Can Development Programs Shape Cooperation?

Results from a Framed Field Experiment in Indonesia

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Abstract

Empirical studies among small-scale societies show that participation in national development programs impact traditional norms of community cooperation. We explore the extent to which varying levels of village and individual involvement in development policies relate to voluntary cooperation within community settings. We used a field experiment conducted in seven villages (208 participants) from an indigenous society in Indonesia known for their strong traditional cooperative norms, the Punan Tubu. We framed the experiment in terms of an ongoing government house-building program. The results indicate that there were synergistic and antagonistic interactions between existing cooperative norms and government development policies. Participants' cooperation in the experimental setting was low, probably because the Punan Tubu are used to cooperating and sharing both under demand and in a context in which uncooperative behavior is largely unpunished. Variation in experimental behavior was related to both village- and individual-level variables, with participants living in resettlement villages and participants living in a house constructed under the government program displaying more cooperative behavior. The cooperation evident in resettled villages may indicate that people in these villages are more comfortable interacting in anonymous settings and less committed to the demand-sharing norms still prevalent in the upstream villages. The more cooperative behavior among villagers who have previously received a house might indicate that they recognize that they are

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now better off than others and feel more obliged to cooperate. Policies aiming to capitalize on existing cooperative behavior to stimulate community collective action should consider the specific conditions under which cooperation occurs in real settings since traditional norms that regulate cooperative behavior might not translate well to cooperation in government-led programs.

A large body of empirical evidence suggests that communities have the ability to cooperate in overcoming social dilemmas, or situations in which there is a conflict between individual and collective interests (Cárdenas 2000; Lewis et al. 2014; Ostrom 1990; Patton 2005). Over recent decades, researchers have unraveled some of the nuances of how communities cooperate in solving collective action problems. A strong finding of this literature is that cooperative behavior is guided by social incentives or pressures, such as the local norms enforced through effective peer monitoring (Fehr et al. 2002; Gneezy et al. 2016; Hawkes 1992; Narloch et al. 2012; Ostrom 2000). Social norms that create expectations of cooperation help individuals to overcome uncertainty about whether others will cooperate and make people more confident about relying on one another, thus boosting cooperation (Beedell and Rehman 2000; Bigoni et al. 2016; Fielding et al. 2005).

Empirical studies among small-scale societies show that both integration into the market economy and participation in national development programs impact traditional norms of community cooperation, with the two processes being more or less entangled, depending on the context. Thus, some scholars have shown that the long-term dynamic processes that bring economic change to previously isolated indigenous peoples and local communities (e.g., markets) have significant impacts on the structure of social interactions and the evolution of social norms (Bowles 1998; Cárdenas et al. 2017; Henrich et al. 2001, 2010). For example, in their cross-cultural study, Henrich et al. (2001) analyze how different levels of integration into the market economy across several indigenous societies relate to cooperation. Their findings show that societies and people who are more market integrated are also more likely to define fairness as equity and that integration into the market economy makes people more willing to engage in immediate exchanges for mutual benefit with people outside the group, or what they call "balanced reciprocity." In other words, integration into the market economy results in familiarity with immediate exchanges with outsiders and promotes a specific type of reciprocity with strangers.

Scholars have also argued that traditional norms of community cooperation can be influenced by a less dynamic and more short-term process: individual participation in national government policies (Onyeiwu and Jones 2003). Indeed, the presumed effectiveness of cooperation within organized communities has led policy makers to try to capitalize on existing network structures, social norms, and relations of trust to stimulate existing community collective action in order to foster community development (Curtis et al. 1999; Vollan 2012). For example, in Australia government funding has been used for more than three decades to support the participation of local rural organizations, known as "Landcare groups," in sustainable resource management. The

groups are established and run by private rural land managers and represent an example of "state-sponsored community participation to contribute to rural development" (Curtis et al. 1999:5). Yet, such policies often overlook the fact that existing networks and norms carry with them community-level inequalities and power structures, for which the use of these informal structures for development policies may deepen existing inequalities (Dasgupta and Serageldin 2000; Race and Sumirat 2015). Thus, in the Landcare group example, the intermittent provision of government funding to voluntary groups undermined rural social relations, reducing the likelihood that communities subsequently engaged with other voluntary or government programs (Curtis et al. 2014). In sum, although this research shows that government interventions and related processes affect communities' willingness to contribute to collective action, there is ambiguity regarding the direction of the change since the government's request of one form of cooperation might indeed affect established social structures and other forms of cooperation (Dasgupta and Beard 2007; Narloch et al. 2012; Onyeiwu and Jones 2003). There is a need for careful and critical analysis of the social context in which community development programs operate (Race and Sumirat 2015).

In this context, the general goal of this article is to test the association between engagement in government development policies and individual cooperation. We do so by comparing results from a framed field experiment and individual and village information on engagement in state development initiatives. The research was conducted in seven Punan villages along the Tubu River (Kalimantan, Indonesia). This article has two specific goals. First, we analyze cooperative behavior in an experimental setting focusing on potential differences between villages with different levels of exposure to national development policies. Second, we analyze the individual- and village-level correlates of individual cooperative behavior in the experimental setting.

The Punan Tubu

The Punan are a society of about 10,000 people living in East Kalimantan, Indonesia. The Punan are diverse hunter-gatherer groups who self-differentiate according to their place of origin and relations with agricultural neighbors (Kaskija 2012). The Punan living around the Tubu River are known as Punan Tubu (Kaskija 2012; Levang et al. 2007). Traditionally, the Punan Tubu had a nomadic livelihood based on hunting bearded pigs, preparing starch from hill sago, and bartering with local farmers (Kaskija 2012). Most Punan Tubu abandoned this nomadic lifestyle around the 1970s when the government of Indonesia established the Kayan Mentarang National Park, restricted entry to the protected area, and moved most people in the area to settlements near the town of Malinau (Kaskija 2012; Sercombe and Sellato 2007). Today, most Punan Tubu live in these two settlements where they mostly practice farming. However, about 800 people continue to live along the Tubu River (Fig. 1). Although the Punan Tubu living upriver have started to rely on hill rice farming and to trade non-timber forest products, they continue to undertake temporary nomadic tours in the forest for hunting and gathering.

The Punan Tubu are ideal for assessing the relation between involvement in development policies and cooperative behavior for three reasons. First, as with other hunter-gatherer societies (e.g., Boehm 1999; Kameda et al. 2005; Hill 2002), the Punan
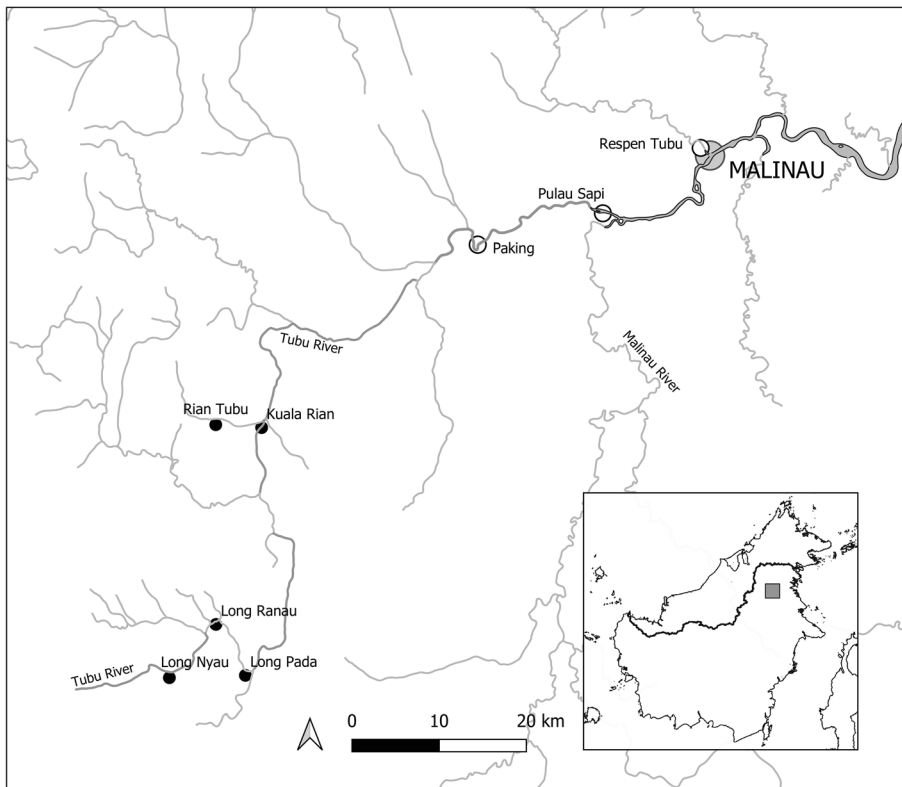
Fig. 1 Location of study villages in East Kalimantan, Indonesia

have a long-standing record of cooperative behavior. Ethnographic accounts suggest that traditionally the Punan extensively practiced sharing, particularly demand-sharing (Kaskija 2012), which is defined as "the social norm by which individuals in possession of highly coveted resources (such as meat) are forced to share food with all other group members (including free-riding individuals who rarely hunt)" (Lewis et al. 2014:2). Demand sharing continues to be important among the Punan living in the upper watershed of the Tubu River (Kaskija 2012; Napitupulu et al. 2016), with anecdotal evidence of this practice diminishing in the resettlement villages, as also documented elsewhere (Kaplan and Gurven 2005). Spontaneous cooperation, defined as "the self-organized cooperation that emerges when people pursue their own ends and mutually adjust to each other to form cooperative arrangements across the boundaries of their usual activities, without being guided by a hierarchical entity" (Wollenberg et al. 2007), has also been documented in upstream Punan villages, mostly in relation to daily tasks (e.g., pulling canoes, childcare; Kaskija 2012; Sellato 1994). Our ethnographic understanding suggests that more organized cooperation also occurs, particularly in relation to new economic activities such as agricultural tasks (e.g., opening of agricultural plots, harvesting) and house building. For example, while many tasks related to the building of wooden houses (e.g., transporting wood from forest to house, putting up the wooden boards) are done by close family members, other tasks (e.g.,

building the foundation, putting on the roof) require cooperation from larger groups. Interestingly, as with other societies that practice demand-sharing (Lewis et al. 2014), the Punan only appear to punish free-riders (people who do not share or do not cooperate) by mocking and ridiculing stingy and uncooperative individuals. Thus, the Punan Tubu have strong cooperative social norms that they use to negotiate between individual and collective interests.

The second reason why the Punan Tubu provide an ideal case to assess the relation between involvement in development policies and individual voluntary cooperative behavior is that Punan Tubu villages have experienced different levels of involvement with development policies. The Punan Tubu lived a nomadic lifestyle in what is now the Kayan Mentarang National Park until the 1970s, when most of them were resettled near the town of Malinau. The resettled Punan Tubu, described as "rich and business-like" and similar to their agriculturalist neighbors (Harrisson 1975), have benefited from access to schooling, health care, and employment opportunities for about four decades. They have also become familiar with market transactions, urban forms of leisure, and daily interactions with outsiders. In contrast, the Punan Tubu living in the upstream villages heavily rely on the environment to make a living, with a subsistence economy based on upland swidden cultivation of rice, hunting of wild boar, and gathering of forest products (Kaskija 2012; Levang et al. 2007). Until recently, the most important source of income for the Punan Tubu in the upstream villages was the commercialization of non-timber forest products, although the arrival of development policies has resulted in an increase in the number of people who regularly receive wages (i.e., as village officials or from participation in government projects; Napitupulu et al. 2016).

Third, nowadays, all Punan Tubu participate in the national development programs that aim to improve village governance, community life, and rural development, as articulated in Law 6/2014 on Villages (Antlöv et al. 2016). In the study area, the government of Malinau started a program known as Gerdema to promote rural development through bottom-up processes based on community aspirations and environmental management (PEMKAB Malinau 2013). The program allowed villages to decide their own development pathways and distributed cash to them for the implementation of such plans, under government guidance and monitoring. Villages were expected to top-up government transfers by providing volunteer labor, local materials, or even cash, and were punished—with reduction of future endowments—if they failed to achieve their own goals. Initiatives developed under the Gerdema program varied from handicraft micro enterprises to the acquisition of agricultural tools (e.g., tractors) and the construction of village infrastructure or private housing.

Villages along the Tubu River opted to use Gerdema funds to build private wooden houses, probably because for the Punan Tubu, these houses are a symbol of development. In contrast to their agricultural neighbors, who live in longhouses, the Punan traditionally did not invest large amounts of resources or materials in building houses or establishing permanent settings (Kaskija 2012). According to ethnographic accounts, before the arrival of the Dutch in the 1920s, all Punan lived in simple huts (*lepow*) conveniently grouped in small, temporary, and mobile residential clusters (Kaskija 2012). While the resettled Punan started to build larger wooden houses from the 1970s, most Punan Tubu in upriver villages continued to live in huts located near small swidden fields and gardens as late as the early 1990s, although

some of them also had bigger houses in more permanent settlements. The turn of the century marked an important change in Punan housing. Kaskija (2012) describes that, since the mid-1990s, many Punan in upriver villages started to build large wooden houses with glass windows, verandas, and painted fronts. The trend was made possible by cash obtained through the commercialization of *gaharu*, incense wood, and the arrival of the credit system to the area. These houses soon became a symbol of status, modernity, and personal success, which probably explains why most upriver villages decided to use money from the Gerdema development program to build wooden houses. Following the requirements of the program, through meetings (mostly attended by men), villages decided on the families who would benefit from a wooden house, the order of construction, and the amount of material and labor to be contributed by each household to top-up (provide the required cost-share for) the government funds.

Together, Punan Tubu's history of cooperative behavior, decades of differential involvement with development policies, and the existence of an ongoing government program that requires cooperation beyond the household make the Punan Tubu an ideal case for examining the relations between engagement in development policies and cooperative behavior.

Methods

Data on individual decisions to cooperate were collected through an economic experiment framed around the house-building program described above, and individual information that was collected in a follow-up survey. The experiment and the survey were administered in March 2014 in the seven Punan Tubu villages and were preceded by 16 months of fieldwork (from March 2012 to July 2013) in two isolated upstream villages (Napitupulu et al. 2016). The research received the approval of the Ethics Committee of the Universitat Autònoma de Barcelona, and we obtained free, prior, and informed consent in each village and from each participant in the study.

Economic experiments have typically been used to uncover variation in predisposition to cooperate (Cardenas and Carpenter 2008), and framing the experiments in the context of cooperative decisions actually being made facilitates responses that mimic behavior (Bouma and Ansink 2013; Bouma et al. 2014; Cárdenas and Ostrom 2004; Dufwenberg et al. 2011; Ostrom 2006). Therefore, we framed our game around the house-building program. This setting is suitable for examining the relation between voluntary cooperative behavior and development policies for two reasons. First, villagers must top-up government funds to ensure that houses are built on schedule since failure to execute the program correctly threatens future disbursements, thus penalizing other families who would not receive funds to build their houses. And second, villagers must decide the sequence in which the houses would be built since only a limited number of houses can be built each year. In sum, although all households are expected to cooperate throughout the life of the program, they would only get a house once, and their turn to receive a house may be at some distant point in the future.

Table 1 Village characteristics

Village	Settlement type	N households in village	Travel time to town[a]	Sample
Vid1	Upstream	32	2 days	47
Vid2	Upstream	24	3 days	24
Vid3	Upstream	40	1 days	33
Vid4	Upstream[b]	8	1 days	16
Vid5	Upstream	25	1.5 days	24
Vid6	Resettlement	200	2 min	40
Vid7	Resettlement	100	30 min	24
			Total	208

[a] Travel time is estimated based on total walking time for resettlement villages and the sum of walking and river transportation for upstream villages
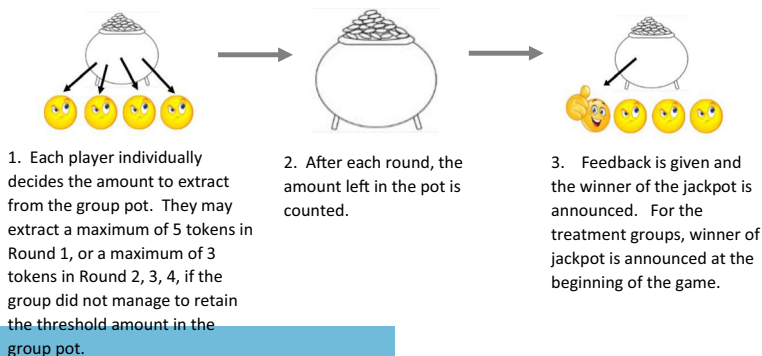
[b] This settlement is not officially designated a village but was treated as such in this work because of the distance from the main village

Participant Recruitment

We recruited participants within seven locations: the five upstream villages and the two resettlement villages (Table 1). In each village, we announced we would have an event lasting about three hours in which attendants would play two games from which people who play could earn some money; there was no show-up fee (for the second game see Napitupulu et al. 2018). Because the upstream villages are small, we could invite all adults (≥18 years of age) in all households. In contrast, in resettlement villages we could only distribute invitations to every other Punan Tubu household and limited participation to one adult per household. In both cases, after extending the invitation, people voluntarily decided whether to participate in the game or not.

The House-Building Game

The game was played in groups of four people ($n = 4$) who played together over four rounds ($t = 4$). Group members were chosen at random and the game was played anonymously (Ledyard 1994), with several groups playing simultaneously. People

1. Each player individually decides the amount to extract from the group pot. They may extract a maximum of 5 tokens in Round 1, or a maximum of 3 tokens in Round 2, 3, 4, if the group did not manage to retain the threshold amount in the group pot.

2. After each round, the amount left in the pot is counted.

3. Feedback is given and the winner of the jackpot is announced. For the treatment groups, winner of jackpot is announced at the beginning of the game.

Fig. 2 Scheme of the house-building game

could see who else was playing at the same time, but they did not know who else was in their group. Researchers knew each player's identity. A person could gain as much as the equivalent of a day's wage.

Each player was asked to extract between 0 and 5 tokens (Fig. 2) from an initial pot of 20 tokens (1 token = Rp 3000 or ~US$ 0.22). The tokens taken by each participant belonged to that person, and whatever was left after all players had made their withdrawal (the "jackpot") was given to one of the players, with a different player receiving the jackpot in each round. Participants were told that the tokens left in the pot were a personal contribution to a collective project, such as helping build a house for another household in the community, and that the jackpot was their opportunity to benefit from other people's cooperation, like when a family receives a house construct-ed with everyone's cooperation. To mimic the condition of the housing program, in which funding may be reduced if sufficient community participation is not achieved, in the experiment the amount of the initial offering was not guaranteed. During the current round the group had to leave a minimum amount of money to ensure the same initial offering in the next round. Specifically, if the group left fewer than 10 tokens in the pot, then the endowment was reduced from 20 to 12 tokens in the following rounds (or a maximum of three tokens per player rather than the original five).

We introduced a treatment to test whether cooperation was dependant on the person knowing when they would receive the jackpot. In half of the groups, we informed players at the beginning of the game in which round each player would win the jackpot (just as in the real-world program, villagers know if they will receive a house that year or not until a subsequent year). They were the control group. The other half of the groups did not have that information beforehand, and participants were only informed of who was the winner of the jackpot of each round at the end of the game (treatment group).

Players communicated their decision on the number of tokens they wanted to extract by using coded envelopes. After each round, researchers collected the envelopes, counted the number of tokens extracted by each player, and calculated total group extraction and the initial pot for the next round. Before each round, researchers used visual methods to give feedback on individual performance, total group extraction, and size of the initial pot for the next round (see p. 3 in the electronic Supplementary Material [ESM]). Participants could not communicate among themselves during the game. The same researchers went from village to village implementing the game. The protocol is available in the ESM.

The Survey

Data from the experiment were supplemented with a survey administered to all participants after the game. The survey collected data on (1) individual demographic information (age, gender, schooling level, and village of residency); (2) two proxies of individual involvement in development programs (owning a government-funded house and receiving a government salary); and (3) social capital.

We used survey data to generate explanatory and control variables to be included in multivariate regression models. We used information on participant's village of resi-dency to generate a dummy variable, *resettlement*, which took the value of 1 for people living in the two resettlement villages and 0 for people living in the upstream villages.

This variable should capture the long-term effect of exposure to government development policies. We then generated two variables that capture individual involvement in development policies: *government house* (1 = the person lives in a household that owns a house built through government program and 0 otherwise) and *government salary* (1 = the person receives salary by the government and 0 otherwise). We also included a set of control variables that past research has shown are associated with cooperative behavior (Chaudhuri 2011; Croson and Gneezy 2009; Ledyard 1994). Our control variables include *age* (in years), *gender* (1 = male; 0 = female), *schooling* (maximum school grade completed), and *social capital*. The measure of *social capital* was based on answers to the following survey question: "If you were in need, for example if you needed [*double average monthly wage*] because someone in your family was sick, could you get that money from other people in the village?"

Data Analysis

We start by providing a descriptive analysis of the sample, using bivariate analysis to test for potential differences between participants living in upstream and resettlement villages and between participants in the treatment and control groups. To test for these between-group differences, we used a *t*-test for continuous variables (age and schooling) and a chi-square for dichotomous variables (government salary, government house, social capital, gender).

To analyze cooperative behavior, we used game data to generate a set of variables capturing the participant's extractive behavior in each round. These variables are a proxy for uncooperativeness. As for the variables describing the socioeconomic characteristics of the sample, we also tested whether there were differences in extraction across participants in upstream and resettlement villages and among participants in the treatment and the control group. The test of equality of means between the samples was done using a *t*-test.

To explore the variables that pattern extraction behavior (the amount taken out of the group pot), we used a multilevel mixed-effects linear regression with a two-level model in which individuals are nested within villages (using the Stata 13 command MIXED). We use this model to explore the association between extraction in the first round and (1) type of village (resettlement); (2) participant's involvement with the government (government house and government salary); and (3) whether the participant was in the treatment or the control group. In all models we controlled for participant's age, gender, schooling, and social capital.

We tested the robustness of the association in two ways. First, we changed the model specifications to see whether the associations we found varied. In our first robustness test, we included village dummies to control for village fixed-effects. Since experience constructing a house or working closely with the government might boost the effects of government exposure in the resettled communities, in our next two models we introduced two interaction terms to capture the relation between living in a resettlement village and (1) receiving a government salary and (2) owning a government house. We computed the Akaike information criterion (AIC) and the Bayesian information criterion (BIC) to compare the results of the models.

The second way in which we tested the robustness of the associations in first-round behavior was by running a set of regressions using only the subsample of

people living in upstream villages. Since our sampling strategy varied in upstream and resettlement villages, using only this part of the sample allowed us to test whether results were independent of the sampling procedure used. In this set of regressions, our first model resembles the core model discussed above. Since group dynamics in the games might be different in different villages because of differences in group characteristics, the last three regressions include variables that capture village-level characteristics. Specifically, we included a variable that captures the share of people in a village who (1) have a government house and (2) receive a government salary. In these three models, we centered the individual-level variables (e.g., if a person has a government house or not) when it was also used as an aggregated village-level predictor (e.g., proportion of people in the village having a government house).

In our last analysis, we used the same regression model to explore extraction behavior in the second, third, and fourth rounds. Since behavior in these rounds might be affected by results of previous rounds, these models incorporated variables capturing (1) whether the person had already received the jackpot and (2) the initial amount received by the group (as an indicator of whether the group had a cooperative behavior or not). We conducted descriptive, bivariate, and multivariate analyses using STATA.

Caveats

We present three methodological caveats that should be kept in mind when reading the results of this work. First, the sample is small and might exhibit self-selection bias. Small sample size is, unfortunately, a cost of working in small, remote villages. Moreover, people voluntarily accepted (or not) our invitation to participate in the game. So, it is possible that only people with a higher (or lower) previous level of involvement in development policies actually participated in the game, potentially biasing the sample. Moreover, given the different population sizes in upstream and resettlement villages, we used different sampling techniques, meaning that the probability of inclusion in the sample was higher in smaller communities. Additionally, our sampling procedure in upstream communities allowed for participation of several members of a single household, but we did not collect information on household characteristics, for which we cannot control for household fixed-effects in our models. Although we tried to minimize sampling biases by randomly selecting households and individuals within households in the resettlement communities, our sampling procedure may have biased the results.

Second, it is possible that the game was too complicated and not all the nuances were well understood. Our procedure to explain the game included giving instructions in Bahasa Indonesia, the official language of Indonesia, and in Punan Tubu, and identifying similarities between the game and the government housing program. An example round was played in front of the participants to help them understand the game dynamic. Then participants' understanding was examined by asking the group some control questions. Additionally, during the game, three team members were available to respond to questions and assist in the game. Despite these precautions, the lack of differences between the treatment and control groups may indicate that the treatment was not well understood. Some subject confusion has been found to affect cooperation in similar experimental games (Palfrey and Prisbrey 1997).

Finally, because it is common in these types of games, the external validity of our findings might be limited by the fact that game incentives were quite different from incentives in real life (Harrison and List 2004).

Results

Sample Description

A total of 208 adults participated in the game and answered survey questions. Our sample consists of 144 participants from upstream villages (69.2% of adults) and 64 participants from the resettlement villages (30.8%). Almost one-quarter of participants (23.6%) received a government salary and more than half (58.2%) lived in a household which had already received a government house. A slightly higher number of women (54.4%) than men (45.6%) participated in the game (Table 2). The average age of participants was 39.3 years and the average grade completed at school was third grade, although 52.8% of the participants had never attended school. About two-thirds of the sample (67.8%) perceived they could get economic help from friends in case of need.

We found several differences between participants from upstream and from resettlement villages. More participants from upstream villages received a government salary (27.1% vs. 15.6%, $p = 0.07$) and lived in houses provided by the government (70.8% vs. 29.7%, $p < 0.001$), although this last result might be artificially inflated because in upstream villages multiple adults from the same household participated in the experiment. On average, participants in the resettlement villages were 10 years older (46.0 vs. 36.4, $p < .001$) and had completed almost three more years of schooling (2.1 vs. 4.9, $p < 0.001$) than participants in the upstream villages. Similarly, while 81.3% of participants in the resettlement villages had received some schooling, the share was only 40.3% in the upstream villages ($p < 0.001$). Finally, we also found that a higher share of participants living in the upstream villages stated they had social capital (88.2% vs. 21.9%, $p < 0.001$).

Table 2 Summary statistics of informant's characteristics by village groups

	Pooled sample	Upstream villages	Resettlement	p
% receiving government salary	23.6	27.1	15.6	0.072[a]
% living in government house	58.2	70.8	29.7	0.000[a]
% female	54.4	54.5	53.1	0.963[a]
Average (±SD) age, in years	39.3 (15.6)	36.4 (13.5)	46.0 (17.8)	0.000[b]
Average (±SD) education, in grades	2.9 (3.6)	2.1 (3.1)	4.9 (3.7)	0.000[b]
% schooled	52.8	40.3	81.3	0.000[a]
social capital	67.8	88.2	21.9	0.000[a]
No. of observations	208	144	64	

[a] reports significance level (p) of a chi-square test of independence
[b] reports significance level (p) of a t-test for independent groups

Table 3 Summary statistics of informant's characteristics by government house ownership

|	Participant lives in government house		
	Yes	No	p
% living upstream	84.3	48.3	0.000[a]
receiving government salary	33.9	9.2	0.000[a]
female	51.3	43.7	0.469[a]
Average (±SD) age, in years	40.9 (13.7)	37.1 (17.7)	0.041[b]
Average (±SD) education, in grades	1.9 (3.0)	4.3 (3.8)	0.000[b]
schooled	39.7	71.3	0.000[a]
social capital	77.7	54.0	0.000[a]
No. of observations	121	87	

[a] reports significance level (p) of a chi-square test of independence;

[b] reports significance level (p) of a t-test for independent groups

We also explored potential differences between people who already had received a government house and those who had not. People living in the upstream villages (84.3% vs. 48.3%; $p <$ .001), people receiving a government salary (33.9% vs 9.2%; $p <$ .001), older people (40.9 vs 37.1; $p <$ .05), people with low levels of education (1.9 vs 4.3; $p <$ .001), and people with social capital (77.7% vs 54.0%; $p <$ .001) were more likely to live in a government house than their peers (Table 3).

Cooperative Behavior

Across rounds, participants took more than 70% of the tokens they were allowed, with extraction rates increasing each round (Fig. 3). In the first round, participants took 72.4% of tokens available to them, with 40.6% of participants extracting five tokens (the maximum possible in the first round). In the last round, participants extracted 81.0% of the tokens available. Only six of the fifty-three groups playing the game managed to retain the number of tokens in the group pot above the threshold in the
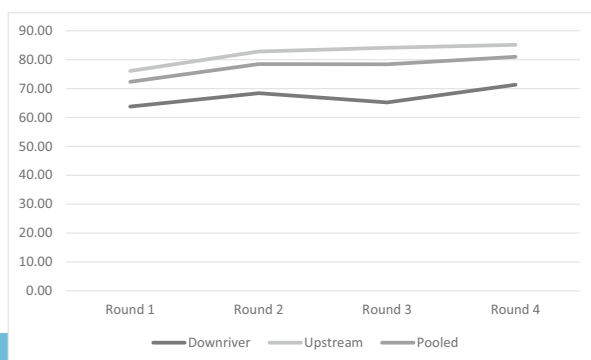
Fig. 3 Average individual extraction per round (in percentages), by village groups

second round and only one of the groups managed to maintain the number of tokens in the group pot above the threshold level until the last round of the game.

Across rounds, people in upstream villages extracted a higher share of tokens than people in resettlement villages (Fig. 3). For example, in the first round, participants living in upstream villages extracted an average of 3.8 tokens ($SD = 1.3$, or 76.1%% of the five tokens available), whereas participants in resettlement villages extracted only 3.2 tokens ($SD = 1.5$ or 63.8%). A t-test suggests that differences in extraction rates between the two groups are statistically significant for all rounds. In contrast, we did not find statistically significant differences in extraction between people in the treatment and control groups. Thus, in the first round, people in the treatment group extracted an average of 73.0% of the tokens versus 71.8% in the control group. Shares were also similar in the other rounds (i.e., 79.8% vs. 77.3 in the second round; 78.3 vs 78.5 in the third round; 83.7 vs.78.6 in the last round).

Multivariate Analysis of First-Round Behavior

Overall, multivariate analysis of extraction behavior in the first round confirms that people living in resettlement villages took less than people living in the upstream villages (Table 4, Model 1). Thus, once we control for sociodemographic characteristics of participants, people living in upstream villages took about 1.25 tokens more than people in resettlement villages ($p < 0.01$). Receiving a government salary was not associated with participant's extraction in the first round, whereas living in a household that already owns a house funded by the government program was associated with extracting 0.6 fewer tokens from the common pot ($p < 0.05$). We did not find any statistically significant difference in first-round extraction behavior between people in the treatment and the control groups. Of the control variables included in the model, only age shows a statistically significant association with participant's extraction in the first round, although the magnitude and statistical significance of the coefficient are modest. An increase in 10 years of age is associated with the extraction of 0.2 more tokens.

Table 4 presents the results of our first set of robustness tests. Overall, the sign and statistical significance of the associations found in the core model remain basically unchanged after including village dummies in the model (Model 2). Moreover, since the AIC and BIC statistics are lower for the model without including village dummies, for subsequent analysis we use the specifications of Model 1 as a reference. Results from models including interaction terms (Models 3 and 4) show several differences in relation to Model 1. When controlling for the interaction between living upstream and having a government salary, we found that people with a government salary living in the resettlement villages take more tokens than people with a government salary living in the upstream villages (Model 3, Table 4). In this model, the variable that proxies for having a government salary is statistically significant. Conversely, the interaction between living in resettlement villages and living in a household that already owns a government house is not associated with first-round extraction behavior (Model 4, Table 4). Furthermore, including this variable in the model makes the association between extraction in the first round and living in a government house statistically insignificant.

Table 4 Multilevel mixed-effect linear regression of first round behavior ($N = 208$)

	Dependent variable: Extraction in Round 1			
	Model 1	Model 2	Model 3	Model 4
Upstream (=1)	1.247***	0.954*	1.446***	1.345***
	(0.333)	(0.440)	(0.338)	(0.369)
Government salary (=1)	0.035	0.074	1.011*	0.041
	(0.245)	(0.245)	(0.469)	(0.245)
Government house (=1)	−0.626**	−0.592**	−0.654**	−0.441
	(0.222)	(0.221)	(0.219)	(0.376)
Treatment (=1)	0.033	0.014	0.061	0.044
	(0.193)	(0.192)	(0.191)	(0.194)
Age (in years)	0.019*	0.018*	0.017*	0.018*
	(0.008)	(0.008)	(0.008)	(0.008)
Gender (male = 1)	−0.145	−0.063	−0.088	−0.145
	(0.217)	(0.218)	(0.215)	(0.217)
Schooling (in years)	0.019	0.015	0.009	0.015
	(0.036)	(0.036)	(0.036)	(0.036)
Social capital	−0.218	−0.235	−0.216	−0.212
	(0.268)	(0.269)	(0.264)	(0.268)
Upstream*Gov salary			−1.272*	
			(0.524)	
Upstream*Gov house				−0.274
				(0.449)
Constant	2.497***	2.603***	2.443***	2.479***
	(0.492)	(0.519)	(0.486)	(0.493)
lns1_1_1_cons	−27.329***	−25.751**	−25.544**	−29.259***
	(7.680)	(7.863)	(8.024)	(7.993)
lnsig_e_cons	0.292***	0.279***	0.278***	0.291***
	(0.049)	(0.049)	(0.049)	(0.049)
AIC	733.888	738.414	730.074	735.516
BIC	770.601	791.814	770.124	775.567

Note: Model 1 includes robust standard errors by village of residency. Model 2 includes village dummies (not shown). Models 3 and 4 include interaction variables. Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In our second set of robustness tests for extraction behavior in the first round (using the subsample of people living in upstream villages), we found similar results to those reported in Table 4. Thus, in these models, owning a government house is negatively associated with first round extraction behavior (Models 1–4, Table 5). Interestingly, for people living in upstream villages, social capital was negatively associated with extraction in the first round ($p < 0.05$); in other words, higher social capital is associated with higher cooperation. This result was consistent across the three models with the subsample of people from upstream villages.

Table 5 Multivariate analysis of first-round behavior, subsample upstream villages

	Dependent variable: Extraction in Round 1		
	Model 1	Model 2	Model 3
Government salary (=1)	−0.188	−0.188	−0.188
	(0.400)	(0.400)	(0.400)
Government house (=1)	−0.612**	−0.612**	−0.612**
	(0.111)	(0.111)	(0.111)
Treatment (=1)	0.152	0.152	0.152
	(0.345)	(0.345)	(0.345)
Age (in years)	0.014	0.014	0.014
	(0.016)	(0.016)	(0.016)
Gender (male = 1)	−0.028	−0.028	−0.028
	(0.144)	(0.144)	(0.144)
Schooling (in years)	0.006	0.006	0.006
	(0.025)	(0.025)	(0.025)
Social capital	−0.454*	−0.454*	−0.454*
	(0.100)	(0.100)	(0.100)
Average gov. house		−1.187	
		(0.457)	
Average gov. salary			−2.205
			(0.848)
Contant	3.933**	4.490***	4.670***
	(0.795)	(0.520)	(0.494)
AIC	485.171	485.171	485.171
BIC	497.051	497.051	497.051
N	144	144	144

Note: Model 1 resembles Model 1in Table 3, for a subsample of informants. Model 2 includes the average number of people in the game owning a government house. Model 3 includes the average number of people in the game receiving a government salary. Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

None of the village-level characteristics (average number of participants living in a government house or receiving a government salary) was statistically associated with extraction behavior in the first round for people living in upstream villages (Models 2 and 3).

In our final analysis, we test the associations with extraction behavior in the three other rounds of the game (Table 6). Results are not consistent from one round to another. Thus, living in an upstream village was associated with higher extraction in the first and last rounds, but not in rounds 2 and 3, and living in a government house was significantly associated with lower extraction only in the first round. The variables that measure whether the person had already received the jackpot and group endowment (a proxy for cooperation within the group) were not associated in a statistically significant way with extraction behavior. Of the control variables, only age appeared to be associated with extraction behavior in the last round of the game.

Table 6 Multivariate analysis of extraction behavior by round

	Dependent variable: Extraction in			
	Round 1	Round 2	Round 3	Round 4
Upstream (=1)	1.247***	0.330	0.331	0.619**
	(0.333)	(0.221)	(0.244)	(0.234)
Government salary (=1)	0.035	0.266	−0.300*	−0.045
	(0.245)	(0.146)	(0.150)	(0.136)
Government house (=1)	−0.626**	−0.097	0.183	−0.111
	(0.222)	(0.134)	(0.137)	(0.123)
Treatment (=1)	0.033	0.100	−0.045	0.197
	(0.193)	(0.116)	(0.118)	(0.109)
Age (in years)	0.019*	0.009	0.007	0.010*
	(0.008)	(0.005)	(0.005)	(0.005)
Gender (male = 1)	−0.145	−0.276*	−0.029	−0.012
	(0.217)	(0.130)	(0.135)	(0.122)
Schooling (in years)	0.019	−0.012	−0.022	−0.012
	(0.036)	(0.022)	(0.022)	(0.020)
Social capital	−0.218	−0.012	0.155	−0.059
	(0.268)	(0.160)	(0.164)	(0.149)
Endowment round 2		0.051*		
		(0.024)		
Endowment round 3			−0.044	
			(0.033)	
Endowment round 4				−0.058
				(0.044)
_cons	2.497***	1.392**	2.445***	2.429***
	(0.492)	(0.433)	(0.509)	(0.592)
lns1_1_1_cons				
	−27.540**	−2.303**	−1.882***	−1.772***
	(8.529)	(0.853)	(0.546)	(0.439)
lnsig_e_cons				
	0.292***	−0.225***	−0.205***	−0.304***
	(0.049)	(0.050)	(0.050)	(0.050)
AIC	733.888	523.158	533.953	494.374
BIC	770.601	563.208	574.003	534.424

Note: All models include village dummies (not shown) and village robust standard errors. Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Discussion

Using a framed field experiment, we explore the extent to which varying levels of exposure to development policies relate to individual voluntary cooperation in

government programs. Three main findings stand out from our analysis. First, unco-operative behavior is the dominant strategy when playing the game framed around the house-building program. Second, village- and individual-level variables are important predictors of extractive behavior in the first round, but not in others. Third, information on when the individual will benefit most from cooperative behavior does not explain extraction behavior.

The first finding of this work is that uncooperative behavior is the dominant strategy used by participants in our game framed around the house-building program. At first glance, the finding contrasts with ethnographic studies of the Punan Tubu, which have characterized them as an egalitarian society, where food sharing and cooperation are prevalent (Kaskija 2012; Napitupulu et al. 2016; Sellato 1994). However, our finding might just be due to the fact that behavior in the house-building game conflated participation in an externally led program with voluntary or spontaneous cooperation. If subjects bring context (e.g., economic, cultural factors) from their daily lives when playing experimental games (Cronk 2007; Cárdenas and Ostrom 2004; Henrich et al. 2005; Lesorogol 2007), as was intended through the use of a framed field experiment, and if for the Punan Tubu this context means that they are expected to share and cooperate when they are asked to do so, then our results do not necessarily contradict everyday behavior. Indeed, taking more tokens from the pot would ensure both that participants are not in a better position than their fellow villagers and that there is nothing left to be shared, a common rule in demand-sharing societies. Moreover, because the Punan do not appear to punish free-riders economically, uncooperative behavior might just reflect the player's understanding that such behavior will not be punished since they play with other people with whom they have long-standing relations (see Gurven and Winking 2008 for a similar interpretation). In future research, the game could be adjusted by differentiating between types of cooperation, including demand-sharing. In itself, this finding has important implications for programs trying to capitalize on existing forms of cooperation to foster community development; it shows that community cooperation, motivated by internal norms, might not necessarily translate into cooperation in externally organized initiatives driven by other norms.

The second finding of this work refers to the variables associated with extraction behavior. When looking at extraction in the first round, we found that people living in resettlement villages take less than people living in upstream villages. Our finding is in line with previous research showing that cooperative behavior in anonymous transac-tions is more likely to occur in settings where transactions between strangers are more common (Henrich et al. 2001, 2006; Ledyard 1994). As mentioned, the Punan Tubu in upstream villages live in small groups of close kin, who depend heavily on each other for hunting, gathering, and agricultural activities (Kaskija 2012; Napitupulu et al. 2016; Sellato 1994). In contrast, the Punan Tubu in the resettlement villages live in larger settlements, mingling with non-kin and strangers, with whom they frequently engage in social and economic transactions. Whereas upstream Punan might assume that their uncooperative behavior might not be punished, because they are among kin and kith (e.g., Gurven and Winking 2008), the resettled Punan might have already conformed to new types of interactions that are more common in anonymous settings (Bowles 1998). It is also possible, as shown elsewhere (Kasper and Mulder 2015), that these interac-tions with non-kin and strangers have weakened demand-sharing norms in the reset-tlement villages, potentially indicating that long-term exposure to development policies

has undermined other forms of community cooperation. This finding is also in line with work highlighting that participation in government programs or policies results in changes in perceptions and understandings of cooperation (Agrawal 2005; Agrawal and Gibson 1999).

Interpretation of the differences between both types of villages should be done with caution, however, as the dummy variable for village type may be capturing a whole host of effects that differ between the upstream and resettled villages. Resettled villages may have different accessibility, income sources, rates of in- and out-migration, communication networks, and a range of other known and unknown factors. For example, in the upstream villages we played the game in the only public building that serves both as school and church, whereas in resettlement villages we played in the school building. Given the importance of religious priming in sparking cooperative behavior (e.g., Purzycki et al. 2018; Shariff et al. 2016), differences in behavior might, indeed, be due to the different associations people have when playing in a building that serves as church. Our data, however, do not allow to separate for this, or similar, effects.

A last finding deserves attention. Our results show that the variable that captures whether the participant had information on when they will receive the jackpot was not associated with extraction behavior, thus suggesting that cooperation was not necessarily linked to expectations of individual rewards. Indeed, from ethnographic information we know that, at least in upriver villages, older and less-educated people received houses in the Gerdema program first. While probably linked to the fact that richer families had already built wooden houses with their own resources, this suggests that traditional norms of cooperation might counter elite capture, or a situation in which the well-off are also the ones able to capture more outside resources (Dasgupta and Beard 2007).

Conclusion

To explore the extent to which varying levels of village and individual involvement in development policies relate to voluntary cooperation, we played a framed field experiment in a small-scale society with a long tradition of demand-sharing and decades of differential involvement with externally led development policies. Participants' cooperation in the experimental setting was low, probably because the Punan Tubu are used to cooperating and sharing on demand and in a context in which uncooperative behavior is largely unpunished. Variation in experimental behavior related both to village- and individual-level variables, with participants living in resettlement villages and those living in a house constructed under the government program displaying more cooperative behavior than their peers. The cooperation evident in resettled villages may indicate that they are more comfortable interacting in anonymous settings, as in our game, or that they are less committed to the demand-sharing norms still prevalent in the upstream villages. The more cooperative behavior among villagers who have previously received a house might indicate that they recognize that they are now better off than others and feel more obliged to cooperate.

Given these findings, we conclude that policies aiming to capitalize on existing cooperative behavior to stimulate collective action targeted to community development

should consider the specific conditions under which cooperation occurs in real settings, as traditional norms that regulate cooperative behavior might not translate well to cooperation in government-led programs. Such policies should also recognize the impacts that externally led development policies can have on diverse forms of cooperation because they might change the nature of existing social relations and the status of people within communities, meaning that the program may act simultaneously in synergy with and antagonistically against social norms, depending on who is the beneficiary of the program and whether individuals are comfortable cooperating with anonymous others or not. Ignoring existing cooperative practices might result in programs not achieving the desired levels of cooperation at best, and the undermining of other forms of community cooperation at worst.

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