Cultural Identities and Resolution of Social Dilemmas*

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Abstract: An experiment is reported for payoff-equivalent public good and common pool games with high caste and low caste West Bengali villagers. Tests are reported for models of unconditional social preferences, models of reciprocity, and cultural identity. Results from the artefactual field experiment indicate that when information about caste is withheld *no* significant difference is observed in the efficiency of play between the villagers and student subjects at American universities in games with positive and negative externalities. In contrast, making the hereditary class structure salient induces different behavior among villagers. Providing caste information leads to: (i) the lowest level of efficiency when low caste first movers interact with a low caste second mover, and (ii) the highest level of efficiency when high caste first movers interact with a high caste second mover. Cross-caste play generates intermediate levels of efficiency.

JEL Classification codes: C93, C70, H41.

1. Introduction

A social dilemma exists when actions motivated by individual incentives produce sufficiently strong externalities for others to render such actions socially inefficient. Classic social dilemmas arise with positive externalities from contributions to public goods and negative externalities with extractions from common pools. Extreme outcomes can occur when complete free-riding leads to no provision of a public good or full extraction leads to total depletion of a common resource. One important question is whether under-provision of public goods is a more or less serious problem than over-extraction from common pools. Phrased in this way, the question has no general answer. We ask a more specific question that does have an answer: in payoff equivalent games, is under-provision a more or less serious problem than over-extraction?

Cox, Ostrom, Sadiraj, and Walker (2013) addressed this question in an experiment with two types of payoff-equivalent public good and common pool games: (a) simultaneous-move, symmetric-power games; and (b) sequential-move, asymmetric-power games. Their sequential-move games included boss treatments in which the second mover (boss) had the advantage of moving after seeing the provisions or extractions of the first movers but had the same feasible set as the first movers in the game. In their king treatments, the second mover (king) observes the first movers' contributions to the public good or forgone feasible extractions from the common pool and, subsequently, may choose to increase efficiency of the final allocation or reduce it, possibly to zero. They found no significant difference between efficiency of play in the symmetric-power public good and common pool games. In contrast, final allocations in the common pool game were insignificantly lower than in the public good game in the boss treatment and quite significantly lower, approaching (a tragedy of the commons) complete depletion of the common pool., in the king treatment.

The striking findings reported by Cox, et al. (2013) were for an experiment run with a convenience sample of undergraduate subjects at American universities. We here ask whether the observed pattern of allocation efficiencies in king common pool and public good games is robust to use of a very different subject pool: rural villagers in West Bengal, India. Furthermore, we ask whether efficiencies in king games with externalities are affected by subjects' cultural identities. Do West Bengali villagers resolve social dilemmas in the same way as American undergraduates? Even more pointedly, is resolution of the social dilemmas dependent on knowledge of other players' caste, arguably one of the more salient extant features of cultural identity.

Recently, some authors have reported experiments with subjects in villages in India designed to measure the effects of the caste system on economic behavior. An underlying question is whether the caste system has contributed to the historical poverty of India and, if so, might it continue to retard Indian economic development. According to Fehr, et al. (2008) "Spiteful preferences may constitute a considerable obstacle for trade, cooperation, and, thus, development." Previous studies report caste effects on spiteful behavior (Fehr et al. 2008) and subjects' performance in an incentivized maze solving game (Hoff and Pandey 2006).

We report results from asymmetric-power,sequential public good and common pool experiments that directly reveal economic surplus foregone or destroyed by failure of cooperation. We compare the behavior of caste-uninformed West Bengali villagers to behavior of undergraduates at American universities as well as behavior of caste-informed villagers. By design, the public good game and the common pool game in our study are payoff equivalent, therefore behavior is predicted to be the same *across the two games* by conventional models of social preferences (spiteful (Fehr and Schmidt 1999; Bolton and Ockenfels 2000) or altruistic

(Andreoni and Miller 2002; Cox and Sadiraj 2007). In contrast, reciprocal preferences theory (Cox, Friedman, and Sadiraj 2008) predicts that more altruistic (or less spiteful) behavior by second movers in public good games than in common pool games for any given vector of first movers' allocations. Group identity theory predicts second mover's allocation to the group account (public good or common pool) is: (a) always at maximum own-appropriation when low and high castes interact, and (b) similar between the two payoff-equivalent games. We test hypotheses derived from the alternative models.

The rest of the paper is organized as follows. Section 2 provides an exposition of payoff equivalence between the public good game and common pool game. Section 3 reports implications of alternative theoretical models for these games while section 4 explains the experimental protocols in India and the United States. Section 5 compares the behavior of students at American universities with that of West Bengali villagers who are not informed of the castes of other subjects. Section 6 compares and contrasts behavior of villagers who are informed of alternative homogeneous or heterogeneous caste compositions of subjects in their common pool or public good games. Section 7 concludes.

2. Payoff-Equivalent Public Good and Common Pool Games

We report experiments with the king versions of the public good (or provision) game and the common pool (or appropriation) game studied in Cox, Ostrom, Sadiraj and Walker (2013).

2.1 Public Good Game

This game has n players consisting of n-1 first movers and one second mover. The first movers simultaneously choose how much to provide, p_j to a public good from own private endowments. Each individual is endowed with e "tokens" in her Individual Fund and can allocate any portion of it (in integers) to the Group Fund. Contributions to the Group Fund create surplus; each token added to the Group Fund decreases the value of the Individual Fund of the contributor by 1 frank (experimental currency unit) and increases the value of the Group Fund by m franks, $n > m > 1$.

After observing the first movers' choices, the second mover (player s) can choose to contribute any non-negative number of tokens up to his endowment, e to the Group Fund. Alternatively, the second mover can choose to take (in integer amounts) any part of the tokens previously contributed by the n-1 first movers. Thus, the second mover's feasible set is $\Psi^{pg} = \{-\sum_{j \neq s} p_j, -\sum_{j \neq s} p_j + 1, \cdots, 0, 1, \cdots, e\}$.

Let $\boldsymbol{p} = (p_1, \cdots, p_n)$ denote the vector of numbers of tokens contributed to the public good by the n players.[1] The payoff to agent i in the public good game equals the amount of her endowment, e less the amount contributed to the public good, p_i plus an equal (1/n) share of m times the amounts contributed to the public good by all agents:[2]

(1) $\pi_i^{pg}(\boldsymbol{p}) = e - p_i + m\sum_{j=1}^{n} p_j / n$

2.2 Common Pool Game

The game has n players consisting of n-1 first movers and one second mover. The Group Fund is endowed with *ne* tokens worth m franks each, for a starting total value of *mne* franks. The first movers simultaneously choose how much to extract from the Group Fund. Each first mover can choose an amount, z_j from the feasible set $\{0, 1, \cdots, e\}$ to extract from the Group Fund. Extractions from the Group Fund destroy surplus; each token removed from the Group Fund increases the value of the Individual Fund of the extractor by 1 frank but reduces the value of the Group Fund by m franks where, as above, $n > m > 1$.

After observing the first mover choices, the second mover decides how many of the remaining $ne - \sum_{j \neq s} z_j$ tokens to extract. The second mover (player s) chooses an amount z_s to extract from the feasible set $\Psi^{cp} = \{0, 1, \cdots, e, \cdots, ne - \sum_{j \neq s} z_j\}$.

Let **z** denote the vector of numbers of tokens extracted from the common pool by the n players. The payoff to agent i equals the number of tokens he extracts from the common pool

[1] We use bold letters to denote vectors.

[2] Note the asymmetry between the most selfish choices for the first and second movers. The most selfish choice for a first mover is 0 whereas it is $-\sum_{j \neq s} p_j \leq 0$ for the second mover.

plus an equal (1/*n*) share of the remaining value of the common pool after the extractions by all players (which is *m* times the total number of tokens left in the common pool by all players):[3]

$$(2)\ \pi_i^{cp}(\boldsymbol{z}) = z_i + m(ne - \sum_{j=1}^{n} z_j)/n$$

<u>*2.3 Payoff Equivalence*</u>

The public good and common pool games are constructed to be payoff equivalent, as shown by the following. If the amount, z_j transferred to the Individual Fund in the common pool game equals the amount, $e - p_j$ retained in the Individual Fund in the public good game, for each player $j = 1, 2, \cdots, n$, then the payoff to any player is the same in both games.[4] This follows immediately from statements (1) and (2) by noting that they imply $\pi_i^{pg}(\boldsymbol{p})$ = $\pi_i^{cp}(\boldsymbol{z})$, when $\boldsymbol{z} = \boldsymbol{e} - \boldsymbol{p}$ and $\boldsymbol{e} = (e, e, \cdots, e)$.[5]

3. Implications of Alternative Theories for the Public Good and Common Pool Games

Several testable hypotheses will be derived in this section. We first consider the implications of unconditional preferences models including *homo economicus* (or "selfish") preferences and conventional models of social preferences. For these models, the payoff equivalent public good and common pool games are also strategically equivalent and therefore players will realize the same efficiency in the two game forms. This is stated in the following proposition.

> *Proposition 1.* For unconditional preferences, efficiency of play is the same in payoff-equivalent public good and common pool games.

Proof: See Appendix 1.

Proposition 1 implies the following testable hypothesis.

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[3] The maximum extraction for a first mover is e whereas it is $ne - \sum_{j \neq s} z_j \geq e$ for the second mover.

[4] Payoff equivalence does *not* require symmetric play; i.e., we do *not* assume that $p_k = p_j, j \neq k$.

[5] As above, we use bold letters for vectors.

Hypothesis 1 (U-SP): Efficiency of play is the same in payoff-equivalent public good and common pool games.

An alternative to nonreciprocal preferences models is provided by the model of reciprocal preferences in Cox, Friedman and Sadiraj (2008). In that model, the reciprocal preferences of a second mover in sequential games are characterized by a partial ordering of opportunity sets (MGT), a partial ordering of preferences (MAT), and two axioms that link the partial orderings (Axioms R and S).[6] Opportunity set *G* is said to be More Generous Than (MGT) opportunity set *F* if: (a) the largest second mover payoff in *G* (denoted g^*_{SM}) is higher than the largest second mover payoff in *F* (denoted f^*_{SM}); and (b) the difference between them is not less than the corresponding difference for first mover(s), $g^*_{SM} - f^*_{SM} \geq g^*_{FM} - f^*_{FM}$. Part (a) of MGT "rules in" generosity and part (b) "rules out" the inclusion of instances of "self-serving generosity." Preference ordering *A* is said to be More Altruistic Than (MAT) preference ordering *B* if (for all payoff allocations) preference ordering *A* has higher willingness to pay to marginally benefit another than does preference ordering B. Axiom R formalizes reciprocity by stating that a second mover will be more altruistic when first mover(s) choose *G* rather than *F* if *G* MGT *F*. Axiom S states that the effect of Axiom R is stronger when a generous act (of commission) overturns the status quo than when an otherwise same act (of omission) upholds the status quo.

The model of reciprocity with the preceding properties has testable implications for play of the payoff-equivalent public good and common pool games in our experiment, as follows. The higher (resp. lower) first mover *i*'s contribution (resp. extraction) in the public good (resp. common pool) game, the more generous the opportunity set of the second mover,[7] and by Axiom R the more altruistic the second mover's preferences. Any contribution by a first mover in the public good game provides the second mover with a more generous opportunity set by overturning the status quo. On the contrary, any extraction by a first mover in the common pool game provides the second mover with a less generous opportunity set by overturning the status

[6] We here provide an informal characterization of the model of reciprocity; it is formally developed in Cox, Friedman, and Sadiraj (2008).

[7] For any given amounts of contributions by other FMs, if first mover *i* increases his contribution to the public good from p_i to p_i+x then *i*'s largest payoff decreases by $(1-m/n)x$ whereas the SM's largest payoff increases by mx/n. For any given amounts of extractions by other FMs, if first mover *i* increases his extraction from the common pool from z_i to z_i+x then *i*'s largest payoff increases by $(1-m/n)x$ whereas the SM's largest payoff decreases by mx/n.

quo. Therefore, by Axioms R and S the second movers' choices are more altruistic in the public good game than in the common pool game for any given allocation to the Group Fund by first movers. Furthermore, in both games second movers' altruism increases with higher (resp. lower) contributions (resp. extractions). As opportunity sets in our games preserve the own-payoff price of altruism, Axioms R and S imply the following testable hypothesis. Let preferences over final payoff allocations be represented by some concave, increasing utility function $v(\boldsymbol{\pi})$. Subgame perfect equilibria are characterized by:

Proposition 2. Assume reciprocal preferences that satisfy Axioms R and S.

a. Second mover's choice in a public good game is more altruistic than in the payoff-equivalent common pool game for any given choice by first movers.
b. Efficiency is higher in a sequential public good game than in the payoff-equivalent sequential common pool game.

Proof: See Appendix 1.

Part (a) of Proposition 2 implies the following testable hypothesis. Second movers' choices are more altruistic in the public good game than in the payoff-equivalent common pool game. Alternatively, because the first movers' choices are known to the second mover his choice can be modeled as determining the final level of the public good (Varian 1994). First movers' contributions serve as income (in the budget constraint) for the second mover. The final public good level (as a normal good) then increases in income, i.e., in first movers' total contribution, which in equilibrium is expected to be larger in the public good game than in the common pool game. Proposition 2 implies testable hypotheses.

Hypothesis 2 (RA): Second mover choices differ between payoff-equivalent public good and common pool games:

2a: Second movers' choices are more altruistic in the public good game than in the payoff-equivalent common pool game.

2b. Group Fund level increases with first movers' total contributions; the rate of increase is higher in the public good game than in the common pool game.

Our third hypothesis about choices by first movers and second movers follows from part b of Proposition 2.

*Hypothesis 3 (*R-SP*)*: Efficiency of play is higher in the sequential public good game than in the payoff-equivalent sequential common pool game.

Propositions 1 and 2 follow, respectively, from models of nonreciprocal and reciprocal preferences. We next discuss implications of a group identity model developed in Appendix 1.

Let the population be composed of two distinct groups of individuals. Each individual makes a decision on allocating resources between her Individual Fund and the Group Fund that affects payoffs of everyone in the group. We assume that people care not only about their own Individual Fund but also about positive externalities from contributing to a public good or negative externalities from extracting from a common pool. Following the group identity literature, we assume that individual preferences over externalities are characterized by goodwill towards insiders (one's own caste) but by animosity towards outsiders (another caste). Hence we assume that individual preferences are increasing in insiders (individuals who belong to own group) payoffs but deceasing on outsiders (individuals who do not belong to own group) payoffs. The type of game does not affect such group-contingent preferences, and therefore they imply that play be the same in our payoff-equivalent common pool and public good games. In the case of cross-caste play by mixed groups in our experiment, all first movers are from the same cast whereas the second mover is from a different cast. It follows from animosity towards outsiders and $m/n < 1$ that the second mover's optimal decision is to take all tokens in the Group Fund. So, in a subgame perfect equilibrium it is optimal for the first movers to contribute nothing in cross-caste play with mixed groups.

Proposition 3: Assume two groups, Own Caste (insiders) and Other Caste (outsiders). Group-contingent preferences imply:

1) Efficiency of play is the same in payoff-equivalent public good and common pool games for both homogenous and mixed groups.
2) Full depletion of the common pool and no provision of the public good for cross-caste play in mixed groups.

Proof: See Appendix 1.

An implication of within-caste favoritism is higher degree of altruism in homogenous-caste games that in mixed-caste games, which gives us the fourth hypothesis.

> *Hypothesis 4* (I/O): Efficiency of play is higher in homogenous-caste games than in mixed-caste games.

Our final hypothesis follows from part (1) of Proposition 3.

> *Hypothesis 5* (I-SP). For any given group composition, efficiency of play is the same in payoff-equivalent public good and common pool games.

4. Experimental Protocols

4.1 Experiment with Villagers

The treatments in this experiment cross the public good or common pool game form with caste configurations in a 2 X 5 design. The caste configurations are as follows:

1. No caste information
2. High caste second mover, with three low caste first movers (Mixed High)
3. Low caste second mover, with three high caste first movers (Mixed Low)
4. High caste second mover, with three high caste first movers (Homogenous High)
5. Low caste second mover, with three low caste first movers (Homogenous Low)

4.2 Procedures for the Village Experiment

We have a total of 808 subjects; 788 of them are Hindu subjects; 434 low caste and 354 high caste.[8] Each subject participated in only one treatment. Twenty-one experimental sessions were conducted with each session lasting 3-4 hours. Each experimental session was planned for approximately 40 subjects; however some sessions had 44-48 subjects and one session had 32 subjects. The sessions were conducted in West Bengal, India in conjunction with three different

[8] Our "High Caste" grouping includes Brahmins, Kshatryias, and Vaishyas while our "Low Caste" grouping includes Sudras and Untouchables.

Non-Government Organizations (NGOs).[9] At each place, volunteers from the NGO visited people's homes a few days before the experiment and read out the invitation script generated by us (in Bengali). The volunteers invited only one individual from each family. Subjects indicated their willingness to participate by either signing the form or putting in a thumb print (for subjects unable to read or write).[10] Information on caste (and other demographic details) was collected and used in forming the treatment groups. Every subject was a member of a four-person group, made only one decision and participated only in one treatment. There were a total of ten treatments.

In each of the five public good treatments, each individual was endowed with Rs150 in an Individual Fund. The first movers' decision task was whether to move money from their Individual Funds to the Group Fund. Each of the three first movers could contribute anything from zero to Rs150 (their entire endowment) to the Group Fund in increments of Rs15.[11] Any amount of money moved to the Group Fund reduced the value of the decision maker's Individual Fund by that amount and increased the value of the Group Fund by three-times that amount. The second mover could contribute some or all of her own Rs150 Individual Fund endowment to the Group Fund or she could withdraw some or all of the contributions of the three first movers.

In each of the five common pool treatments, a group was endowed with Rs1,800 in their Group Fund. The choice of each individual was whether to move money from the Group Fund to his or her Individual Fund. A first mover could move any amount from 0 to Rs150 into her Individual Fund in increments of Rs15. Any amount of money appropriated from the Group Fund increased the value of the Individual Fund by that amount and reduced the value of the Group Fund by three-times that amount. The second mover could withdraw none, some, or the entire amount left in the Group Fund by the first movers.

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[9] Locations for the West Bengal experiments are: (1) Sagar Island, South 24 Parganas, West Bengal, (2) Panarhat, Falta area, South 24 Parganas, West Bengal, and (3) Jharkhali, Canning & Basanti block, South 24 Parganas, West Bengal.

[10] At the beginning of each session, the experimenter (U. Sen) was introduced to the assembled participants by the Secretary of the NGO and thereafter she read aloud (in Bengali) the consent form for the subjects. After the experiment began, the experimenter read the instructions in Bengali and answered questions.

[11] The Rs15 unit of divisibility was chosen in order to make the feasible set of choices in India the same as in an earlier experiment in the U.S. (Cox, et al., 2013) in which a subject could choose an integer from {0,1, …,10} when deciding on the number of dollars to transfer between accounts.

In both public good and common pool treatments, an individual's earnings equal the end value of his Individual Fund plus one-fourth of the end value of the Group Fund. Note that the above amounts of money are economically significant: the minimum wage for unskilled workers in West Bengal at the time of this study was Rs110-130 per day.[12] Subjects were informed about the (single blind) payoff procedures. Further details on the procedures in conducting the experiment with villagers are reported in Appendix 2.

4.3 Experiment with Students

The experiment with students was previously reported in Cox, Ostrom, Sadiraj and Walker (2013). Experiment sessions were conducted at both Georgia State University and Indiana University. In each session, subjects were recruited from subject databases that included undergraduates from a wide range of disciplines. Via the computer, the subjects were privately and anonymously assigned to four-person groups. No subject could identify which of the other subjects in the room were assigned to their group. Because no information passed across groups, each session involved numerous independent groups. At the beginning of each session, subjects privately read a set of instructions that explained the experimental treatment. Additionally, an experimenter reviewed the instructions publicly. The games described above were operationalized in a one-shot decision setting with a double-blind payoff protocol. The game settings and incentives were induced in the following manner.

In a public good game, each individual was endowed with $10 in his or her Individual Fund. The decision task of each individual was whether to contribute to a Group Fund. Any $1 moved to the Group Fund was tripled in value. An individual's earnings equaled the end value of his or her Individual Fund plus one-fourth of the end value of the Group Fund.

In the common pool game, each group was endowed with $120 in their Group Fund. The decision task of each individual was whether to appropriate from the Group Fund. Any amount of money appropriated from the Group Fund increased the value of the Individual Fund by that amount and reduced the value of the Group Fund by three-times that amount. An individual's earnings equaled the end value of his or her Individual Fund plus one-fourth of the end value of the Group Fund.

[12] Source: http://labour.nic.in/wagecell/Wages/WestBengalWages.pdf

5. Comparison of Caste-Uninformed Play with Student Play

In this section we compare the efficiency of play by U.S. students with that of West Bengali villagers who were not informed of the caste identities of the other subjects in the group. The question is whether data reveal different norms of cooperation and reciprocity across these two subject pools and, if so, whether these differences are robust to the type of game.

5.1 Efficiency of Play by U.S. Students and West Bengali Villagers

The minimum possible payoff to a group of subjects in a public good or common pool game is *ne*. The maximum possible group payoff in either type of game is *mne*. The actual payoff to subject *i* is π_i. Hence the actual surplus generated by a group of subjects *from playing* a public good or common pool game is $\sum_{i=1}^{n} \pi_i - ne$. The maximum possible surplus *from playing* a game is $mne - ne$. Hence, the observed efficiency of play of a game is:

$$(3) \quad \alpha = 100 \times \frac{\sum_{i=1}^{n} \pi_i - ne}{mne - ne}$$

Figure 1 shows (estimated kernel) densities of efficiencies for public good (or provision) and common pool (or appropriation) treatments in the U.S. and India. These figures suggest strong game form effects on efficiencies, with public good games eliciting more cooperative behavior than common pool games. Behavior is similar for students and villagers not given information about caste. Indeed, in the public good game, the (mean) efficiencies are 39.08% (19 groups) for students and 44.88% (21 groups) for caste-uninformed villagers. In the common pool game, the (mean) efficiencies are 20.74% (18 groups) for caste-uninformed villagers and 18.42% (19 groups) for students. Data from either game fail to reject the null hypothesis of similar efficiency across the two subject pools.[13]

These data support the following conclusion.

Result 1a: Resolution of social dilemmas is similar for caste-uninformed villagers and U.S. students in both the public good game and the common pool game.

[13] Kolmogorov-Smirnov test, p=0.240 (public good) and p=0.996 (common pool)

We next turn our attention to a testable implication of nonreciprocal (selfish and unconditional social) preferences models stated in Proposition 1. For such preferences, the payoff-equivalent public good and common pool games are strategically equivalent, which gives us Hypothesis 1 (U-SP). Data reject this hypothesis (Kolmogorov-Smirnov test: p=0.002 for West Bengali villagers and p=0.069 for U.S. students). The efficiencies are significantly smaller in the common pool game than in the public good game, which is consistent with Hypothesis 3 (R-SP). Thus a second finding is as follows.

Result 1b: Inefficiencies from social dilemmas appear to be more severe in the common pool game than in the payoff-equivalent public good game regardless of whether subjects are caste-uninformed West Bengali villagers or U.S students.

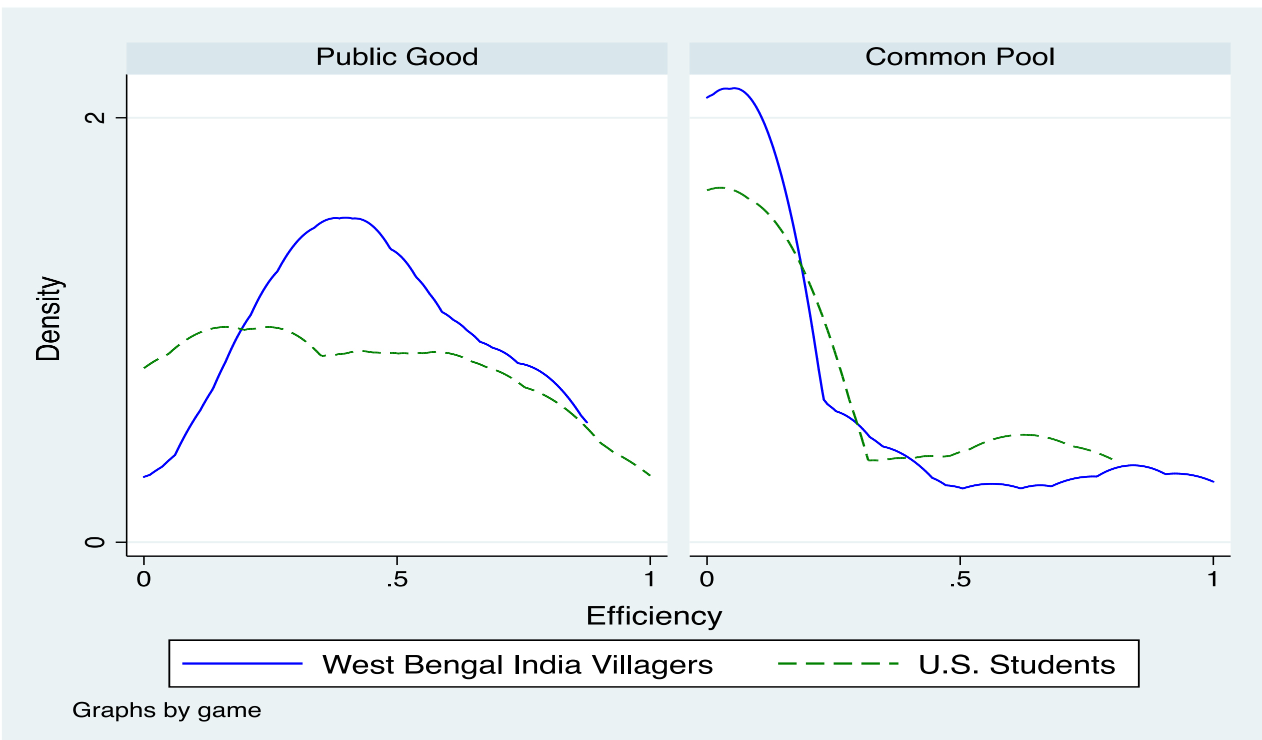

Figure 1. Play Efficiency across payoff-equivalent Games

5.2. Reciprocal Actions of U.S. Students and West Bengali Villagers

In order to gain some insight into whether "reciprocal actions" are different across the two populations, we turn our attention to second mover data.[14] Since second mover choices can be dependent on choices made by the first movers and payoffs in the villager and student experiments are in different currencies, we construct normalized second mover choice variables for comparability, as follows. In a public good experiment, the minimum feasible choice of a second mover is a non-positive amount equal to the total contributions of the first movers. The maximum feasible choice is the second mover's Individual Fund endowment, which is Rs150 in the India experiment and $10 in the student experiment. The normalized choice variables for second movers in a public good game are:

$$\begin{aligned} p_N^{pg}(P_{-s}) &= \frac{p^{pg} + P_{-s}}{150 + P_{-s}} \quad (villagers) \\ &= \frac{p^{pg} + P_{-s}}{10 + P_{-s}} \quad (students) \end{aligned}$$

where P_{-s} is the total contributions of first movers to the Group Fund and p^{pg} is the (observed) second mover's choice.

In a common pool game, the minimum feasible amount the second mover can transfer into his Individual Fund is 0. The maximum feasible amount that a second mover can place in her Individual Fund is Rs600 minus the sum of the extractions by the first movers in a villager experiment or $40 minus the sum of the extractions by first movers in a student experiment. The normalized choice variables for second movers in a common pool game are:

$$\begin{aligned} p_N^{cp}(Z_{-s}) &= \frac{(600 - Z_{-s}) - z^{cp}}{600 - Z_{-s}} \quad (villagers) \\ &= \frac{(40 - Z_{-s}) - z^{cp}}{40 - Z_{-s}} \quad (students) \end{aligned}$$

[14] We use the term "reciprocal actions" because the experimental design does not discriminate between actions motivated by reciprocity and actions motivated by unconditional altruism (Cox 2004).

where Z_{-s} is the total extraction of first movers and z^{cp} is the (observed) second mover's choice in the common pool game. Note that $p_N^{pg}(P_{-s}) = 0$ (resp. $p_N^{cp}(Z_{-s}) = 0$) are the least generous feasible choices for a second mover in the public good (resp. common pool) game. Also, $p_N^{pg}(P_{-s}) = 1$ (resp. $p_N^{cp}(Z_{-s}) = 1$) are the most generous feasible choices for a second mover in the public good (resp. common pool) game.

Means of normalized second movers' choices are: 0.74 (21 villagers) and 0.57 (19 students) in the public good game whereas in the common pool game these figures are 0.31 (18 villagers) and 0.30 (19 students). Our data fail to reject the null hypothesis of similar levels of reciprocal actions across two populations.[15] Data from both populations, however, reject (Kolmogorov-Smirnov test, p=0.004 (villagers) and p=0.028 (students)) the null hypothesis of similar reciprocal actions across games in favor of the alternative hypothesis of more altruistic choices in the public good game, which is consistent with Hypothesis 2a (RA). We conclude that:

Result 2a: Overall reciprocal actions are similar across U.S. students and West Bengali villagers.

Result 2b: The public good game elicits more altruistic choices than the common pool game; this is robust across U.S. students and West Bengali villagers.

6. Comparison of Caste-Informed Play with Caste-Uninformed Play

A central question is the effect of information about caste identity on cooperation in public good and common pool games. What effect does knowledge of other players' castes have on the ability of group members to generate surplus in a public good game or not to destroy surplus in a common pool game?

6.1 Realized Surplus with Public Goods and Common Pools

Figure 2 shows (estimated) densities of efficiencies observed among West Bengali villagers when information on the caste of own group members is provided. Visual inspections suggest higher efficiency among homogenous high caste players (green dashed lines) than homogenous low caste players (red small-dashed lines); play efficiencies in mixed groups are between those

[15] Kolmogorov-Smirnov test: p=0.446 (provision) and p=0.996 (appropriation).

observed in homogenous groups. Game effects are pronounced in the absence of information on caste (blue solid lines) but they seem to disappear in the presence of information on caste of others in the group, suggesting that caste effects on efficiency are stronger than game effects.

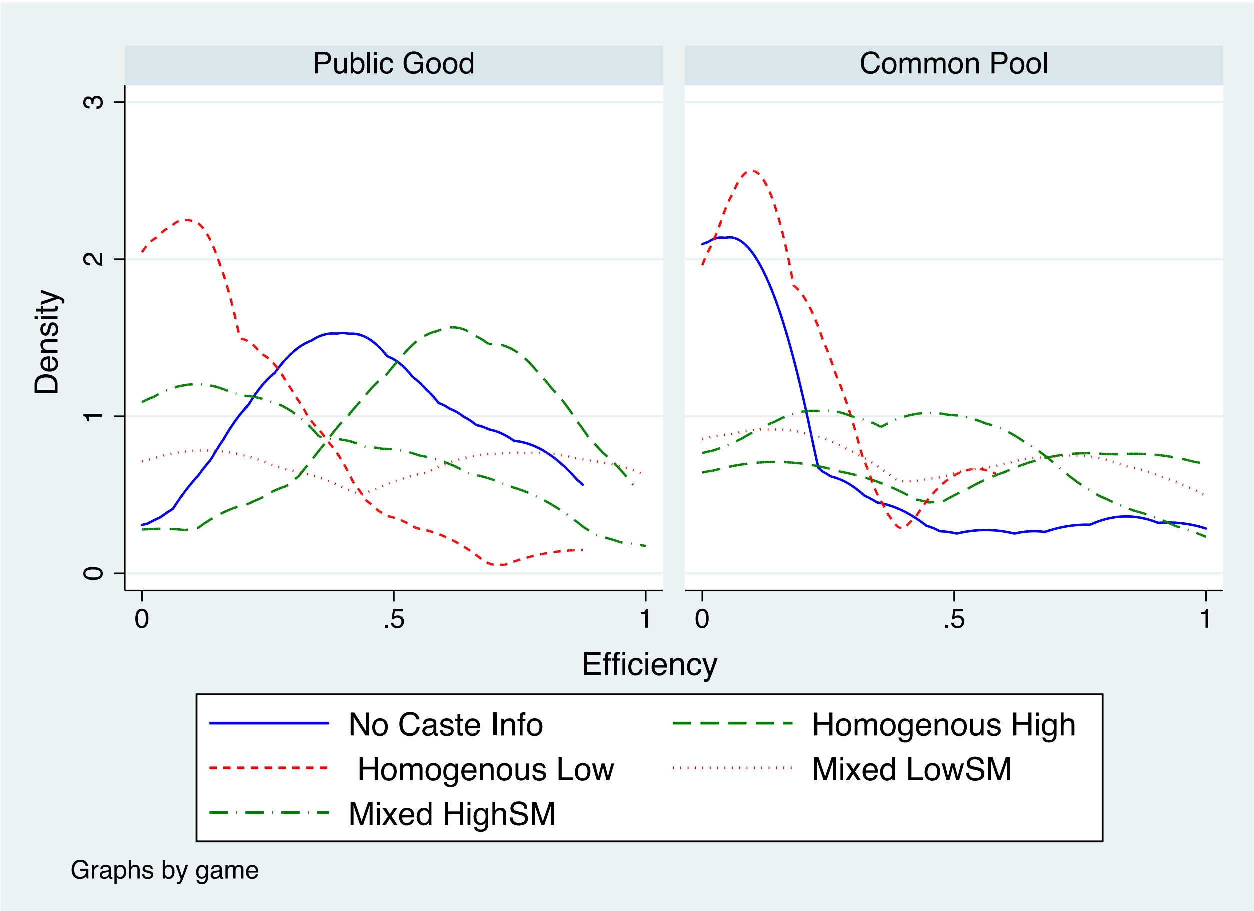

Figure 2. **Play Efficiency among Caste-Informed and Caste-Uninformed Villagers**

Information on magnitudes of the caste and game effects on realized efficiency, as well as on first mover choices and second mover choices, is provided in Table 1. Entries in each row show means (and 95% confidence intervals) of the variables reported in the top row of the table across different games but with the *same* caste composition. Entries in each column, on the other hand, correspond to play across different caste compositions within the *same* game; the largest and the smallest values of each column are in bold. Consistent with impressions from a visual inspection of Figure 2, data reveal that efficiency is highest (resp. lowest) in groups with homogenous high (resp. low) caste subjects whereas efficiencies in mixed groups are somewhere between. The ranking is robust across public good and common pool game forms.[16]

Table 1. Effects of Caste Identity on Resolution of Social Dilemmas

	Efficiency		**First Mover Choices**		**Second Mover Choices**	
Game / **Composition**	Public Good	Common Pool	Public Good	Common Pool	Public Good	Common Pool
No Caste Information	0.45 (0.34, 0.56) {21}	0.21*** (0.05, 0.37) {18}	73.57 (59.23, 87.91) {63}	63.61* (57.59, 82.03) {54}	48.57 (-14.85, 112.00) {21}	**-66.39*** (-144.21, 11.43) {18}
Homogenous (all High)	**0.57** (0.45, 0.70) {18}	**0.56** (0.33, 0.79) {15}	88.33 (73.42, 103.25) {54}	**93.33** (74.24, 112.43) {45}	**78.33** (11.59, 145.01) {18}	**56** (-34.75, 146.75) {15}
Homogenous (all Low)	**0.17** (0.08, 0.26) {26}	**0.16** (0.07, 0.25) {20}	69.81 (57.59, 82.03) {78}	**38.5***** (24.21, 52.79) [60}	**-107.77** (-171.16, -44.38) {26}	-18.75* (-77.01, 39.51) {20}
Mixed (Low SM)	0.45 (0.27, 0.63) {22}	0.37 (0.21, 0.52) {25}	**94.77** (80.47, 109.08) {66}	83.20 (68.54, 97.86) {75}	-13.64 (-101.84, 74.57) {22}	-30.4 (-112.23, 51.43) {25}
Mixed (High SM)	0.30 (0.14, 0.46) {17}	0.41 (0.27, 0.55) {20}	**64.11** (49.45, 78.78) {51}	70.75 (53.91, 87.59) {60}	-10.88 (-87.65, 65.89) {17}	35.75 (-33.02, 104.52) {20}

Figures in brackets correspond to 95% CI; braces show the number of observations; bold, largest and smallest values in a column. Game effect significant (Kolmogorov-Smirnov test) at 10% (*), 5% (**), 1% (***).

The data show that efficiencies of play in Mixed groups (cross-caste play) are between efficiencies in Homogeneous (all-Low) and Homogeneous (all-High) groups. This is inconsistent

[16] Public good games: Using the homogenous low caste treatment as the control group, we find that efficiencies are significantly higher (Kruskal-Wallis test) for all groups except the Mixed Low group. Mean efficiency is still higher in the Mixed Low treatment (0.30) than in Homogenous Low treatment (0.17) but the difference fails to be significant as we are using adjusted p-values (0.006) to correct for multiple comparisons. Common pool games: significantly higher efficiencies are observed only for data from homogenous groups with high caste subjects.

with Hypothesis 4 (I/O) which states that efficiency is expected to be lowest in Mixed groups. Providing information on the caste of other members in the group has a significant[17] negative effect on play efficiency in public good games only in case of Homogenous Low caste groups (p=0.001) whereas the effect in common pool games is positive for Homogenous High caste players (p=0.006). For all homogeneous and mixed caste compositions, play efficiencies across public good and common pool games are similar. In contrast, when information on caste is absent, the public good game is more efficient than the common pool game (p<0.006; 0.45 (public good) and 0.21 (common pool); see No Caste Information row, the first two columns of Table 1). Data from Homogenous (all Low) treatment reject group-identity preferences (Hypothesis 4 (I/O), which require efficiency to be higher in the Homogenous Low than in the Mixed groups. Our data support the following conclusions.

> Result 3a. Homogenous groups with high caste subjects are more successful in resolving social dilemmas than homogenous groups with low caste subjects. The success of mixed groups in resolving such dilemmas is somewhere between and comparable to the success of caste-uninformed groups.

> Result 3b. Resolutions of social dilemmas by caste-informed villagers are similar across public good and common pool games.

These findings on play efficiencies raise some additional questions. Are high caste subjects better at resolving social dilemmas because of a higher level of trust? Or is it due to different norms of reciprocity among villagers from different castes? We next turn our attention to the effect of information about caste on first mover and second mover actions.

6.2 Effects of Game Form and Caste Information on First Mover Behavior

Final public good level is increasing in total contributions of first movers when public good is a normal good (see Appendix 1). If so, trusting behavior of first movers is vital for efficiency. For comparison purposes we consider the decisions of FMs as the rupee amounts allocated to the Group Fund in the public good game or rupee amounts left in (not extracted from) the Group Fund in the common pool game. Aggregated figures (means and 95% CI) on the decisions of the first movers are reported in the two middle columns of Table 1. In public good games, average

[17] Kruskal-Wallis test, (multiple comparisons) adjusted p-value for significance is 0.006.

amounts contributed by FMs vary from a low of 64.11 (43%) in the mixed groups with high caste SMs to a high 94.77 (63%) in the mixed groups with low caste SMs. In the common pool game, average amounts *not* extracted vary from a low 38.50 (26%) in the homogenous groups with low caste subjects to a high of 93.33 (62%) in homogenous groups with high caste subjects. Kruskal-Wallis test rejects the null hypothesis of homogeneous FM play across five treatments (p=0.016 (public good) and p=0.001 (common pool))[18] but data from groups with high caste first movers mainly account for these differences.

When opportunities for surplus creation are available (in public good games), contributions are highest among groups with high caste FMs: 94.77 (low cast second mover) and 88.33 (high cast second mover). In the presence of surplus destruction prospects (in common pool games), the high caste FMs show much greater restraint by leaving a larger quantity (93.33) in the common pool for the high caste SMs. In comparison, the low caste FMs show the least amount of restraint when they play against SMs of their own caste in common pool games (and leave only 38.5).

Choices made by FMs can be motivated by altruism or by trust in SM's reciprocating FMs' cooperative choices. If FMs' decisions are mainly driven by altruism then high caste FMs' contributions in homogenous and mixed groups should be similar; similarly for low caste FMs. Data from high caste FMs are consistent with this hypothesis with the exception of behavior of low caste FMs whose extractions is more restrained when the SM is from the high caste (Kolmogorov-Smirnov test, p-value=0.028). If, however, FMs' decisions mainly reflect belief in SM's conditional generosity then FMs' decisions should vary with the caste of the SM, which is consistent with low caste FMs extractions. We conclude that choices made by high caste FMs are more generous than low caste FMs.

Result 4. High caste FMs are more cooperative than low caste FMs; the result is robust across public good and common pool games.

[18] If we do not include data from caste-uninformed groups, p-values are 0.008 (public good) and 0.0002 (common pool).

The null hypothesis of FMs' allocations to the Group Fund being equal across public good and common pool games is rejected at 1 percent significance only by data from homogenous groups with low caste subjects.[19]

6.3 Effects of Game Form and Caste Information on Second Mover Behavior

We next ask whether caste is associated with different levels of conditional generosity by second movers. Looking at figures reported in the Public Good columns in Table 1 for FM choices and SM choices we observe smaller contributions for SMs. Also, high caste SMs' and FMs' contributions are closer (10 = 88.33 - 78.33) than are low caste SMs' and FMs' contributions (177.58 = 69.81- (-107.77)); thus high caste SMs appear more generous than the low caste SMs in homogenous groups. The result that high caste SMs are more generous than low caste SMs (see Result 5a) is supported by data from homogenous groups.

As explained in section 3, Axioms R and S of revealed altruism theory (Cox, Friedman, and Sadiraj 2008) predict higher generosity by SMs in the public good game than in the common pool game. Figures reported in the middle two and right two columns of Table 1 show this pattern except in the homogenous low caste groups. These results provide support for Proposition 2.

To analyze data at the individual level, we ran hurdle regressions; this is warranted as the 24% (public good) and 32 % (common pool) of the data are at 0 level of the Group Fund. In addition, responses of subjects who come from the same village may be correlated because of local social conventions. To control for this we cluster responses at the village level in the hurdle regressions. Estimates (and p-values) are displayed in Table 2. Our dependent variable is the final value of the Group Fund because, as explained in the theoretical section, the decision problem of the SM can be written in terms of maximization of SM utility defined over public good, P and individual payoff, y with the total contributions of first movers entering as the SM income in the budget constraint. We expect positive estimate for the total FMs contributions (income effect). The larger the income the more MGT the opportunity set, and by Axiom R and S the more MAT preferences. So, we expect the estimate of the total FMs' contributions in the common pool game (while still positive) to be smaller than the estimate in the public good game.

[19] It is rejected at 10 percent significance with data from the no caste information treatments.

Table 2: Second Mover Demand for Public Good

Average marginal effects from the Hurdle model (Cragg, 1971).

Dependent: Final PG Fund	Public Good		Common Pool	
	(1)	(2)	(3)	(4)
FM Choice Effects				
XchoiceSum [+]	0.726***	0.708***	0.565***	0.570***
	(0.000)	(0.000)	(0.000)	(0.000)
XchoiceMin	-0.272	-0.284	0.265	0.244
	(0.407)	(0.424)	(0.189)	(0.430)
Caste Effects				
Mixed [-]	-61.744	-59.652	91.500**	100.357**
	(0.167)	(0.114)	(0.027)	(0.012)
Homogenous Low [+]	-169.806***	-183.912***	41.863	50.427
	(0.000)	(0.000)	(0.307)	(0.238)
Homogenous High [+]	46.129	105.327**	127.369**	145.983***
	(0.189)	(0.018)	(0.011)	(0.005)
Demographics				
Lower Education		-43.263**		-7.218
		(0.043)		(0.736)
Higher education		-24.657		-15.890
		(0.362)		(0.449)
Male		13.125		-3.367
		(0.352)		(0.745)
Married		2.550		-9.386
		(0.881)		(0.656)
High Caste (SM)		-74.726**		-7.515
		(0.014)		(0.721)
Observations	104	101[a]	98	95[a]
Nr of clusters	29	29	33	32[a]

Note: [a] Religion of 20 subjects was not Hindu, so caste information is missing for them; Six of these 20 were SM (3 (public good) and 3 (common pool)). Predicted signs of estimates in square brackets. 0 in the public fund is treated as hurdle. No Information on caste and Middle education (number of years of education between 7 and 10) is the omitted category. Robust p values in brackets; *** p<0.01, ** p<0.05, * p<0.1; SEs clustered at village level.

Explanatory variables include the minimum in addition to the total FMs' contribution to the Group Fund by the three FMs in a group. The other main variable of interest is whether SM generosity in homogenous caste groups is different from SM generosity in groups with mixed caste or no information about caste and, if so, whether the caste of homogenous groups matters. For Identity preferences, we expect the estimate of Mixed group to be negative (animosity towards outsiders) and the estimates for homogenous groups (benevolence towards insiders) to be positive. We also include demographic variables to control for idiosyncratic characteristics of second movers. All estimates (and p-values) are reported in the second and third columns of Table 2.

First consider results for play in public good games. Both models, with and without demographics, report similar signs of estimates. Our data show that the SM demand for the public good is, as theoretically predicted above, positively affected by the total amount contributed to the Group Fund by the first movers. Compared to no caste information groups, generosity is significantly lower in low caste homogenous groups, which is inconsistent with identity preferences. We also see SM demand for public good is lower for less educated villagers and for high caste SM in mixed groups. Summarizing these results we conclude:

Result 5a: SM's demand for public good increases with the total contribution by the three first movers in public good games.

Result 5b: Cooperation is lowest in homogenous low caste groups in public good games.

Next consider play in common pool games. To test for robustness of findings across games, and to make comparison of SM demand for public good across two games transparent, both first mover and second mover choices in the common pool game used in our statistical analysis are transformed as described in the theoretical section: an amount extracted by a player is reported as the corresponding amount left in the common pool, which is the payoff equivalent choice in the public good game. Parameter estimates and p-values are reported for hurdle estimator with and without demographic control variables. As in public good games, models with and without demographics report similar signs of estimates in common pool games. Again, the SM's public good demand in common pool game is positively affected by the total amount of money left in the Group Fund. Compared to No Caste Information, SM's demand for public good is highest for high-caste homogenous groups but it is also higher in the mixed groups, which is inconsistent with identity preferences. Similar to the public good game, high caste second movers are not more cooperative than low caste second movers as the coefficient estimate for the High Caste variable is not statistically different from 0 (p=0.721). Our next result is:

Result 6: The higher is the amount not extracted by the first movers, the less severe the tragedy of the commons.

7. Concluding Remarks

Previous literature (Fehr, Hoff, and Kshetramade 2008) has suggested that spiteful preferences of upper caste Indians may pose an obstacle to trade, cooperation, and development. But the "spite" observed by Fehr, et al. (2008) is third-party, costly punishment of defectors. While costly punishment inherently reduces total payoffs in the immediate instance, the credible threat of such punishment may elicit more cooperation and higher payoffs in a larger context. We experiment with public good and common pool games that directly reveal economic surplus foregone or destroyed by failure of cooperation.

Our public good and common pool games incorporate a type of power asymmetry that provides ample opportunity for failure of cooperation. Three first movers simultaneously decide how much to contribute to a public good or extract from a common pool. One second mover makes a choice after observing choices made by the first movers. In the public good game, the second mover can either contribute to the public good or appropriate as his private property as much as all of the previous contributions by the first movers. In the common pool game, the second mover can either refrain from taking from the common pool or extract part or all of the remaining resource in the common pool after the first movers' extractions.

In one treatment with each (public good or common pool) game form, we withhold information about the caste identification of all other subjects in an experiment session. The efficiency of play in these caste-uninformed treatments with villagers is not significantly different from the efficiency of play observed in an experiment with student subjects at American universities (reported in Cox, Ostrom, Sadiraj and Walker, 2013). This absence of a significant cultural effect holds for both the public good game and the payoff-equivalent common pool game. In this way, we did not observe an overall cultural difference in level of cooperation between the two subject pools.

Behavioral patterns become more heterogeneous, however, in treatments in which the Indian villagers are informed about the caste identities of other subjects. The highest efficiency is obtained in both public good and common pool games when three high caste first movers are matched with a high caste second mover. The lowest efficiency is observed when three low caste first movers are matched with a low caste second mover.[20]

Intermediate efficiency levels are observed when the second mover comes from a different caste than the first movers. In comparison to the efficiency level observed in the public good game with students at American universities, the efficiency in homogenous high caste groups is significantly higher and the efficiency in homogenous low caste groups is significantly lower. For the common pool game, the efficiency of homogenous low caste groups is significantly lower than for students. There is no significant difference between efficiency in homogenous high caste groups and U.S. student efficiency of play in the common pool game.

The public good and common pool games in our experiment are payoff equivalent. They are strategically equivalent for all models of unconditional (selfish or social) preferences as well as for caste-identity-contingent preferences for fixed group compositions (homogenous or mixed). In contrast, the public good and common pool games are not strategically equivalent for the reciprocal preferences in revealed altruism theory (Cox, Friedman and Sadiraj 2008). Revealed altruism theory predicts specific differences in play between the public good game and common pool game: that second movers will behave more altruistically in the public good game than in the common pool game. Tests of these predictions reveal the following. Observed differences in play between public good and common pool games are inconsistent with predictions of unconditional preferences models. In contrast, observed differences in play of second movers across public good and common pool games are mostly consistent with the predictions of revealed altruism theory. Observed play by villagers who are informed about the caste identities of others is inconsistent with in-group and out-group behavior based on caste identity.

[20]This result may be compared with previous findings by Hanna and Linden (2012) who find discriminatory behavior in education by low castes towards other low castes in India and by List and Price (2009) who find that minority solicitors, whether approaching a majority or minority household, are considerably less likely to obtain a contribution. This finding is similar to what Alesina et al. (1999) found earlier regarding the shares of spending on productive public goods in U.S. cities are inversely related to the city's ethnic fragmentation. Fershtman and Gneezy (2001) found systematic mistrust towards male players among the minority ethnic Jews by both more educated and wealthier ethnic groups as well as their own groups.

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Appendix 1: Derivation of Theoretical Results

We will use bold letters for vectors, *s* to index the second mover and capital letters for summations. The initial Private Fund endowment of each player in the public good game is *e* and the initial Group Fund endowment is 0. In the common pool game, the initial Private Fund endowment of each player is 0 and the initial Group Fund endowment is *ne* (and the value is *mne)*. Let *m* denote the (constant) marginal effect of player i's decision on the Group Fund.

Proof of Proposition 1. Player *i*'s payoff in the public good game when the vector of contributions is **p**, equals player *i*'s payoff in the common pool game when the vector of appropriations is, $\boldsymbol{z} = \boldsymbol{e} - \boldsymbol{p}$, verified as follows

$$\pi_i^{cp}(\boldsymbol{z}) = z_i + \frac{1}{n}(m(ne - \sum_{j=1..n} z_j)) = e - p_i + \frac{m}{n}(ne - \sum_{j=1..n}(e - p_j)) = e - p_i + \frac{m}{n}\sum_{j=1..n} p_j = \pi_i^{pg}(\boldsymbol{p})$$

This implies that $\boldsymbol{p} = (\boldsymbol{p}_{-s}, br^{pg}(\sum_{j \neq s} p_j))$ is a SPE in the public good game iff $\boldsymbol{z} = (\boldsymbol{e} - \boldsymbol{p}_{-s}, e - br^{pg}(\sum_{j \neq s}(e - p_j))$ is a SPE in the common pool game. Therefore in equilibrium efficiency of play is the same across games.

Proof of Proposition 2. Let v_i (.) representing *i*'s convex and monotonic preferences over final allocations. Let $u_i(P, y_i)$ denote the utility from private consumption, y_i and public good consumption, P constructed as a composition of v_i(.) and payoffs $\boldsymbol{\pi}$. That is,

$$u_i(P, e - p_i) = v_i(\pi_i, \boldsymbol{\pi}_{-i}), \, where \, \pi_j = e - p_j + (m/n)P, \forall j = 1...n$$

It follows from concavity and monotonicity of v_i on payoffs that u_i is concave and increasing on public good level, P and individual payoff, $y_i = e - p_i$. We use Varian (1994) approach and look at the second mover decision in terms of determining the final level of the public good. The second mover's decision problem therefore can be written as

$$\max_{P, ys} u_s(P, y_s) \quad s.t. \quad y_s + P = e + P_{-s}, y_s \geq 0, P \geq 0$$

The level, P_{-s} of first movers' contributions in the public fund serves as the income for the second mover. It follows from private and public good consumption being normal goods that the second mover's demand for P increases with income, $e+P_{-s}$. That is, (*) $P = D_s(e + P_{-s})$ is an increasing function of P_{-s}, the more the first movers contribute the more public good is provided. Let $\boldsymbol{p}^* = (\boldsymbol{p}^*_{-s}, br_s^{pg}(\boldsymbol{p}_{-s}))$ be the most efficient SPE in the public good game and let the level of public good there be $P^* = \sum_{j\neq s} \boldsymbol{p}_j^* + br_s^{pg}(\sum_{j\neq s} \boldsymbol{p}_j^*)$. The optimal contribution of first mover i,$_{1\ldots n-1}$ is implicitly determined[21] by the f.o.c.,

$$\frac{\partial u_i(P^*, e-p_i^*)}{\partial P}(1+\frac{\partial br_s^{pg}(P_{-s}^*)}{\partial P_{-s}}) - \frac{\partial u_i(P^*, e-p_i^*)}{\partial y_i} = 0$$

By Axioms S and R (see Cox et al. 2013), $br_s^{pg}(Y) = br_s^{cp}(Y) + h_i(Y),\ \mathit{for\ some}\ h(.) > 0, h'(.) > 0.$ Therefore at P^*

$$\frac{\partial u_i(P^*, e-p_i^*)}{\partial P}(1+\frac{\partial br_s^{cg}(P_{-s}^*)}{\partial P_{-s}}) - \frac{\partial u_i(P^*, e-p_i^*)}{\partial y_i} = -\frac{\partial u_i(P^*, e-p_i^*)}{\partial P} h_i'(P_{-s}^*) < 0$$

Thus, first mover *i* wants to decrease his "contribution", $p_i^{cp} < p_i^*$ which together with (*) imply that efficiency of play in the public good game is (weakly) larger than in the payoff equivalent common pool game.

Proof of Proposition 3. Let group-contingent preferences be represented by some concave function $f_i(\boldsymbol{\pi})$, that is increasing in own and insiders payoffs, but decreasing in outsiders payoffs, that is, $\frac{\partial f_i(\boldsymbol{\pi})}{\partial \pi_j} \leq 0$, if *j* is not from i's group, and $\frac{\partial f_i(\boldsymbol{\pi})}{\partial \pi_k} \geq 0$ otherwise. The proof of part (1) is identical to the proof of Proposition 1. To show part 2, note that the composition of our mixed groups consist of all first movers being from one cast and the second mover being from another cast. It follows from the marginal per capita return, m/n<1 and from second mover's preferences being malevolent towards outsiders (all first movers in the mixed groups) that it is optimal for the second mover to take out all is in the public fund. That is, $br_s(P_{-s}) = -P_{-s}$ as

$$f_s(0,\cdots,0,e+P_{-s}) \geq f_s(e-p_1+\frac{m}{n}P,\cdots,e-p_{n-1}+\frac{m}{n}P, e-z+\frac{m}{n}P), \forall z \in [-P_{-s}, e]$$
$$\mathit{where}\ P = P_{-s} + z$$

[21] Concavity of $u_i(P, y_i) = v_i(\pi_1(P, y_1), \cdots, \pi_i(P, y_i), \cdots, \pi_n(P, y_n))$ in *P* and y_i , follows from other regarding preferences, v_i being concave and increasing in $\boldsymbol{\pi} = (\pi_1, \cdots, \pi_n)$ and the (weak) concavity of π_j in *P* and y_i.

Therefore in the SPE the first movers contribute 0 in the common fund because for any positive contribution, $\boldsymbol{p}_{-i}$ of other first movers, first mover *i* utility satisfies

$$f_i(e - p_i, \boldsymbol{e} - \boldsymbol{p}_{-i}, .., e + P_{-s}) \leq f_i(e, ..., e)$$

The inequality follows from properties of identity preferences, f_i: increasing in own and other first movers' payoffs (who are from the same group as *i*) and decreasing in the second mover's payoff who is not from *i*'s group.

Appendix 2. Details on Procedures for the Experiment in Villages

An individual subject's decisions were recorded in a separate, private room by the experimenter. The final payment at the end of the experiment was handed out to each subject privately and separately. Each subject was paid according to what decision he or she had made in the experiment as well as the decisions made by the other group members in addition to the Rs 50 show-up fee.

The groups were formed based on the caste categories to which each subject belonged. Each subject was invited to come to a separate room to make her individual decision in private. After each subject came in and took his or her seat in the private room, the experimenter briefly explained the procedure and rules once again. Thereafter, the subject was handed a decision sheet based on his or her role as first mover or second mover. Across all ten treatments, the second mover subject was also informed about the amount of money contributed (PG) to or extracted (CP) from the Group Fund by each of the three first movers. The subject was asked to carefully consider all the information and thereafter make his or her decision in private. In the caste-informed treatments, each subject in a four-person group was informed about the caste composition of the other members of the group. No information about the caste of the other group members was provided to the subjects in the no-caste-information treatments.

We had to overcome difficulties in recruiting lower caste subjects. In order to be able to recruit a heterogeneous subject sample, we went to villages with relatively large presence of lower caste individuals. In other locations, we found subjects typically arriving at the experiment site in groups with their friends or neighbors. To ensure that subjects did not play strategically believing that their friends would be in the same group, we applied the following procedure. The name and village of residence of the subjects had been taken down one after the other in the order of arrival at the experiment site. Each subject was called by name one after the other to come to the private room. However consecutive people being called to the private room were placed in different groups. For example, subject numbers 1, 2 and 3 may have come from the same village and be called one after the other, but we placed them in different groups –for example subject #1 may be the first mover person 1 in Group 1, subject #2 could be the first mover person 1 in Group 2 and subject #3 could be the second mover person 1 in Group 3. At the time of explaining the instructions of the game, the subjects were clearly informed that they would be in groups different from their friends. When a subject came to the private room to make the decision, he or she was once again reminded that friends were not in the same group. Subjects may have made an assumption of a person's caste or characteristics when they saw the last person leaving the room. To minimize any effects from such observations, subjects were specifically informed that the previous person leaving the room would not be in their group.