University of Mumbai

DEPARTMENT OF ECONOMICS

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WORKING PAPER UDE47/02/2014
February 2014

ISSN 2230-8334

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Vidyanagari, Mumbai 400 098.

Documentation Sheet

Title:

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***WP. No.*:** UDE47/02/2014	***Contents:*** 26P, 10T, 02F, 36R
Date of Issue: February 2014	***No. of Copies:*** 100

Abstract

Mainstream economic theory holds that economic agents are purely self-interested players. However, individual preferences could be socially determined in that sustained enculturation in contexts that emphasize and applaud cooperative behavior might lead to individual preferences becoming more pro-social. If this is the case, communities with long established social norms of cooperation might make anonymous individuals behave more cooperatively even when selfish behavior is guaranteed to go unpunished. Can communities where the norm of cooperation is culturally embedded solve social dilemmas better than communities, which lack such culture? Can such cultures be engineered in a relatively short span of time? This study attempts to address these questions pertaining to designing of informal and formal institutions that would facilitate decentralized local development. The impact of local history of the norm on voluntary contribution to public good was evaluated by conducting finitely repeated public good games in two model villages of Maharashtra, which are famous for local development achieved through voluntary labour and two villages lacking history of such normative behavior. A Multi-variate Multi-level regression approach was adopted to segregate the within-individuals and between-villages variation. We observed higher contribution to the public good in communities with long established social norms of cooperation compared to those without the history of the norm when controlling for other determinants. However, between-village difference was not predominant.

Key Words: Public Goods, Experimental Economics, Norm of Cooperation, Local Participation

JEL Code(s): C90, C93, H40, H41

Culture, Community and Institutions: Voluntary Provision of Public Goods in Maharashtra

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1. Introduction

Experimental economics has been investigating the robustness of Voluntary Contribution Mechanisms (VCMs) as an alternative to the resource-restrained decentralized Government mechanism for the provision of public goods. Rational agent model predicts no voluntary private provision for public goods owing to non-excludability and non-rivalness in their consumption. These characteristics make free riding a dominant strategy for selfish economic agents. Additionally, these characteristics also reduce probability of revealing true preferences and the true willingness to pay for such goods. Thus, accurate estimation of demand for public goods becomes difficult, resulting in Pareto inferior outcome of under-provisioning of these goods.

The empirical validity of the free-riding hypothesis has been examined with the help of the public good game. In the public good experiment, n participants can invest the given endowment (e) in a private fund or can contribute (c_i) in a group fund partly or fully. Return from the private fund equals unity. The contribution collected through group fund (Σc_i) is doubled ($\Sigma c_i * 2$) by the experimenter and divided equally among all the participants ($(2*\Sigma c_i)/n$), irrespective of their contributions. Thus, private returns from investing in public goods (R_i) equal to $e - c_i + ((2*\Sigma c_i)/n)$. Thus, the social returns from contributing in public good are 2 per unit contributed while a subject earns only 0.5 units for each unit contributed. Therefore, zero contribution to the group fund remains the unique Nash equilibrium for all participants, predicting strong free riding. Olson (1965) has famously asserted "Unless the number of individuals in a group is quite

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Authors thank Sanjukta Basu, Jeenay Daftari, Chandrakant Patekar for their timely assistance in administering the sessions. We are also grateful to the local authorities and citizens in the experimental villages for their whole-heartedly cooperation and warm hospitality.
The research is funded by CCSS.

small, or unless there is coercion or some other special device to make individuals act in their common interest, rational-self-interested individuals will not act to achieve their common or group interests (here, public good)". The argument, soon become famous as the 'zero contribution thesis', implies absence of positive contribution for public good under anonymity.

However, experimental evidence differs from this conventional game theoretic Nash equilibrium and seems to claim a full range of behaviors from fully selfish to fully altruist, depending on the contexts and social institutions in operation. Dawes and Thaler (1988) argued, "It is certainly true that there is a 'free rider problem' …On the other hand, the strong free rider prediction is clearly wrong". Positive investment in a one-shot public good experiments, first observed by Marwell and Ames (1979), caught theorists' and experimentalists' attention. In direct response, Kim and Walker (1984)[I] and Isaac et al.(1985) introduced (finite) repetition in public good experiments and observed free-riding behavior in later iterations. Repeated public good experiments were then replicated with other possible variations investigating consistency of late arrival of the free-riding tendency and its causes. Though research seeking causes of the decay is still inconclusive, the decay in the contribution is an experimental regularity.

This paper investigates this regularity in the context of local cultural heritage. Culture is expressed in terms of norms, values and ideas that can unconsciously shape individual preferences through the process of enculturation. Cultural heritage emphasizing the norm of cooperation may eventually mold individual preferences into being more pro-social, even when selfishness is guaranteed to go undetected. The endogenously developed cooperative preferences may therefore change the incentive structures and lead to greater public goods contribution than predicted by the simple Nash equilibrium.

We selected four localities in Maharashtra, India for the experimentation. Two of the villages are recognized world over for successful community action through consciously designed community level organizations. Two other localities were small villages that did not have such engineered organizations but nevertheless had a sense of community through shared bonds of kinship and locality as well as an informal culture of community labour. We conducted a finite public good experiment in these villages and observed higher average contribution towards

public goods in the model villages compared to other villages. However, within-village difference was not starkly higher than individual-level differences.

The plan of the paper is as follows. Section 2 is a literature review. Section 2.1 documents the results of the public good experiments and the subsequent section tries to summarize the role played by local cultural evolution in construction and maintenance of physical public goods. Section 3 reports the design and procedure of the experiment while data is analyzed in the subsequent section. Section 5 concludes the paper.

2. Literature Review

2.1: Public Good Experiments

Various alternative hypotheses have been tested to explain the decay in contribution in later iterations of public good games. Among others, most discussed are 'learning' and 'strategic' hypotheses proposed by Andreoni (1988). The learning hypothesis assumes that subjects get enough opportunity to learn the incentives in repeated play compared to a single-shot game. So 'learning' causes the decay. 'Strategic' hypothesis claims that subjects may strategically conceal their free-riding tendencies and contribute to induce inexperienced and susceptibly irrational group-members to cooperate in the initial rounds. Nonetheless, free-riding remains the optimal strategy in the last iteration (*ibid* p. 294). However, none of the hypotheses was unambiguously supported by the experimental data. Participants started with higher contributions after re-start of the game, which was inconsistent with the learning hypothesis (Croson 1996). Cooperation was found to be higher in case of Strangers compared to Partners, indicating lack of strategic elements. On the contrary, (Croson 1996; Fehr and Gächter 2000; Sonnemans et al. 1999) found results consistent with the strategic hypothesis.

Cooperation in public goods was also explained in terms of kindness and confusion by Andreoni (1995). He found that on average about half of all cooperation comes from subjects who understand free-riding but choose to cooperate out of some form of kindness (altruism or warmglow). He further commented that reduction in confusion due to learning after the fifth round was replaced by a growth in kindness, leaving cooperation fairly stable.

A growing body of literature argues that participants are not only motivated by money maximization but have other-regarding preferences. Croson (1998) found a positive relationship between individuals' contributions and their beliefs about others' contributions in both Partner and Stranger treatments. Andreoni (1988, 1990) suggests that subjects are altruistic toward other subjects or possibly that they get a 'warm glow' by giving to the public good. Palfrey and Prisbrey (1997) found support for 'warm glow' and reduction in the confusion over time.

These results suggest that there exists heterogeneity in preferences that operate in the experimental setup. Several studies have shown that the majority of the population exhibits 'conditional cooperation' i.e. cooperation in response to others' cooperation and withdrawal of cooperation to punish free-riders (Ashley et al. 2008; Croson et al. 2005; Croson 2007, Croson 2008; Fischbacher et al. 2001; Frey and Meier 2004; Gächter 2007).

Kurzban and Houser (2005), by simulating results of a public good experiment, showed that 63% of players were reciprocators who contribute to the public good as a positive function of their beliefs about others' contributions. Nearly 20% were classified as free-riders while the remaining 13% were classified as cooperators who contributed to generate group benefits at a cost to themselves. Fischbacher et al. (2001) categorized the majority of participants as conditional cooperators with self-serving bias (50%) who contribute less than others' contribution and 30% as free-riders. Fischbacher and Gachter (2010) found that contribution declined due to the presence of 'imperfect conditional cooperators' who only partly matched their contribution with others' contributions. The presence of 'free rider' type is not necessary for the decay. The paper concludes that universal free riding eventually emerges, despite the fact that most people are not selfish.

To sum up, free-riding, cooperation and conditional cooperation are recognized as fairly stable 'preferences' to predict outcomes of public good experiments. While free riders drag the system towards Pareto inferior solutions, cooperators lead it to other end of the spectrum. Initial contribution levels across different population groups will depend not only on the relative frequency of these three 'types' of players but also on this information being common knowledge. The rate of decline in contribution will depend critically on the sensitivity of

conditional cooperators to the existent proportion of free riders, tendency to update their beliefs downward and the extent of imperfection in matching others' contributions.

2.2: Culture and Norms

Local cultural heritage can play a crucial role in determining this relative frequency of different 'types' of individuals and in generating common knowledge about the same. Local cultural heritage mainly constituted by social norms, social practices-rituals, shared history, symbolic capital, other formal and informal bargaining institutions are indicatives of social preferences of the local participants. Norms have played a crucial role in shaping the path of cultural evolution through cultural group selection process. Chudek and Henrich (2010),Chudek et al. (forthcoming)) have importantly argued that the cultural evolution of norms over tens or hundreds of thousands of years, and their shaping by cultural group selection, may have driven genetic evolution to create a suite of cognitive adaptations. They have referred to such adaptation as norm psychology. This suite facilitates, among other things, identification and learning of social norms, expectation of sanctions for norm violations, and ability to internalize normative behavior as motivations (Henrich 2011). It implies that the environment conducive for formation of the social norm of cooperation may generate a culture of cooperation over the generations.

Formation and sustenance of the social norm of cooperation may not be always strictly social in nature, mainly because of individual dependency on social groups for economic/occupational gains. Nobel Laureate Elinor Ostrom (2000) has demonstrated that local informal institutions are capable of avoiding 'the tragedy of the commons' by giving rise to norms and thereby improving the incentives for collective action.

A well-established norm over generations is likely to be reflected in other aspects of social life as well. Thus, over generations, social groups may achieve cooperative outcomes even when individuals are not dependent upon each other for their livelihoods.

Cialdini et al. (1990) argued that norms have been internalized to a great extent that they are confirmed even in the absence of external sanctions, incentive structure or personal commitments. On the other hand, Bicchieri (2006) argues that individuals use a combination of a deliberational approach[II] and heuristics to decide about norm conformity. With conscious

deliberation, individuals attempt to balance the perceived (or misperceived) costs and benefits of alternative courses of action. This approach is likely to be adopted when one is held accountable for one's choice; when the consequences may be particularly important and long-lasting; or when one has the time, knowledge, and disposition to ponder over alternative choices. Under the heuristic route, behavior is guided by default rules stored in memory that are cued by contextual stimuli. Norms are one of the default rules. Norm compliance is an automatic response to situational cues that focus attention on a particular norm. The later approach thus implies that norms would be followed even in the absence of sanctions or monitoring systems.

The intrinsic aspect of the evolved culture (inclusive of norms) is the common knowledge among individuals (Chwe 2001). Common knowledge can be defined as "everyone knows the behavioral rules; everyone knows that everyone knows them" and so on ad infinitum. In the absence of pre-transaction communication, common knowledge facilitates coordination. Rubinstein (1989) had shown the essentiality of common knowledge (and not just mutual knowledge) for achieving coordination. Thus, local culture can solve the coordination problem by generating common knowledge essential for coordination but it is the norm of cooperation evolved in a social circle that can check the free-riding tendency.

Evolution and stability of the norm of cooperation in a group implicitly indicate that the majority of individuals are 'cooperative-type'. In short, norms and culture generate the common knowledge about others' behavioral tendencies in a given situation and therefore about the distribution of 'types' of players. The underlined systematic stability of cooperation further makes selfishness unattractive especially in repeated interactions. Thus, eventually, local culture may succeed in molding an individual's selfish preference into a 'stable' cooperative one. Among other determinants, leadership plays a crucial role in formation and stabilization of social norms in a community. However, 'unconditional cooperation' as a result of consistent norm-compliance behavior would be elicited in situations when leaders are not physically present. Our experimental environment tested individual preferences in the absence of leadership.

The stable cooperative preference, if exhibited even in double-blind anonymous situations in repeated interactions, opens up an array of research questions about collapse of an informal bargaining institution when the initial leadership gets withdrawn or its adaption to the socio-

economic dynamics. This opens up the possibility that free-riding need not be the default behaviour of rational economic agents, even in one shot interactions when the other members of the group which share the same cultural values of cooperation and altruism.

We investigated the variation in contribution levels and free-riding tendencies in village communities enjoying a strong culture of voluntary labour-based collective action against other communities that had no such history. It is argued that a consistent history of voluntary work for community-based projects like water conservation, road repairs, building temples, would lead to the establishment of a norm for cooperation. If these norms are sufficiently salient, they may be internalized by individuals in the manner discussed above.

Sample villages:

Treatment Villages: Ralegan Siddhi and Hiware Bazar, both in the Ahmednagar district of Maharashtra, are famous as model villages in India for transforming the drought-prone area into a water-surplus area and other community-related projects through voluntary labour. Both the villages are 44 km away from each other and hold the ideology that any government welfare scheme would underperform without participation of local citizens. The dominant philosophy of the villages is summarized in five proscriptions: a) Ban on alcohol in the village b) Ban on grazing cattle on common lands c) Ban on cutting and felling trees on common lands d) Contraception for men e) Voluntary labour for community based projects. Both the villages are situated in the drought-prone area of Maharashtra. In the 1970s, the two villages were just one of the several poverty stricken water scare villages in the area. Mr. Anna Hazare and Mr. Popatrao Pawar took the lead in the respective villages to encourage people for voluntary contribution in terms of money, labour and efforts for betterment of the villages in all aspects in the 1980s. The two villages have shown a substantial improvement in physical and social infrastructure over the years, mainly achieved through voluntary labour contributions, leading to improved economic outcomes. Over the years, a lot has been achieved through democratic decision making. Both the villages hold their Gram-sabha (village meetings) regularly where important policy decisions are taken with villagers' consensus maintaining utmost transparency and accountability. A key area has been the ability to exercise control over individual usage of scarce resources like water. As an example, cropping patterns are collectively enforced by the village community. In Hiware

Bazar, water usage by households is monitored by groups of women. These women impose fines on households found wasting potable water. The amounts collected by such groups in fines are presented in the fortnightly village meeting, where the village community decides on the utilization of such balances. Recently, when the village needed extra funds for construction of a public building, some villagers pledged their individual wealth as collateral for a bank loan for the village community. In Hiware Bazar, villagers are not allowed by the village community to sell their lands to outsiders.

Both have attracted a great deal of media attention and have won several state and national awards. Researchers, policy makers and ordinary citizens from all over the country as well as from abroad visit these villages regularly in order to appreciate, understand and learn from the reasons for their success.

In both Ralegan Siddhi and Hiware bazar, water channels built to conserve the rainwater are a matter of pride and social recognition for villagers. In addition, the villagers build school buildings through voluntary labour. The villagers have built the village temple, the village community hall, tourist information centers, roads etc. through voluntary labour contributions.

In Ralegan siddhi, Gram-sabhas are held in the temple. Anna Hazare (2003), believes that temples will rejuvenate moral values among villagers which would motivate people to cooperate for the welfare of the village. He believes that the Gram-sabha is the top most institution of democracy. He advocates decentralized governance and insists that power should be given to voters (Raginwar(2011)). All people celebrate 2nd October as 'Parivartan Divas' (Transformation Day) when new-born babies and married couples are welcomed by gifting new clothes. The eldest male and female are honored as parents of the village and clever & courageous students are awarded. All villagers are served dinner. This practice is viewed to increase feeling of unity, equality and trust among villagers and convey these values to new generations as well.

For Hiware bazar, Gramsansad is the village parliament, where decisions are taken collectively. The villagers subscribe to the view that the Central or State government cannot govern the village. “We are the people and we are the government”, says Mr. Pawar, Sarpanch of the village (Sisodia(2011)). The village celebrates Ganesh festival together.

Control Villages: Nagewadi (district Satara) and Avasari (Budruk) in Ambegaon district, Pune were chosen as control villages, which lack any manifestation of local collective action.

Agriculture is the main occupation in these two villages. Landless labourers work in others’ farms for their livelihood.

Nagewadi and Avasari have two and five temples respectively. Most people celebrate festivals at the household level in these villages.

All these localities are governed by the Panchayat. However the Panchayat holds two-three meetings in a year with its residents. Mostly new schemes introduced by the government are discussed.

Both the villages have been facing a shortage of water for domestic and agriculture usage along with the irregular supply of electricity. This underlies the need for public goods even in control villages.

Annexure II and Annexure III show important demographic and socio-economic characteristics of the villages and sample chosen respectively. The presented tables bring out important facets about the studied samples for this study. Although the structure of the public good experiment was identical in all the villages, the population was heterogeneous in terms of income groups, caste and occupation. The Demand for types of public goods, social networks, level of social capital and collective efforts also vary in these regions.

3. Experimental Design & Procedure

The Standard public good game (as described in introduction) was administered with 20 independent iterations. The experimental endowment was Rs.20 per head per round to split between private and public good. Three groups were formed with four subjects in each for each session. Membership to each group was random, anonymous and reassigned after each round. Such partial anonymity about group members was viewed essential to control 'strategic motivation'. The group contribution was doubled by the experimenter before dividing equally among the players.

Instructions[III] were given in the state's mother tongue (Marathi). Instructions were kept as neutral as possible to avoid saliency of the norm of cooperation. Marathi terminologies for 'local participation', 'collective efforts', which are widely used to describe socially upheld behaviour patterns, were avoided to prevent activation of schemas related to cooperative behavior or expectation. The 'Experimenter's effect' was maintained constant as one of the authors gave the instructions in all the sessions. Players were asked simple questions orally to check their comprehension of instructions. They were given forms[IV] in Marathi to write their contributions towards the group fund, along with their identification number. These forms were collected after each round. The collected group fund, player's share in the (doubled) group fund and total private returns from the round was informed to all players before the next round. All these details were marked with specific signs and were conveyed to subjects to help illiterate and senior subjects to assimilate information clearly. This provided the players a chance to learn about other's behavior in each round and update their expectations and behavior accordingly in the subsequent rounds. A single practice session was conducted to make players familiar with the experimental procedure. The session was followed by two questionnaires and a demographic survey. Players were paid their returns (Ri) in addition to the show-up fee of Rs.150. Each session lasted for about 2-3 hours.

In Ralegan Siddhi, the experimental sessions were conducted in one of the temples in the village whereas in Hiware Bazar, it was administered in the Gramsansad building. In Nagewadi (Avasari), two sessions were conducted in one of the temples (building of Gram Panchayat) of the village, while one session was required to be conducted in a villager's house.

4. Data analysis

4.1: Evidence against Zero Contribution Thesis

Both, the zero contribution thesis evaluated under anonymity and backward induction in a finitely repeated public game, separately, predict the absence of any positive contribution starting from Round 1 (R1). Contrary to this prediction, we observed positive contribution in all the villages, as shown in Table 1. Wilcoxon Signed Rank (WSR) test confirmed that average contribution was not equal to zero (results are not reported for the sake of brevity). Similarly, "Strategic hypothesis" (Andreoni (1988)) predicates sharp increase in free-riding tendency in last few iterations of the public good game, leading to mean contribution to zero in the last round (R20). However, none of the villages witnessed zero contribution (confirmed by Wilcoxon test results) in R20. As presented in Annexure I, village-wise trend in average contribution for twenty rounds has never approached zero in any round.

Positive contribution in control villages implies absence of strong free riders in localities having no specific culture of cooperation. However, in this paper we investigate the difference between contributions in control and treatment villages as to infer potentiality of a locality approaching socially optimal contribution for public goods. Contributing the whole endowment by all group members would be socially optimal due to the linear production function of public good here.

Table 1: Mean contribution in Rs. (% of the endowment)

Village	**Round 1**	**Round 20**	**Standard Deviation: all 20 Rounds**
Ralegan Siddhi	11.00 (55%)	8.47 (42%)	0.9906
Hiware Bazar	11.31 (57%)	9.47 (47%)	0.6476
Nagewadi	8.52 (43%)	7.86 (39%)	0.8577
Avasari	7.92 (40%)	7.69 (38%)	0.7291

Table 1 shows a remarkable difference in mean contribution in R1 for Ralegan Siddhi and Hiware Bazar on one hand compared with other localities, on the other hand. Mean contribution for Ralegan Siddhi was 55% of the endowment. It was 57% for Hiware Bazar. Average

contribution for the control villages was moderately low, ranging between 40-43% of the endowment. Interestingly, the gap between mean contribution of the first and last round was widest for the treatment villages compared to control villages.

We clubbed the round 1 data for control and treatment villages for further analysis. Mean contribution in treatment villages was Rs.11.15 (56% of the endowment) higher than Rs.8.22 (41%) in control villages as shown in Table 2. One-tailed Wilcox Test result confirmed the difference (W= 10.3647, p value = 0.0157). Similarly mean contribution in last round was higher in treatment villages compared to control villages. However, mean contribution declined in both the localities from the first to last round. In case of treatment villages, contribution in the last round was statistically significantly lower than the first round, as substantiated by one-tailed Wilcox test (W = 3175.5, p-value = 0.0097). Same was the case for control villages (W = 2914.5, p-value = 0.09821). The results may suggest free riding. Standard deviation was moderately higher in treatment villages compared to control villages.

Table 2: Analysis of Average Contribution in Round 1 and Round 20

	Round 1		Round 20	
	Control villages	Treatment villages	Control villages	Treatment villages
Mean (Rs.)	8.22 (41%)	11.15 (56%)	7.78 (39%)	8.97 (45%)
Median (Rs.)	9.5 (48%)	10 (50%)	6 (30%)	7 (35%)
Mode (Rs.)	10 (50%)	10 (50%)	2 (10%)	20 (100%)
Standard Deviation	4.66	5.20	5.95	6.54
No.of Observations	72	72	72	72

We replicated the public good experiment in an identical manner in all villages; however villages differ with respect to their local cultural contexts. If local cultural contexts systematically influence individual decision making; individuals in a particular village are expected to behave more alike than individuals across villages. In such a case, individual-level data is nested in village-level data. Hence clustering the village-level data would explain larger variation in contribution than would be explained by individual-level regressors. However, if cultural contexts do not influence the contribution significantly, individuals from different villages can be

considered as part of a large population. Multi-variate multi-level model estimates regression coefficients at both individual and village level.

For our analysis, only a dummy variable for villages is incorporated as village-level determinants, pertaining to the hypothesis that whether communities with the culturally embedded norm of cooperation witness higher contributions than communities without such history. Admittedly, these villages differ on various geographical-economic-social aspects, however the long history of collective action or absence of it may itself has influenced these aspects. For instance, villagers in Hiware Bazar have collectively restricted the sale of village land to outsiders. So the present population of the village, to some extent is the result of the norm. Similarly, higher income level enjoyed by both the treatment villages is unambiguously the result of collective actions. So differences in control and treatment villages on demographic parameters are endogenously determined by the norm of cooperation and so non-differentiable. Nonetheless, investigation of any statistical differences in contribution between Ralegan Siddhi and Hiware Bazar is warranted before pooling their data as treatment village; similarly for Nagewadi and Avasari.

The Group fund of the previous round was expected to have an impact on contributions in the immediate subsequent rounds, even though group composition changed after each round. We wished to check this causality, by adding the group fund of the previous round as one of the explanatory variables. In round 1, participants had no group fund to refer to, so contributions made in round 1 were omitted. Data of one individual from Hiware Bazar and one from Nagewadi was also omitted as they provided incomplete personal information. So the total sample size available for the analysis was 2,698.

Additionally, mean contribution over all rounds was regressed on individual determinants and village dummy to further substantiate the multi-level regression results.

Comparison of Ralegan Siddhi and Hiware Bazar: As shown in Table 3.1, between-Village variance was substantially lower at 0.2326 as against within-individuals variance of 33.4300. The intra-class correlation[V] was considerably low (0.0069) suggesting that between-villages variation was lower than within-individuals variation. Intercept averaging over these villages was Rs.8.33, statistically significantly different from zero (Table 3.2). However, the differential intercept for a single village (-0.2595) from the overall average intercept was statistically insignificant at 5% level of significance (Table 3.3). It implies that differential intercepts for both the villages were not considerably different from the average intercept (for both the villages combined, given by the fixed effects).

Mean contribution for Ralegan Siddhi was, on an average, lower compared to Hiware Bazar, as shown in Table 4; however, it was also statistically insignificant (-0.9150,P-value=0.464). Adjusted R-square for the model was 0.3%.

Similarly, Wilcoxon Rank Sum Test (W= 704.5, P-value = 0.5282) further substantiated the findings. These results suggest the absence of statistically significant difference in average contribution of these villages. It allowed clubbing of the data of Hiware Bazar and Ralegan Siddhi for the analysis.

Table 3: Multi-level Regression for treatment villages

Table 3.1: Hyper-parameters of the model

	Variance	
Village (intercept)	0.2326	
Rounds	0.0001	
Gender	0.1197	
Residual	33.4300	
Number of observations : 1349		
Table 3.2 : Fixed Effects		
	Estimated coefficients	P values
Intercept	8.33	0.0000 ***
Group fund of previous round	0.14	< 2e-16 ***
Age	-0.02	0.1821
Literacy	-0.29	0.0000 ***
Income	0.00	0.0106 *
Farmers (=1 for participant reported their	-1.23	0.0006 ***

occupation as agriculture; else 0)		
Gender (1= females; 0=males)	-0.32	0.5381
Rounds	-0.04	0.1962
Table 3.3 : Random effects for Ralegan Siddhi		
	Coefficient	P value
Intercept	-0.2595	0.5158
Rounds	0.0063	0.0000 ***
Gender	0.1862	0.0000 ***
Significant levels: 0% '***' 0.1% '**' 1% '*' 5% '.'		

Table 4: Result of OLS regression

(Dependent variable = mean contribution over all rounds)

(Intercept)	15.2600	0.000004 ***
Ralegan Siddhi (=1 for that village ; else 0)	-0.9150	0.464
Age	-0.0175	0.6979
Literacy	-0.3871	0.0217 *
Income	0.0000	0.5736
Agriculture (=1 for farmers ;0 otherwise)	-1.2860	0.2706
Gender (=1 for female ; 0 for male)	-0.6859	0.5941
Residual standard error: 4.477 on 64 degrees of freedom Adjusted R-squared: 0.00376		

Comparison of Nagewadi and Avasari: As shown in Table 5.3, differential intercept for each village (random effects) was statistically significantly different from the average intercept (fixed effects). However, village-level variance was considerably lower than that at individual-level. Similarly, intra-class correlation was also substantially low (0.0356).

Similarly, mean contribution over rounds for Nagewadi was statistically insignificantly different from Avasari (1.5940, P-value= 0.2686). Adjusted R-square for the model was 15%. We also failed to reject the null of equality of mean of the two villages due to statistically insignificant results of Wilcox test (W = 771, p-value = 0.1677). So we could club the data of Nagewadi and Avasari as control villages.

Table 5: Multi-level Regression

Table 5.1: Hyper-parameters of the model

	Variance	
Village (intercept)	0.9528	
Rounds	0.0009	
Gender	0.0079	
Residual	25.7800	
Number of observations : 1349		
Table 5.2: Fixed Effects		
	Estimated coefficients	P values
Intercept	5.20	0.0084 **
Group fund of previous round	0.11	0.0000 ***
Age	0.02	0.0825 .
Literacy	-0.06	0.1083
Income	0.00	0.0778 .
Farmers (=1 for participant reported their occupation as agriculture; else 0)	-0.69	0.0957 .
Gender (1= females; 0=males)	-1.69	0.0002 ***
Rounds	-0.03	0.4742
Table 5.3 : Random effects for Nagewadi		
	Coefficient	P value
Intercept	0.6172	0.0000 ***
Rounds	-0.0194	0.0000 ***
Gender	-0.0563	0.0000 ***

Table 6: Result of OLS regression

(Dependent variable = mean contribution over all rounds)

Intercept	7.2340	0.0016 **
Nagewadi (=1 for that village ; else 0)	1.5940	0.2686
Age	0.0253	0.3797
Literacy	-0.0166	0.8771
Income	0.0000	0.5863
Agriculture (=1 for farmers ;0 otherwise)	-0.7532	0.5696
Gender (=1 for female ; 0 for male)	-3.1550	0.0007 ***
Residual standard error: 3.462 on 64 degrees of freedom Adjusted R-squared: 0.1547		

Figure 1 shows a consistent gap in average contribution between control and treatment villages. Despite the marginal decay in average contribution over rounds, treatment villages recorded higher average contribution compared to control village in all rounds.

Figure 1: Round Wise Mean Contribution For Control and Treatment Villages

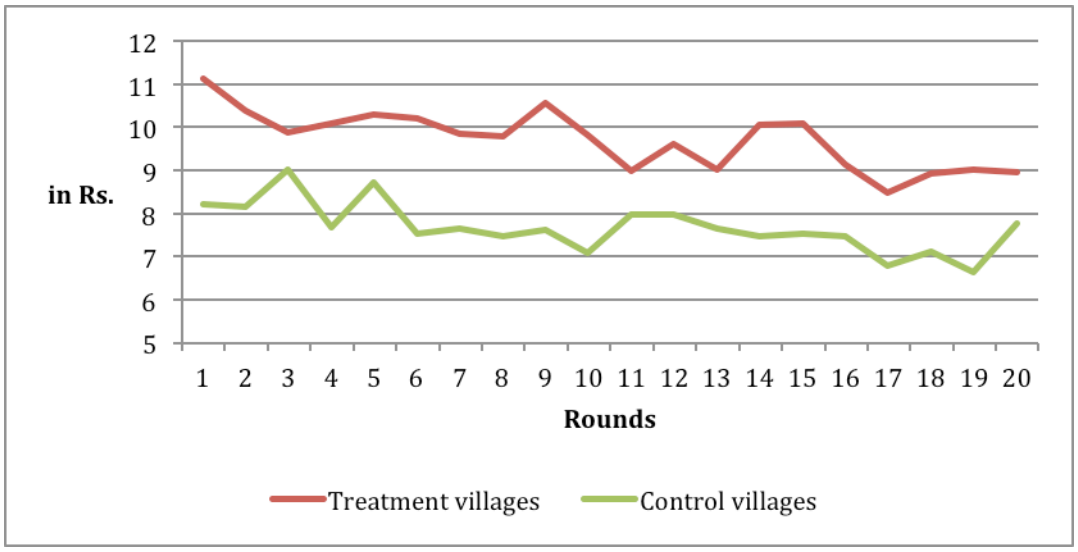

Table 7 shows the multi-variate multi-level regression results using the pooled data for treatment and control localities.

Table 7: Result of Multi-level Regression

Table 7.1: Hyper-parameters of the model

	Variance	
Locality (intercept)	0.2948	
Rounds	0.0003	
Gender	0.7477	
Residual	29.7900	
Number of observations : 2698		
Table 7.2: Fixed Effects		
	Estimated coefficients	P values
Intercept	5.9130	0.0000 ***
Group fund of previous round	0.1388	< 2e-16 ***
Age	0.0023	0.7617
Literacy	-0.1513	7.96E-08 ***
Income	0.0000	0.0109
Farmers (=1 for participant reported their occupation as agriculture; else 0)	-0.7162	0.0027 **
Gender (1= females; 0=males)	-0.5929	0.5289
Rounds	-0.0332	0.2584

Table 7.3: Random effects

	Coefficient for control village	Coefficient for treatment village	P value
Intercept	-0.3757	0.3757	0.6641
Rounds	0.0111	-0.0111	0.0000
Gender	-0.5984	0.5984	0.0000

As shown in Table 7.1, between-localities variance (0.2948) is lower than within-individual variance (29.7900). The intra-class correlation was as low as 0.0098, indicating that between-location variation was lower than within-individuals variation. It implies that grouping the data into control and treatment localities fails to convey meaningful information. It further suggests the absence of differences in average contribution between control localities and treatment villages, after controlling for rounds and other variables.

Table 7.3 shows random effects of the model for the group of control localities and p values. Average contribution between treatment and control villages differs marginally by Rs.0.4; however, the random effect was not statistically significant (p value=0.6641). The overall slope coefficient (-0.0332, P-value=0.2584) in fixed effect for 'rounds' was negative. Average contribution declined as rounds progressed implying free riding over rounds; however, the result was not statistically significant. Treatment villages reported comparatively more decay in contribution compared to control villages as random effects for slope was -0.02 (p value = 0.0000).

As shown in Table 8, the treatment villages recorded statistically significantly higher mean contribution than control villages (1% level of significance), controlling for various socio-demographic variables. Mean contribution in treatment villages is (on an average) Rs.2.25 higher than the control villages. Predisposition to the norms of cooperation and collective actions results in higher average contribution in treatment villages compared to control villages. Adjusted R-square of the model was 10%.

Table 8: OLS Regression for Mean Contribution over All Rounds

Intercept	10.6600	2.23e-08 ***
Treatment villages	2.2540	0.0018 **
Age	-0.0067	0.7818
Literacy	-0.2190	0.0124 *
Income	0.0000	0.3919
Gender (=1 for females; 0 otherwise)	-1.6960	0.0210 *
Agriculture (=1 for farmers; 0 otherwise)	-0.5397	0.4721
Residual standard error: 4.018 on 135 degrees of freedom Adjusted R-squared: 0.1039		

To sum up, average contribution in treatment villages was substantially higher in round 1 compared to control villages. However, overall variation in contribution, after controlling for rounds and others variables is predominantly explained by individual-level determinants rather than village-level determinants. So the difference in average contribution in treatment and control villages appears to be insignificant, especially given the negative random effect of rounds for these villages. Free-riding tendency is exhibited in both the villages but it is relatively higher in treatment villages.

Gender and contribution towards public goods: A voluminous literature in various disciplines of social sciences shows the systematic gender differences in decision-making. We investigated for gender differences in contribution towards public goods in control and treatment villages. Behavior of males and females differ statistically significantly in both the villages. As depicted in Table 8, women on an average contributed less than their male counterparts (-1.6960, P-value=0.0210). However, when location-wise gender difference was explored, it was observed that females in treatment villages contributed higher (by an average of Rs 0.5984, p value = 0.0000) compared to their male counterparts. On the other hand, females contributed less than males in control village. The result suggests the gender-wise differences in the normative behavior.

5. Concluding remarks

We compared the contribution levels in a repeated public good experiment in localities having a history of collective actions with those without any such history. These experimental sessions were conducted under double-blind anonymity. The contribution in treatment villages was higher compared to control villages in all the rounds. However, the contribution declined in later iterations in both the villages; and the rate of decay was higher in treatment villages. These results may suggest that disposition to the heuristic (of local norm of cooperation) would lead to higher contributions in initial phase but deliberational approach will be soon adopted resulting in free-riding in this context. Nonetheless, average contribution in treatment villages remained persistently higher than the contribution level in control villages.

Multi-variate multi-level regression analysis shows that the classification of villages as treatment and control villages explained some part of the variation in the contribution data; however, within-individuals variation was larger than the between-village variation. It implies that the studied qualitative difference (about the history of normative behavior) between treatment and control villages did not strongly influence the contributions over the rounds.

These findings suggest that the norm of cooperation and collective action is fragile; their stability depends crucially on monitoring and punishment mechanisms. Withdrawal of the same, as in our experimental design, may negate the impact of long history of the norm of cooperation to some extent. Ostrom (1990) has also observed that in all known self-organized resource governance regimes that have survived for multiple generations, participants invest resources in monitoring and sanctioning the actions of each other so as to reduce the probability of free riding. It therefore appears that the established history of the norms may not always inculcate the stable preference of 'unconditional cooperation' in an individual's value system. Thus, cooperation in the treatment villages could be attributed to the possibility of being sanctioned for non-cooperative behavior. The observed normative behavior in repeated interactions therefore is strategic in nature.

Nonetheless, importance of norms as a coordinating mechanism cannot be undermined on this note, as its existence still enabled the treatment villages to report higher contributions compared

to control villages. The norm of cooperation and collective action has helped the villages to better implement various government schemes for local development. For instance, Mr. Pawar, Sarpanch of Hiware Bazar admitted that it is the norm of voluntary labour and collective action that enabled villagers to build two rooms in the cost of a single room provided by the state government. Similarly, Mr. Hazare from Ralegan Siddhi attributed the early completion of most government local projects to voluntary labour by the villagers (Sisodia (2011)). Ostrom (2000) also has advocated that the increasing the authority of individuals to devise their own rules may well result in processes that allow social norms to evolve and thereby increase the probability of individuals better solving collective action problems. Evolution of informal institutions such as the norm of cooperation and their sustenance may lead to effective policy implementation at the local level and can be complementary to the interventions of formal institutions to achieve local development.

Notes

[I] They misled five participants about the total number of participants present for the session.

[II] The deliberation approach is different from 'ideal' rational deliberation approach depicted in the traditional rational choice model, which lacks empirical support Camerer (2003).

[III] Translated instructions will be provided by authors on request

[IV] Forms will be provided on request.

[V] Intra-class correlation = $\sigma_{\alpha}^2 / (\sigma_{\alpha}^2 + \sigma_{y}^2)$ where σ_{y}^2 = Within-village variance and σ_{α}^2 = Variance among average contribution of various localities. Intra-class correlation approaches zero if grouping conveys no information and it approaches one if all individuals in a group are identical (Gelman, 2007).

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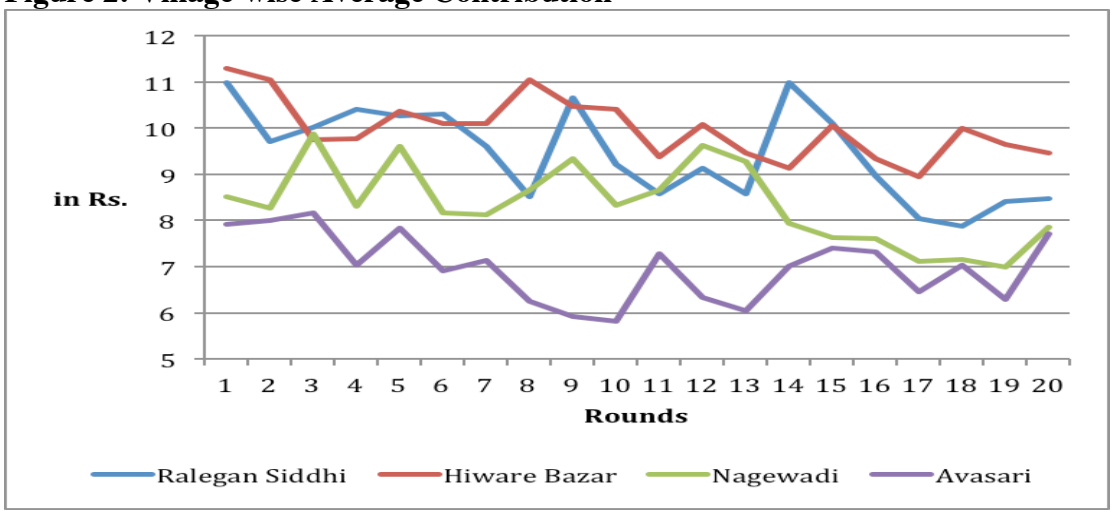
Annexure I

Figure 2: Village-wise Average Contribution



Annexure II

Table 1: Information of sample villages

	Nagewadi	Ralegan Siddhi	Hiware Bazar	Avasari (B)
Sub-district, district	Wai, Satara	Parner, Ahmadnagar	Nagar, Ahmadnagar	Ambegoan, Pune
State, Country	Maharashtra, India	Maharashtra, India	Maharashtra, India	Maharashtra, India
Population (in persons) *	737	2,317	1,141	4,394
Households	169	434	217	877
Type of community : (closed or open)	Closed community	Closed community (Land selling to outsiders is restricted collective by villagers)	Closed community (constrained by geographical situation)	Mostly a closed community
Language spoken	Marathi	Marathi	Marathi	Marathi
* Census 2011				

Annexure III

Table 2: Characteristics of the Sample chosen

	Nagewadi	Ralegan Siddhi	Hiware Bazar	Avasari (B)
% Of sample participants from Scheduled Caste	25%	0%	3%	0%
Composition of the sample in terms of ethnicity				
Hinduism	75%	100%	97%	100%
Islam	0	0	3%	0
Buddhism	25%	0	0	0
Composition of the sample in terms of income group				
	Nagewadi	**Ralegan Siddhi**	**Hiware Bazar**	**Avasari (B)**
< Rs.1000	29%	0%	9%	6%
Rs.1000-3000	49%	17%	23%	6%
Rs.3000-5000	9%	44%	9%	28%
Rs.5000-7000	0%	19%	6%	6%
Rs.7000-9000	0%	6%	3%	6%
> Rs.9000	14%	14%	51%	50%