more than equal endowment players. The first is in line with existing fairness theories, according to which people are inequality averse and therefore distribute resources in such a way that inequality is reduced. However, the same theories would also predict that low-endowment players would contribute less, which is contradicted by our data. Buckley and Croson (2006) came to a similar finding. They attribute this to people's belief that free-riding is morally wrong as suggested by Sugden (1984), and hence both poor and rich players need to contribute their fair share. As a consequence, low endowment players contribute an equally large *absolute* share as high endowment players. This explains why average contributions are higher in the unequal endowment treatment.

This difference between low- and high-endowment players disappears in the representative-sharing treatment. We observe that the increase in contributions

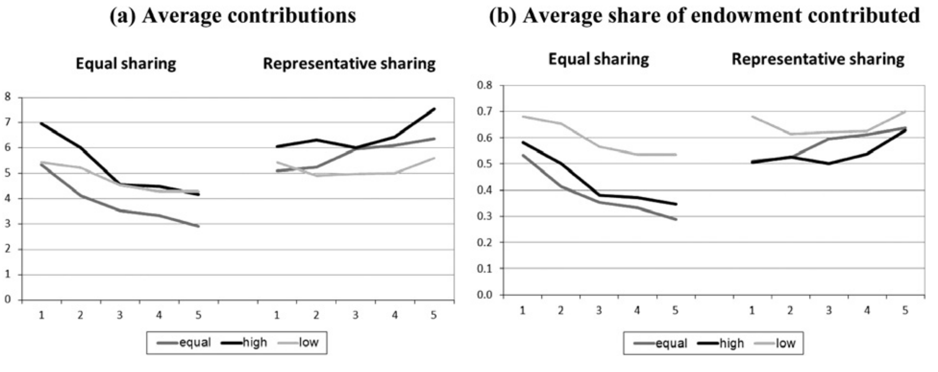

Figure 1. Contributions per Round of High, Low, and Equal Endowment Players

between rounds 5 and 6 is larger for high-endowment members than for low-endowment members. Whereas in the equal-sharing treatment high- and low-endowment players contribute equally, in the representative-sharing treatment high-endowment players contribute more than low-endowment players. This gives high-endowment players a higher chance to become the representative. In 32 of the 40 observations of the representative-sharing treatment with unequal endowments, the representative was indeed a high-endowment player.

3.2. *Aid Distribution*

On the basis of these observations one may conclude that to maximize individual earnings, aid distribution by representatives is better than equal distribution, as it leads to higher contributions and hence aid attracted. However, it is also necessary to assess the distributive implications of devolving aid distribution to representatives. It may be the case that representatives keep a large part of the aid for themselves, making the other players actually worse off than with equal aid distribution.

To assess this, we look at the average aid received by the group members. Figure 2a plots the average aid resources group members receive in the equal-sharing and representative-sharing treatments. We observe that in the equal-sharing treatment, average aid received shows a similar pattern as the average contributions (see Table 1), i.e. declining over time and higher with endowment inequality. This is of course not surprising given the perfect relation between total contributions and available aid, and the fact that aid is equally distributed in this treatment. In the representative-sharing treatment, average aid received (excluding the aid kept by the representative) does not increase above the levels of the last round of the equal-sharing treatment. This is a striking result as in the representative-sharing treatment substantially more aid is attracted. As demonstrated in Figure 2b, which plots the relative aid shares distributed among the

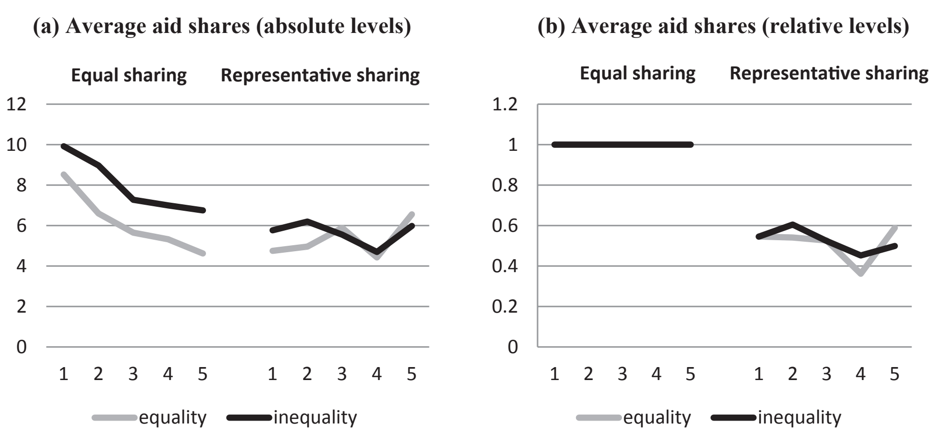

Figure 2. Average Aid Share Received per Round with Endowment Equality and Inequality

Note: Absolute aid share = amount of aid received. Relative aid share = aid received/(total aid/n), with n = 8; the share of the representative is not included in the representative-sharing treatment.

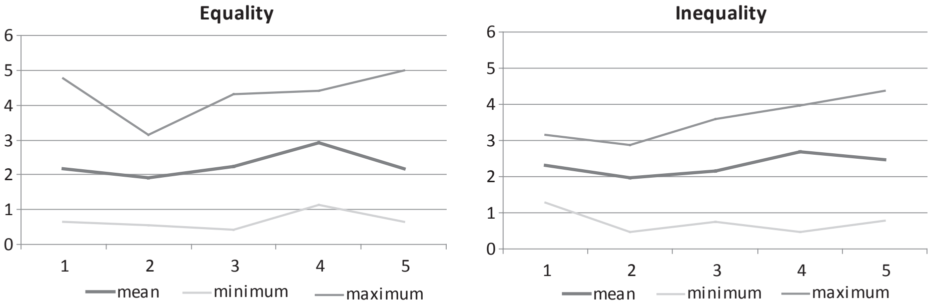

Figure 3. The Average Share of Total Aid Captured by the Representative Relative to His Share in the Total Contributions per Round with Endowment Equality and Inequality

group members (apart from the representative), we find that in the representative-sharing treatment more than 40 percent of the aid resources is kept by representatives. This suggests serious aid capture by representatives.

However, two further observations are required. First, as can be observed in Table A2 in Appendix 2, there is substantial variation in the average share kept by the representative. Second, representatives may keep larger shares than other group members to compensate for their higher contributions. To come to a more nuanced picture we should look at the share of aid the representative keeps relative to his/her contribution. Figure 3 plots the proportion of the relative aid share kept over the relative contribution. A value of 1 means that the representative keeps a proportion of aid relative to his/her contribution similar to the other group members. In addition to the mean value, the figure shows the minimum and maximum values across groups, for equal and unequal endowments separately. We observe that the value of this indicator is on average around 2, which indicates that representatives keep more aid than they deserve given their contribution and confirms there is substantial aid capture by representatives.

The fact that representatives keep large aid shares would not be a problem if there is sufficient rotation among group members to assume the representative role. To study change in the representative role, we create a variable that counts for each group the number of rounds (out of a maximum of 4) in which the current representative is different from the one in the previous round (Indicator 1). An alternative way is to count the number of rounds (out of a maximum of 5) in which the representative is a group member who has not had this role before (Indicator 2). Table 2 shows the distribution of both indicators, separately for the equal and unequal endowment treatments. We observe that the change of representatives is considerable and similar between both treatments. Using a Mann–Whitney test, we find that the distributions of Indicator 1 (two-sided $p = 0.825$) and Indicator 2 (two-sided $p = 0.578$) are not statistically different between both treatments.

3.3. *Competition vs Anticipation of Punishment*

As indicated by the large shares kept by representatives, being a representative can be very profitable. The other group members do not have any way to

TABLE 2

Change in Community Representatives (representative-sharing treatment)

Indicator 1 Representative Round $t \neq$ Representative Round $t-1$	Equality	Inequality	Indicator 2 First Time Group Representative	Equality	Inequality
1 round	0	1	1 round	2	1
2 rounds	3	3	2 rounds	1	5
3 rounds	3	1	3 rounds	5	1
4 rounds	2	3	4 rounds	0	1
N	8	8		8	8

Note: This table shows the extent to which the task of distributing aid changes within the group of participants in the five rounds of the representative sharing treatment. Indicator 1 depicts the number of rounds in which the representative was not the same as in the previous round. Indicator 2 depicts the number of rounds with a representative that was not a representative before.

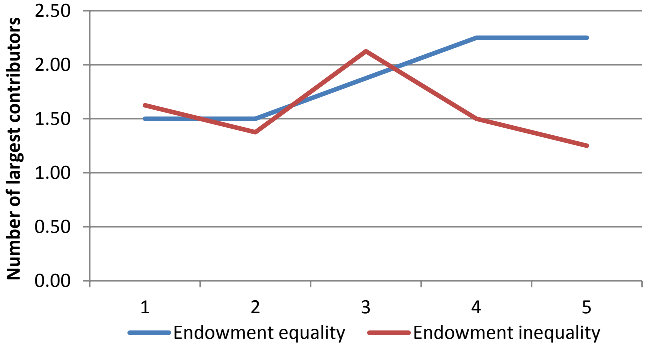

Figure 4. Number of People with the Highest Contribution in Each Round of the Representative Sharing Treatment with Endowment Equality and Inequality

punish the representative directly. They could reduce their contribution, but this would also affect other group members. The best way to react against capture by representatives is to contribute as much as (or more than) the representative in an attempt to seize the representative role. The increase of average contributions over rounds and the relatively high contributions of high-endowment people in the representative treatment could be seen as an indication of the relevance of such competition. However, both patterns may also result from anticipation of punishment (by the representative) for contributions that are deemed lower than justified. In this section, we shed some light on these issues.

Figure 4 plots the number of group members who make the largest contribution in a particular group and round, for equal and unequal endowment treatments separately. We observe that while both treatments start with a similar average number of largest contributors, in the equal endowment treatment competition increases, whereas in the inequality treatment it slightly declines (after an incidental increase in round 3). This difference between both treatments is not surprising, as with inequality the pool of potential competitors is half as large as in the equal endowment treatment. Low-endowment group members have a lower

TABLE 3

Distribution of the Value of the Highest Contribution for All Rounds (representative-sharing treatment)

Highest Contribution	Share of Rounds (all sessions)	
	Equality	Inequality
6	5.0%	
7	5.0%	2.5%
8	15.0%	25.0%
9	20.0%	15.0%
10	55.0%	32.5%
11		12.5%
12		12.5%
Total	100.0%	100.0%
N	40	40

Mann–Whitney test for significance of difference: z = 2.831; two-sided p = 0.005.

TABLE 4

Distribution of Contributions as Compared to the Previous Round

Treatment	Equal Sharing	Representative Sharing
% of players contributing at least as much as the highest contributor in the previous round		
Equality	7	24
Inequality	14	22
High endowment	15	30
Low endowment	13	13
% of players contributing less than the median contribution in the previous round		
Equality	54	40
Inequality	54	45
High endowment	54	41
Low endowment	53	48

Note: Each cell for the full treatment is based on 256 observations (rounds 1 and 6 are excluded). Cells for high and low endowments are based on 128 observations each.

chance of becoming the largest contributor. The stronger competition for the representative role in the equality treatment is also reflected in that in 55 percent of observations the highest contribution equaled the total endowment in the equality treatment compared to 12.5 percent of observations in the inequality treatment, as shown in Table 3.

A more dynamic way of looking at competition that also allows consideration of the anticipation of punishment is to compare current and previous contributions (Table 4). The share of players contributing at least as much as the highest contributor in the previous round is much higher in the representative-sharing treatment than in the equal-sharing treatment, indicating that players indeed compete for the representative role. The effect is largest for the equality treatment, where the share increases from 7 to 24 percent, as compared to a rise from 14 to 22 percent for the inequality treatment. For the inequality treatment, the increase is only due to the high-endowment players. This again suggests more competition under equality. Similarly, we now find clear evidence of behavioral changes to avoid punishment. The share of players that contribute less than the median contribution in the previous round decreases with the introduction of representative sharing. Again, this effect is strongest for the equality treatment. Both high and low endowment players are less likely to contribute less than the previous median contribution. Yet, the effect is smallest for the low endowment players, who therefore seem less afraid of punishment. These results suggest that the increase in contributions resulting from the introduction of representative sharing is the result of both competition for the role of representative and anticipation of punishment for free-riding.

3.4. *The Influence of Real-Life Economic Inequality*

So far, we have only looked at the influence of inequality induced by experimental treatments. However, as the participants knew the other group members in the experiment, they were able to compare their individual wealth with the average group wealth. As a consequence, participants may bring real-life inequality into the experiment. To analyze the influence of real-life economic inequality on the participants' behavior, we make use of regression techniques. The results of the regression models can be found in Appendix 2.

In a first analysis, we investigate what determines one's contribution. We estimate different models. In a first model we use the positive and negative standardized deviations from the group average of livestock as explanatory variables and only used the data of the equal endowment treatment (Model 1). Livestock is one of the major determinants of wealth in the region. The positive deviation is calculated as the absolute value of the standardized difference between the participant's livestock and the group average if it is positive, otherwise zero.[5] The negative deviation is equal to the absolute value of this difference if it is negative, otherwise zero. In Model 2 we only use the data of the unequal endowment treatment and add a control for the endowment of the group member, using a dummy variable equal to 1 in case the group member receives a high endowment. In Model 3, we extend Model 2 by adding interaction terms between the group members' endowment and the positive and negative deviations of the number of cows they have.

Table A3 shows the results for the equal-sharing treatment. The results in all models confirm a negative time trend, which was previously observed in the descriptive analysis. Looking at the individual models, we find that in contrast to the equality treatment (Model 1) where no effects of real-life inequality were observed, in the inequality treatment (Model 2) poorer group members tend to contribute more. When adding interaction effects with the endowment dummy variable (Model 3), we find that this effect is mainly driven by poorer group members who are high-endowment players in the experiment. Apparently, participants who are comparatively poorer than the other participants in real-life find they should contribute more than others if they are more able to do so (i.e., when they receive higher endowments).

[5]To make sessions comparable we standardize these variables by dividing them by the group average.

We now investigate individual contributions in the representative-sharing treatment. We estimate the same models as we did for the equal-sharing treatment. Table A4 shows the results. Here again we do not find any effect of real-life inequality in the equal endowment treatment (Model 1). In the unequal endowment treatment, we again find a positive effect of being at the same time poorer than the group average and being a high-endowment player (Model 3). This effect, however, is much stronger than in the equal-sharing treatment. This suggests that especially the poorer participants want to benefit from the opportunity provided to become the group representative (and to benefit from large aid shares).

As being among the highest contributors in the representative-sharing treatment gives one the chance to be the representative, and hence distribute the attracted aid resources, it is interesting to identify the determinants of being the highest contributor. Table A5 shows the results of a series of probit regression models that estimate the likelihood that one makes the largest contribution, controlling for the same variables as in the previous regressions. Whereas in the equality treatment (Model 1) none of the coefficients are statistically significant, with endowment inequality the coefficients of cows above and below the group average as well as the interaction with the endowment dummy (Model 3) are all statistically significant. To interpret the size of these effects in probability terms, we calculate predicted probabilities for different values of cattle property (we use values 0 and 1 above/below group average) and 95 percent confidence intervals. We find that high endowment group members have a significantly higher likelihood of being the largest contributor if they have less livestock than the group average (30.93 percent; 95 percent confidence interval: 15.37 percent to 46.50 percent) than when they have more livestock than the group average (5.01 percent; 95 percent confidence interval: –3.56 percent to 13.59 percent), or equal livestock as the group average (2.52 percent; 95 percent confidence interval: –3.30 percent to 8.34 percent). This again suggests that real-life inequality induces poorer players to make use of the opportunity provided by the high endowment they receive in the experiment.

After having studied what influences individual contributions, we look at the distribution of aid. Two aspects are important: how much the representative keeps and how the remaining resources are distributed among the rest of the group. We start with the latter. Remember that a representative has three options: giving a high share, a low share, or nothing to each of the other group members. As the latter option was selected in only very few cases, we limit the analysis to the choice of a high share compared to either a low or no share. In particular, we estimate the likelihood that a particular group member receives a high share. For this, we estimate a probit regression controlling for the positive and negative deviation from the average contribution. The positive (negative) deviation is calculated as the absolute value of the standardized difference between the participant's contribution and the group average if it is positive (negative), otherwise zero. Table A6 reports the results.

According to the results of Model 1, which uses the data of the equal endowment treatment only, players who contribute less than the group average are less likely to receive a high aid share from the representative. Calculating marginal probabilities we find that the likelihood of receiving a high share decreases with

12.93 percent for each unit below the average contribution. In Model 2, which uses the data of the unequal endowment treatment only, we use the same explanatory variables as in Model 1 and add a control for the endowment of the group member. Converting the results into probability terms, we find that the likelihood that a group member receives a high share decreases with 18.45 percent for each unit below the average contribution, and, ceteris paribus, is 14.45 percent lower for high-endowment group members. To test whether the marginal effect of one's relative contribution differs between hig- and low-endowment players, in Model 3 we also add interaction effects between the group member's endowment and his/her relative contribution. The interaction effects are not statistically significant.

In a final analysis, we investigate the aid representatives keep for themselves. For this we estimate a regression on the pooled treatments with the proportion of aid kept by a representative in a specific round as dependent variable. We control for the endowment of the representative, the representative's livestock, and his/her share in the total contribution made by the group (Model 1). In a second model (Model 2) we also control for the representative's livestock and the interaction with his/her endowment. Table A7 shows the results. In Model 1, without the interaction effects, we observe that the representatives' contribution correlates positively with the share of aid resources they keep. In Model 2, where we add interaction effects between real-life inequality and endowment inequality, we find that representatives keep larger shares if they are wealthier than the group average and they have a low endowment in the experiment, but this effect is reduced when they have a high endowment or endowments are equal among all players.

4. Conclusion

In this article, we experimentally studied aid distribution and cooperation in rural Nicaragua. For this, we used a two-stage game implemented in a field lab. In the first stage, players contribute to a collective effort that determines the amount of aid that is given to the group, which is then distributed among the players in a second stage. We found that in a treatment where aid is distributed by a group representative, selected as the highest contributor, contributions are higher compared to a treatment where aid is equally distributed. The higher contributions are due to both competition for the role of representative and anticipation of punishment for free-riding. These increase the amount of aid, but as representatives keep high aid shares this does not lead to more aid for the other players.

While keeping high aid shares to themselves, representatives do take fairness considerations into account. They give higher aid shares to players with lower endowments and lower shares to players who contribute relatively little. Moreover, representatives with lower wealth relative to the group average tend to keep more aid for themselves. They also do so when they contribute more relative to the group average. The latter two elements, however, cannot fully justify the very high shares group representatives keep for themselves. The distributional consequences of this appropriation behavior, however, are limited because of high rotation of the representative role.

What do these results imply for the discussion on "elite capture" in real-life CBD schemes? The fact that representatives keep more for themselves than what they give to others, suggests considerable elite capture. However, several nuances are needed. First, representatives keep more than what they give to others, but they also contribute more than others.[6] However, analyzing aid shares relative to contributions, we found that community representatives keep more aid than they deserve, which confirms that aid capture by representatives is substantial. Second, we also found that representatives are not only driven by self-interest, but also care about fairness. They differentiate between community members, by giving higher aid shares to poorer community members and lower shares to low contributors. The high shares they keep for themselves, however, indicate they are little influenced by fairness considerations when comparing their position with the other community members. Hence, they tend to follow fairness considerations in a self-serving way, which is consistent with recent bargaining literature (Neale and Bazerman, 1992; Thompson and Loewenstein, 1992; Babcock *et al.*, 1995; Babcock and Loewenstein, 1997; Konow, 2009).

Our experimental game, however, deviates from actual CBD schemes in several aspects. While we observed considerable rotation of the representative role in consecutive rounds, this is less likely in the real world, where it is more common that community members do not have equal opportunities to become the community representative. In our experiment we found that community members with high endowment can contribute more and hence have better chances of becoming the representative. There may be more variables on which community members differ and that correlate with people's capacity to act as a community representative. One such variable is the experience community representatives acquire at the interface between aid donors and communities. As documented by Bierschenk *et al.* (2000), the capacity to work at the interface and to make contact with aid providers is mainly acquired through experience at the interface. As a consequence, the chance of becoming the community representative depends not only on one's decision in the current round, but also on one's previous experience as a community representative. When this is the case, changes in community representatives will become less frequent over time, and hence the distributional consequences of elite capture will be more severe.

There are at least three other aspects in which real-life community mobilization and aid sharing differ from our games. First, we assumed that aid donors did not exert any influence on the selection of community representatives. While in reality community representatives are indeed endogenously selected, there may be some room for aid donors to interfere and eventually influence who gets the role of local aid distributor. As argued by D'Exelle (2009), this is necessary if aid donors are really committed to discouraging recurrent exclusion processes and aid capture by community representatives. Second, in our experimental design the information on the aid distribution is always made public. However, in reality community

[6]Community representatives often refer to this as an argument in favor of keeping higher aid shares, and also community members accept their representatives to keep higher shares because of this. This is illustrated by Platteau and Gaspart (2003, p. 1690) in a case study of elite capture: "That he [the community representative] appropriated to himself a disproportionate share of the benefits of the aid program is considered legitimate by most of them. They indeed think that without his efforts their own situation would not have improved at all. In particular, he created the village association which had to be formed in order to be eligible for external assistance."

representatives oftentimes manage to conceal information on (part of) the distribution. That this may influence individual behavior has been demonstrated by D'Exelle and Riedl (2008) who found an important effect of information on aid distribution. Third, as indicated by previous experimental work (see, for example, Cappelen *et al.*, 2010), variation in the causes of wealth/needs of individual community members as well as the sources of the economic resources that are distributed may be of important relevance when aid resources are distributed. Undoubtedly, a further investigation of the determinants of aid mobilization and aid distribution, taking due consideration of these variables, would certainly be a valuable extension to our research.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

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Table A3: Determinants of individual contribution (equal-sharing treatment)
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Table A6: Amount of aid received (representative-sharing treatment)
Table A7: Proportion of aid kept by representative