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Leading by example and endowment heterogeneity in local public good provision: A framed field experiment in Hyderabad, India

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Abstract

In India's slums, toilets are commonly shared among households, which creates a collective action problem for the provision of toilet cleanliness and maintenance. We study the effect of heterogeneity and leading by example on cooperation in a framed field experiment with 120 slum dwellers from Hyderabad, India. Endowment heterogeneity has a negative effect on contributions. In contrast to previous studies, leading by example decreases average contributions. However, the effect of leadership is positive and large for participants with leadership experience in real life. We conclude that framed field experiments must acknowledge the mediating role of real-life experience and social identities.

Keywords: Collective Action; Leadership; Public Goods Game; Sanitation

1 Introduction

Poverty alleviation and quality of life in developing countries are largely determined by the sufficient provision of public goods to the poor (Besley and Ghatak, 2006). Adequate sanitation facilities are crucial for human health and well-being, and they are severely undersupplied in developing countries (Black and Fawcett, 2008). Progress in sanitation development has been slow, and the millennium development goal of improved sanitation for 75 percent of the world's population will likely not be met. Sanitation is also intertwined with other challenges, such as gender equality, hunger, and education (United Nations, 2012). Governments and municipalities do not invest enough in public infrastructures for sanitation. Furthermore, technical, cultural, behavioral, and political barriers to improved sanitation exist at various levels (Chaplin, 1999; Baruah, 2007; McFarlane, 2012; Mosler, 2012; Andres et al., 2014; Engel and Susilo, 2014; Kutter, 2014; O'Reilly et al., 2016), and only recently have scholars and practitioners started to systematically investigate these issues (Black and Fawcett, 2008).

Private in-house toilets are a preferred option for households in today's modern society. However, private toilets are costly to construct, and, especially in crowded urban communities, they cannot be build due to high housing density (Black and Fawcett, 2008). For many poor urban dwellers, toilets—which are shared among three to ten households—remain a reality that they must bear. The maintenance of shared toilets can be understood as a collective action problem for public good provision. In addition to recognizing individual behavior and perceptions (Günther et al., 2012; Mosler, 2012; Sonego and Mosler, 2014), understanding the social interactions of multiple users is thus important, and economic experiments are a useful method for analyzing collective action problems that involve strategic interaction (Poteete et al., 2010).

In this paper, we study the maintenance of sanitation facilities as a collective action problem via an experimental public goods game that was conducted in the field with 120—mostly female—slum dwellers from Hyderabad, a large and fast growing city in south India. From the literature, we identified two important factors that contribute to success or failure of collective action. First, we investigated economic inequality as a potential barrier to successful collective action. Second, we examined the effect of leading by example on public good provision. In addition, we used questionnaire data collected from game participants to understand the extent to which socio-economic characteristics affect decision-making in the game. This is the first lab-in-the-field experiment to focus on the provision of local public goods using this combination of treatments, and it is one of the first studies to investigate leading by example in a field setting (cf. Jack and Recalde, 2015; Gangadharan et al., 2016; Müller et al., 2016).

The paper is structured as follows. Section 2 introduces the study context and derives the two factors under investigation from the literature. Section 3 describes the game design and explains the sampling procedures and practical conduct of the experiment. Sections 4 and 5 present and discuss the results. Finally, Section 6 summarizes the paper and makes broader conclusions.

2 The Experiment

2.1 Heterogeneity and Leadership in the Voluntary Provision of Public Goods

Rational choice theory predicts that, unless selective incentives, i.e., private goods that can be easily excluded from the use of others, are attached to public goods, rational and selfish individuals will not contribute to public goods. The voluntary provision of public goods will then occur at levels below social efficiency (Olson, 1965). This view of an inevitable social dilemma has been prominently challenged by Ostrom (1990), who has shown that, in the presence of certain institutions, such as monitoring and sanctioning systems, communities

can collectively manage common-pool resources. In addition, she has proposed a larger set of second-level variables that affect the success of collective action (Ostrom, 2009).

Ostrom's ideas have also been applied to collective action for public good provision in developing countries (Markelova et al., 2009; Bharamappanavara et al., 2016). Heterogeneity and the presence of leadership are among the important second-level variables that can dictate the success or failure of collective action (Ostrom, 2009). The effect of community heterogeneity on successful collective action and cooperation is theoretically ambiguous and empirically contested (Baland and Platteau, 1997; Varughese and Ostrom, 2001; Poteete and Ostrom, 2004; Baland et al., 2007; Habyarimana et al., 2009; Bharamappanavara et al., 2016). Heterogeneity can concern various dimensions (Baland et al., 2007), and it is difficult to operationalize in empirical research (Agrawal and Gibson, 1999). Heterogeneity may affect collective action through a diverse set of mechanisms. For instance, people who identify with a particular social group may prefer collaboration within this group, or they may more easily know how to punish and reward each other (Habyarimana et al., 2009).

Collective action may also be facilitated by the presence of leadership, as "group formation often needs a catalyst, and the nature of the catalyst is crucial" (Thorp et al., 2005). Such leadership can emerge from individuals within the community or from outsiders who may also provide training, critical inputs, or social networks (Nkonya et al., 2008; Markelova et al., 2009). Leaders can enhance coordination and may be able to mobilize a critical mass for starting collective action processes (Calvert, 1992). More importantly, leaders may set an example for others to follow if followers do not know which actions are deemed appropriate (Hermalin, 1998). Especially in experimental research on public good provision, obtaining information on what a first mover does correlates positively with the behavior of those who follow (e.g., Sutter and Rivas, 2014). Particularly in the field, behavior may also be affected by the interaction between the rules of the game, such as the leadership presence and social identities, which could mediate behavior (Gangadharan et al., 2016).

2.2 The Public Goods Game

We use a standard public goods game to represent the maintenance of the collective sanitation facility. We test a variety of sanitation facilities observed in Hyderabad slums by introducing the collection of funds to pay a person to maintain the sanitation facilities. One can also think of the contribution as one's contribution to leave the toilet in a clean state. The question is how to increase the contributions to the public fund to maintain the sanitation facilities, given that the use is private and spread over the whole day.

Shared toilets are located in neighborhoods, which are heterogeneous across a number of dimensions. Hyderabad is a fast-growing city to which people migrate from different parts of the country; these migrants have diverse socio-economic backgrounds, which may have an impact on a community's ability to solve collective action problems. When thinking of multiple contributors, the decision to contribute may be made either simultaneously or sequentially among different users. Funds may be collected in a transparent or opaque box, i.e., what others have contributed may be observable or unobservable.

Our study is based on a public goods game with a standard linear voluntary contribution mechanism (VCM) (Isaac et al., 1984) and n (= 5) players. In the game, each player decides how much to contribute from initial endowments of size e_{ir} (= 5, 10, or 15 Indian rupees, contingent on treatment in our study). The game is played repeatedly for r (= 8) rounds. In each round, player i decides how much he or she wants to contribute to a common fund, and his or her profits π_{ir} in round r are calculated as follows:

$$\pi_{ir} = \frac{a(\sum_{j\neq i}^{n-1} x_{jr} + x_{ir})}{n} + e_{ir} - x_{ir}$$

where x_{ir} is player *i*'s contribution; x_{jr} are the other (n – 1) players' contributions in round *r*; and *a* (= 2) is a constant, which satisfies $1 < a < n$ (the dilemma condition). In a finitely repeated game, free-riding (i.e., contributing zero) is a dominant strategy. The social optimum, which is defined as the strategy that maximizes aggregate payoffs $\sum_{i=1}^{r}\sum_{j}^{n} x_{jr}$, is to contribute everything. Typically, in a linear VCM public goods game, players start contributing, on average, half of their initial endowment, and contributions decrease over time (Chaudhuri, 2011).

2.3 Hypotheses and Treatments

Several economic experiments have investigated the effect of asymmetric endowments on contributions in public goods games. Most studies in the lab find that absolute contributions increase and relative contributions decrease with increasing endowments (Aquino et al., 1992; van Dijk and Wilke, 1995; Chan et al., 1996; Chan et al., 1999; Cherry et al., 2005). Buckley and Croson (2006) find that endowment heterogeneity has no impact on individual contributions. Van Dijk and Grodzka (1992) study endowment heterogeneity and manipulate the information available to subjects. Participants are either aware or unaware of other players' endowments (and, in turn, heterogeneity). However, information on heterogeneity does not strongly affect actual contributions. In a meta-analysis of public goods games, Zelmer (2003) concludes that, in the typical case, endowment heterogeneity reduces contributions. However, few experiments struggle with investigating endowment heterogeneity in actual field settings with non-student participants.

Cárdenas et al. (2002) study the impact of income inequality on natural resource use—framed as firewood extraction—in rural Colombia. They find that those who have lower opportunity costs in alternative income opportunities (as induced by the experimental treatments) harvest more of a common resource. Notably, with asymmetry in alternative incomes, total harvesting of firewood decreases, thereby reducing the pressure on ecosystems. Hayo and Vollan (2012) demonstrate that socio-demographic heterogeneity, which is calculated at the group level from questionnaire data, leads to less cooperative play in a "grazing game" conducted with farmers in Namibia and South Africa.

A relatively large empirical experimental literature exists on leading by example (Andreoni, 2006) in the lab. In experimental games, leadership in public goods games is typically introduced through sequential contributions. In a first step, one or more leaders decide what their contributions will be; in the next step, the leaders' contributions are announced, and others follow with their decisions. Leaders are assumed to be inclined to set a positive example by contributing large amounts, and followers are expected to contribute more contingent on their leaders' contributions (Sutter and Rivas, 2014).

Only a few studies have investigated the role of leadership in field populations. Jack and Recalde (2015) use a public goods game in which leaders are known and elected by followers. Although such an approach is closer to a field setting in which identities are typically known, maintaining the leader's anonymity has the advantage of followers' contributions being solely driven by leaders' contributions. With our anonymous design, we can rule out that leaders' contributions are driven by image concerns or fear of followers' reactions. Gangadharan et al. (2016) conduct a public goods game to study gender differences in cooperation in rural India. The authors introduce leading by example with randomly selected leaders, and the leader's gender is revealed to followers in some treatments. Men and women respond differently to leadership. In particular, men contribute significantly more to the public good if they encounter a male or unknown leader. The difference vanishes if a female leader is selected. This behavior can be explained by a

violation of social norms and identity acquired in everyday life. In contrast to Gangadharan et al. (2016), we are interested in understanding the behavior of leaders, not followers. In a threshold public goods game with Indian farmers, Müller et al. (2016) do not find an effect of leading by example on the coordination of investments. Due to the large number of Nash equilibria, the authors find arriving at a straightforward prediction of leading by example difficult. In our study, we avoid this problem by using a simple design with a unique Nash equilibrium. In India, religious heterogeneity has also been shown to potentially undermine the positive effects of leadership in the lab (Keuschnigg and Schikora, 2014).

Empirically, studies in the lab almost unequivocally find a positive effect of leading by example on coordination and cooperation (Wilson and Rhodes, 1997; Foss, 2001; Gächter and Renner, 2003; Moxnes and van der Heijden, 2003; Güth et al., 2007; Potters et al., 2007). Sutter and Rivas (2014) summarize the recent experimental literature from the lab; in almost all cases, leadership increases average contributions, and followers' contributions are positively correlated with their leaders' contributions. Our experiment is inspired by the design of Levati et al. (2007), who combine leading by example with endowment heterogeneity in a laboratory setting. Based on the literature, we formulate the following two hypotheses:

H1: Endowment heterogeneity has a negative effect on average contributions to the public good.

H2: Leading by example has a positive effect on average contributions to the public good.

2.4 Experimental Design

To test the hypotheses, two factors—the distribution of endowments and leadership—were varied in a full factorial within-subjects design. The order of treatments was randomized in four blocks, each of which started with a different treatment to also allow for a between-subject comparison.[1] Blocks were varied within sessions to avoid correlation of session effects with treatments. The random order within-subjects design was chosen to avoid the confounding of treatments with communities, group dynamics, or learning (Friedman and Sunder, 1994; Charness et al., 2012). Table 1 summarizes the experimental design.

[1] The order of treatments in these four blocks and additional information on ordering effects are provided as part of the supplementary material.

Table 1: Overview of Experimental Design

	Treatment 1	Treatment 2	Treatment 3	Treatment 4
Name of treatment throughout the rest of the paper	Baseline	HetNoLead	HomoLead	HetLead
Heterogeneity	No	Yes	No	Yes
Leader	No	No	Yes	Yes
Endowments in Indian rupees (Players 1 to 5)	10, 10, 10, 10, 10	5, 5, 10, 15, 15	10, 10, 10, 10, 10	5, 5, 10, 15, 15
Number of players per group	5			
Sum of group endowments per round	50			
Total endowments per player over all eight rounds	80			
Number of subjects	120			
Number of decisions per subject	2			
Number of distinct decisions in sample	240			
Order of treatment	Randomized in blocks			

Source: Self-design

Each subject had to decide eight times how much to contribute from an initial endowment. In all four treatments, other players' endowments were known to everyone. However, these players' identities were kept secret. Anonymity was ensured, and neither endowments nor contributions could be related to a particular player (cf. supplementary material/experimental instructions).

The game framing referred to sanitation-related public goods. A session started with a general introduction regarding the problem of sanitation, and the rules of the game were then read to all 20 participants in a session. Participants were asked to picture a scenario in which they would share a toilet with four other neighbors. For maintenance, cleaning, and small repairs, some money would have to be collected. This money would be collected anonymously in a box, and an opaque box was presented to participants in the game instructions. Some rupee coins were placed in the box to demonstrate this collection in practice. In the next step, another box, which was transparent this time, was shown to the participants. Again, the game facilitator added some coins to the box. Now, participants could see how much money was in the box. It was then highlighted that, with this type of box, the participants could easily recognize how much money previous contributors had added to the total fund.

It was noted that such differences in the organizational setup would also exist in the game. Participants were told that, in half of the games, one participant would be randomly and

anonymously selected to be the "first mover,"[2] and the remaining four participants could make their contributions knowing how much money had been added to the box by the first person. The first mover was not the same person for the entire game, and the person to contribute first was newly selected for each of the four rounds. Furthermore, it was explained that, as in real life, some people had more money than others, and such heterogeneity would also be part of the game.[3] For both conditions—heterogeneity and leading by example—paper sheets, on which subjects would later indicate their decisions, were used in the demonstration phase to explain the game's tasks. To ensure an accurate understanding of the rules, the game facilitator posed several questions to gauge understanding among randomly selected participants at the end of the demonstration phase. During all stages, participants were free to ask questions.

By drawing lots from a box, subjects were then randomly assigned to one of four groups per session, each of which consisted of five participants. Each group started with a different treatment. A group of two or three research assistants was randomly assigned to each group to organize the game. Printed sheets were distributed to participants. These sheets involved visualizations, and, following pre-testing in the field, these sheets were designed so that they could also be easily accessed by illiterate subjects (cf. supplementary material). All decisions were made in private, and communication was not permitted during the game. Following players' decisions in a particular round, the results were verbally announced and noted on a white board in English and in the local language, Telugu. Research assistants received training so that they always announced these results in the same way. After eight rounds of play and with the help of trained field staff, a short survey was conducted. Finally, subjects were paid on the basis of their decisions in all eight rounds.

2.5 Community and Participant Selection

Based on the knowledge gathered in three field visits to Hyderabad in from 2010–2012, five slum communities were selected for the experiment. These communities were chosen in cooperation with local partners from the Centre for Action Research and People's Development, an NGO that works on sanitation, gender equality, and food security in the city's slums. Locations were considered with respect to their sanitation situations. Subjects were recruited only when they could relate to the game's framing. Problems with sanitation and water access had to be prevalent within the community because it "is not the case that abstract, context-free experiments provide more general findings if the context itself is relevant to the performance of subjects" (Harrison and List, 2004). With the help of the local partnering NGO, a local contact partner was asked to invite 20 subjects that met these conditions for a small game as part of a research project on slum development. All further details were provided to participants at the time of the game. Although the sampling procedure might introduce a bias, we have no reason to believe that respondents differ from the general population of the slum areas under investigation. Local partners also provided spaces in which to conduct the experiments (e.g., schools, community halls, yards, or temple compounds).

The experiment was eventually conducted with 24 groups of five individuals, which led to 120—mostly female—slum dwellers in six experimental sessions. All data and code are available from the authors. A typical session lasted approximately two and a half hours.

[2] We strictly avoided the word "leader" because of its strong connotation in Indian society. We wanted to study the basic principles of leading by example in an anonymous setting. Additional information on the practical implementation of the leading-by-example treatments is provided in the supplementary material. For a coordination game that uses a similar procedure in the field, see Müller et al. (2016).

[3] However, we ensured participants that the total endowments over all rounds of the game would always add up to 80 rupees.

Subjects received a participation fee of INR 100 and were paid for each decision in the experiments (cf. Charness et al., 2016). The median and mean earnings from the game (excluding the INR 100 participant fee) were INR 117.8 and INR 121.2 (SD = 17.517), respectively, with a minimum and maximum of INR 69.4 and INR 175.2, respectively. Thus, participants earned, on average, INR 221.2, which was approximately USD 4 at the time of the experiment and equivalent to one or two daily wages for slum dwellers in Hyderabad. Table 2 describes and presents summary statistics for some key participant variables, which were collected in the post-experiment survey and used in the regression analysis.

Table 2: Characteristics of Participants

Variable Name	Description	N	Mean	SD	Min	Max
FEMALE	= 1 if participant is female	120	0.90	0.30	0.00	1.00
AGE	= age in years	118	33.29	10.94	15.00	65.00
MARRIED	= 1 if married	120	0.87	0.34	0.00	1.00
DAILYWAGE	= daily wage in Indian rupees	120	72.23	116.22	0.00	600.00
WEALTH	PCA Wealth Index[4]	120	0.00	1.50	-4.56	2.40
READANDWRITE	= 1 if participant can read and write	120	0.53	0.50	0.00	1.00
YEARSINSCHOOL	= years of formal schooling	120	5.06	4.76	0.00	15.00
YEARSINAREA	= years that participant has lived in the neighborhood	116	13.66	8.41	0.00	40.00
SHGMEMBER	= 1 if participant is member in a self-help group	120	0.52	0.50	0.00	1.00
SHGLEADER	= 1 if participant has leadership position in a self-help group	120	0.19	0.40	0.00	1.00
HINDU	= 1 if participant states Hinduism as religion (= 0 if any other religion)	120	0.74	0.44	0.00	1.00

Source: authors' calculations.

Clearly, the vast majority of participants were female. Sanitation and its related problems affect women more than men; thus, females were the focus of recruitment. Additionally, the level of education in the sample was rather low, with an average of only five years spent in school and almost half of the participants being illiterate. About half of the participants were members of a self-help group, and approximately one-fifth of the participants had a leadership position in one of these groups. Three-quarters of all participants were practicing Hindus, which is relatively close to the census figures for Hyderabad, which has a large Muslim population, a considerable Christian contingent, and the prevalence of other minority religions.

[4] The index has been constructed from a list of household assets based on the method developed by Filmer and Pritchett (2001). It includes seven variables: possession of a color TV (1), mobile phone (2), motorbike (3), electric fan (4), water filter (5), LPG cylinder for cooking (6), and private water tap in the house (7).

3 Results

3.1 Treatment Effects

Table 3 displays the summary statistics for contributions in the public goods game. The data are pooled across all eight rounds and 120 participants.

Table 3: Contributions by Treatment

	N	Mean contribution in INR	Standard deviation	Minimum	Maximum
Pooled Data (Full Sample)	960	5.15	3.143	0	15
Treatment 1 (Baseline)	240	5.458	2.855	0	10
Treatment 2 (HetNoLead)	240	5.275	3.587	0	15
Treatment 3 (HomoLead)	240	5.004	2.730	0	10
Treatment 4 (HetLead)	240	4.863	3.311	0	15

Participants contributed, on average, approximately half of their endowments. This rate is similar to the rates typically found in such experiments and is close to what has been found in rural India (Ledyard, 1995; Chakravarty et al., 2010; Chaudhuri, 2011; Bouma et al., 2014).

The differences between treatments are statistically significant at the five percent level (Kruskal-Wallis-Test, χ^2 (3) = 9.040, p = 0.0288). The pair-wise differences between treatments are relatively small yet statistically significant. Under heterogeneous endowments, participants contribute slightly less (M = 5.068, SD = 3.455) than under homogeneous endowments (M = 5.231, SD = 2.799). This difference is statistically significant (Mann-Whitney U-test, z = 2.310, p = 0.0209). A larger difference exists between the leadership (M = 4.933, SD = 3.032) and non-leadership conditions (M = 5.367, SD = 3.240). This difference is statistically significant at the ten percent level (Mann-Whitney U-test, z = 1.926, p = 0.0542). Here, contrary to the findings in the literature, leading by example decreases contributions. We will explore possible explanations for this behavior below.

3.2 Socio-Economic Heterogeneity: Regressions on Contributions

Table 4 presents three specifications of multilevel regressions on contributions in the game. Three-level models are used with decisions (level 3), nested in players (level 2), nested in groups of five subjects (level 1).[5]

[5] Further model specifications and robustness checks are presented in the supplementary material.

Table 4: Multilevel Models on Contributions

	(1) Static	(2) Dynamic	(3) Dynamic with socio-economic covariates
HETNOLEAD	-0.1960	-0.2943	-0.2205
	(0.1908)	(0.2066)	(0.2123)
HOMOLEAD	-0.4542**	-0.5042**	-0.5528***
	(0.1907)	(0.2069)	(0.2128)
HETLEAD	-0.6085***	-0.6444***	-0.6877***
	(0.1908)	(0.2067)	(0.2136)
2NDROUNDTREAT	0.2561*	0.3926**	0.4221**
	(0.1499)	(0.1639)	(0.1686)
ENDOWMENT	0.3526***	0.3469***	0.3514***
	(0.0213)	(0.0234)	(0.0241)
ROUND	-0.0760**	-0.0933***	-0.1047***
	(0.0327)	(0.0359)	(0.0370)
OWN CONTRIBUTION T-1		0.0033	-0.0029
		(0.0305)	(0.0313)
CONTRIBUTIONSOTHERS		-0.0306*	-0.0234
T-1		(0.0166)	(0.0169)
FEMALE			-0.0885
			(0.7930)
AGE			-0.0402*
			(0.0231)
MARRIED			-1.4199**
			(0.5930)
DAILYWAGE			-0.0014
			(0.0019)
WEALTH			-0.0353
			(0.1329)
READANDWRITE			0.4345
			(0.6073)
YEARSINSCHOOL			-0.1414*
			(0.0735)
YEARSINAREA			-0.0253
			(0.0295)
SHGMEMBER			-0.8863*
			(0.4994)
SHGLEADER			0.6146
			(0.5476)
HINDU			-0.6290
			(0.4980)
Constant	2.1525***	2.8517***	7.0890***
	(0.4126)	(0.5928)	(1.5209)
N	960	840	798
χ^2	291.1926	243.6627	258.2344
$p > \chi^2$	0.0000	0.0000	0.0000
Log likelihood	-2197.6137	-1941.7962	-1852.2193

Source: Authors' calculations. *Note:* Standard errors [accounting for the panel structure] in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The first model includes only static game data, namely, dummy variables for the respective treatments, with BASELINE as the reference category and participants' endowments in Indian rupees (5, 10, or 15). The 2ROUNDTREAT variable is a dummy variable indicating whether a treatment is applied the second time in the game. ROUND is a continuous variable indicating the round (1 to 8) to test for a decay effect.

The second model extends the first model by adding two dynamic variables, namely, the lagged contribution and the lagged contribution of others in the previous round (t – 1).[6] The third model adds socio-demographic variables to control for heterogeneity. The large χ^2 statistics indicate that the overall explanatory capacity of the models is high. Formal χ^2 tests of the multi-level model against a benchmark OLS model, which does not account for the hierarchical data structure, show that the multi-level model is preferred in terms of explanatory power. The estimates show relatively large and jointly statistically significant effects of the treatment variables on contributions. In addition, ENDOWMENT, 2ROUNDTREAT, MARRIED, and READANDWRITE show larger and statistically significant effects. The effect of ROUND is negative, indicating the decay in contributions over time. However, compared with what is typically found in related field experiments (Chakravarty et al., 2010; Werthmann, 2011; Bouma et al., 2014), this effect is relatively small.

3.3 The Role of Leadership

Analyzing the effect of leadership reveals that, contrary to what is typically found in the literature, leading by example reduces contributions in our experiment. Table 5 presents summary statistics for all 480 leadership decisions by leadership status in the game and actual leadership in a self-help group.

Table 5: Contributions by Leadership Status in Game and Real Life

Participant is leader in the game	Participant holds leadership position in a self-help group in real life	Number of observations	Mean contribution	SD of mean contribution
No	No	312	5.074	3.074
Yes	No	76	4.5	3.031
No	Yes	72	4.514	2.907
Yes	Yes	20	5.9	2.553

Source: Self-design.

Leadership decisions clearly differ by experience with a leadership position in real life. When selected as leaders, SHG leaders contribute 5.9 rupees compared with 4.5 rupees from non-SHG leaders. These relationships also hold when controlling for other characteristics by a regression analysis, as shown in Table 6.

[6] No lagged variables are available for the first round, resulting in the lower number of observations and differences in coefficients in the second column. Adding socio-economic variables further reduces the number of observations due to missing observations in the questionnaire. Specifically, the model in the third column is based on 114 out of 120 participants.

Table 6: Multilevel Regression on Leaders' and Followers' Contributions in the Game

	(1) Leaders in the game	(2) Leaders in the game dynamic	(3) Leaders in the game dynamic with interaction term	(4) Followers in the game	(5) Followers in the game dynamic
HETLEAD	0.0443	-0.4613	-0.4261	-0.0602	-0.0130
	(0.5136)	(0.4722)	(0.4710)	(0.2183)	(0.2440)
2ROUNDTREAT	1.3143**	1.0893**	1.0863*	-0.0464	0.2260
	(0.6406)	(0.5516)	(0.5640)	(0.3155)	(0.3585)
ENDOWMENT	0.3652***	0.4057***	0.4185***	0.3027***	0.3031***
	(0.0927)	(0.0800)	(0.0817)	(0.0349)	(0.0395)
ROUND	-0.0619	-0.0612	-0.0760	-0.0968	-0.1301
	(0.1636)	(0.1205)	(0.1308)	(0.1127)	(0.1299)
SHGMEMBER	-1.4486*	-1.1624*	-1.1820*	-0.6219	-0.6083
	(0.7790)	(0.6369)	(0.6571)	(0.5562)	(0.5285)
SHGLEADER	2.2856***	1.3694*	3.1424	0.3300	0.2690
	(0.8631)	(0.7109)	(2.0482)	(0.6154)	(0.5819)
OWN CONTRIBUTION T-1		0.3821***	0.4058***		0.0930*
		(0.0845)	(0.1028)		(0.0498)
CONTRIBUTIONSOTHERS T-1		0.0691**	0.0822**		-0.0532**
		(0.0332)	(0.0412)		(0.0264)
OWN CONTRIBUTION T-1 x SHGLEADER			-0.0382		
			(0.1903)		
CONTRIBUTIONSOTHERS T-1 x SHGLEADER			-0.0714		
			(0.0913)		
LEADERCONTRIBUTED				0.0821*	0.0747
				(0.0462)	(0.0515)
Constant	4.6833*	-4.3284*	-5.1893*	7.3690***	8.3096***
	(2.5238)	(2.5741)	(2.9284)	(1.6493)	(1.7729)
N	90	78	78	366	315
χ^2	45.5379	96.9355	91.1925	106.7929	101.6673
$p > \chi^2$	0.0001	0.0000	0.0000	0.0000	0.0000
Log likelihood	-214.0202	-172.7603	-174.6926	-860.7163	-744.0824

Source: Authors' calculations; *Note:* Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; other individual control variables include those from Table 2.

SHG leaders are seen to contribute substantially more when leading in the game (2.29 rupees in Model 1), while the effect of being an SHG leader is hardly detectable when following (Models 4 and 5). Analogous to the regression table above, Models (2) and (3) include the dynamic variables. One's previous choices and others' contributions are seen to have a much greater effect on the leadership decisions, and the overall effect of actual leadership (variable SHGLEADER) decreases; however, given the 1.37 rupees contribution, this effect is still relatively large (cf. Model 2) and marginally significant.

Note that formally leadership positions should routinely and randomly rotate among members, which would allow us to rule out any endogeneity biases. Participants told us that leaders occasionally stay in power for longer terms; leaders may also be selected democratically. Therefore, we tested whether the observed characteristics of the leaders and

non-leaders differ. We did the same for members and non-members. In both cases, no statistically significant differences were found, and a logit model with membership and leadership as dependent variables did not show large statistically significant effects. As such, it seems plausible that actual leaders have learned how to lead from experience, whereas participants without such experience prefer to contribute less.
To test if participants without experience perhaps base their contributions on previous decisions, Model (3) introduces two interaction terms: OWN CONTRIBUTION T-1 x SHGLEADER and CONTRIBUTIONSOTHERS T-1 x SHGLEADER. The effects of previous choices of leaders and non-leaders can thus be directly distinguished. Although the effects are not statistically significantly different from zero, we find that the effect of previous contributions becomes even larger for non-leaders and smaller for leaders, which is indicated by the negative signs of the coefficient estimates for the newly introduced interaction terms. In other words, strong heterogeneity exists in the effect of the leadership treatment on experimental subjects, which is contingent on their own experiences with leading in the game. Participants who are SHG leaders in real life contribute larger amounts if they are leading; non-leaders—more than in other treatments—use previous decisions to orient themselves when asked for a choice in a seemingly unfamiliar task.

Models (4) and (5) show that leaders' decisions encourage followers to contribute more. Each rupee is matched by approximately 0.32 rupees (= 4 times 0.08) in total. In other words, the negative impact of the leadership condition in the game must be attributed to the first movers' low contributions rather than to followers.

4 Discussion and Conclusion

In our experiment, we found only a small and statistically insignificant negative effect of heterogeneity on contributions. We thus fail to reject the first hypothesis on the negative effect of heterogeneity. For wealthier users, access to private toilets may be within reach; however, the poorest individuals may find contributing any amount difficult. In the relatively homogeneous—albeit extremely poor—communities that we have studied, this factor seems to be less of a problem. However, other dimensions of heterogeneity may influence the organization of collective action. The fast-growing city of Hyderabad attracts migrants from all over India, who have diverse cultural and linguistic backgrounds. A lack of communication possibilities between community members may at times be a greater barrier to cooperation than wealth inequality. Additionally, heterogeneity is embedded in the broader context of a particular community, and perceptions of what is a fair contribution may differ between cases.

Contrary to what is typically found in the experimental literature, leading by example does not increase contributions in our experiment. Thus, we reject the second hypothesis. In the experiment, leaders, on average, fail to contribute more than followers. However, strong heterogeneity exists among the leaders' decisions. We found that participants who have leading roles in real life are well aware of the importance of setting a positive example. For this group, the second hypothesis cannot be rejected. The contributions of actual leaders, when randomly selected to lead in the game, were substantially higher. Regression analysis has also shown that followers condition their contributions on leaders' decisions, thereby further amplifying the positive effect on aggregate contributions. Hence, if actual leaders accept a leadership role in contributing to the public good, overall cooperation may substantially increase.

These findings have implications for the practical organization of voluntary contributions to public goods. Increasing transparency and publicly announcing contributions seems useful, especially if leaders are not random. With an awareness of this phenomenon, communities may organize collections so that experienced leaders are the first to contribute, ensuring that these contributions are known to followers. Alternatively, leaders may find ways of setting a

positive example and communicating their decisions. Our results also suggest that, with random leadership, inexperience makes things worse. In this case, anonymous collections are better than sequential organization.

In our game, leaders' contributions were anonymous. How people's behavior would have changed if contributions were known and could be linked to faces, social status, and information on caste or religion remains an open question. Although experimental ethics forbid conducting experiments that link decisions with identities, other methods can be used to explore these factors. In small communities, information on social status, the possibility of building one's reputation, and the potential threat of peer punishment are other important issues to investigate.

In our experiment, experienced leaders came from the ubiquitous Indian self-help group system. Leaders randomly rotated, and leaders were not different from non-leaders in our data, which suggests that experience with leadership matters more than personal characteristics. Thus, a more careful rotation of leadership positions could create substantive co-benefits in other domains. The ability to set a positive example is not necessarily an inborn character trait, but it can be learned with practice. In conclusion, social identities can induce substantial heterogeneity in the treatment effects of field experiments. Ignoring such interaction effects may lead to inefficient estimates of treatment effects and erroneous conclusions.

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