Evolution and Human Behavior 34 (2013) 398–404

Contents lists available at ScienceDirect

Evolution and Human Behavior

journal homepage: www.ehbonline.org

Original Article

Ethnic dominance damages cooperation more than ethnic diversity: results from multi-ethnic field experiments in India

Timothy M. Waring [a,*], Adrian V. Bell [b]

[a] School of Economics, University of Maine, Orono, ME, 04469, USA
[b] Department of Anthropology, University of Utah, Salt Lake City, UT, 84112, USA

ARTICLE INFO

Article history:
Initial receipt 8 January 2013
Final revision received 30 July 2013

Keywords:
Cooperation
Public goods
Ethnic diversity
Caste system
Social preferences

ABSTRACT

Research in many societies shows that ethnic diversity correlates with a decline in cooperation at the community level. This literature neglects cases in which ethnic heterogeneity is hierarchically structured. Power and status differences between ethnic groups, or ethnic dominance, may play an important role in determining cooperative outcomes. We test this hypothesis using public goods experiments with caste groups in India in which we manipulate the caste composition of experimental groups. Conservative estimates show that ethnic dominance between high and low ranking castes has a much larger negative effect on contributions in the public goods experiment than does caste diversity. We argue that ethnic dominance interactions such as ethnic discrimination constitute a type of antisocial punishment between groups. We also find that conditional cooperation is limited to within ethnic groups, revealing ethnocentric cooperation preferences. These results confirm the importance of group structure in human cooperative patterns, and help bridge the gap between evolutionary theory and cooperation dynamics in multi-ethnic real world settings.

1. Introduction

The assertion that ethnic diversity causes reductions in cooperation has empirical and theoretical support. Evolutionary theory suggests that humans have evolved to create ethnic groups in order to overcome adaptive challenges and solve collective action problems (Wilson & Wilson, 2007). Human cultural abilities have coevolved with our cooperative tendencies (Bell, Richerson, & McElreath, 2009; Boyd & Richerson, 2009; Boyd & Richerson, 1985; Richerson & Boyd, 2005) to make human groups uniquely successful (Henrich & Henrich, 2007). Human groups develop distinguishing ethnic markers which help stabilize cooperation and solve coordination and collective action problems (Boyd & Richerson, 1987; Efferson, Lalive, & Fehr, 2008; McElreath, Boyd, & Richerson, 2003; Boyd & Richerson, 2009). Theorists argue that cooperation within groups may evolve in response to competition between groups in both genetic (Choi & Bowles, 2007) and cultural terms (Henrich, 2004).

This evolutionary theory of the cultural nature of human cooperation is supported by the evidence. Behavioral experiments measuring the cooperative effects of group competition support the idea from multi-level selection theory that within-group cooperation culturally mediated (Gneezy & Fessler, 2012; Gunnthorsdottir & Rapoport, 2006; Gürerk et al., 2006; Puurtinen & Mappes, 2009; Sääksvuori et al., 2011; Tan & Bolle, 2007; De Cremer & Van Vugt, 1999; Erev, Bornstein, & Galili, 1993). Thus, from a theoretical vantage, if individuals hold a preference for ethnocentric cooperation (Fehr, Hoff, & Kshetramade, 2008b; Horowitz, 2000) then the presence of additional ethnic groups (increasing ethnic diversity) in a community should increase cooperation within groups, and decrease cooperation between groups.

Research in development economics and organizational studies suggests that the total cooperative effect of increased numbers of ethnic groups is in fact negative. Population level development data have linked ethnic diversity with negative consequences for economic growth (Easterly & Levine, 1997) and for a community's ability to provide public goods (Banerjee, Iyer, & Somanathan, 2005), such as public schools (Miguel & Gugerty, 2005), water and waste services (Alesina, Baqir, & Easterly, 1999), police, and environmental management (Baland, Bardhan, & Bowles, 2007; Ruttan, 2006). Organizational research has attended to the effects of social diversity for decades (Williams & O'Reilly, 1998), and though the effects are mixed, these studies show that ethnic diversity frequently reduces team performance in both public and private sectors (Pitts & Jarry, 2007; Hur, 2013; Pelled, Eisenhardt, & Xin, 1999; Watson, Kumar, & Michaelsen, 1993). But, no experimental studies have measured the cooperative effects of ethnic diversity.

Other research shows that ethnic interactions entail additional complexities. For instance, ethnic divisions between powerful groups may pose a greater barrier to cooperation than ethnic divisions between groups of minority status (Posne, 2004). Meanwhile, cultural heterogeneity may not impede collective action on the community

* Corresponding author. 200 Winslow Hall, Sustainability Solutions Initiative and School of Economics, University of Maine, Orono, ME, 04469. Tel.: +1 207 581 3157; fax: +1 207 581 4278.
E-mail address: timothy.waring@maine.edu (T.M. Waring).

1090-5138/$ – see front matter
http://dx.doi.org/10.1016/j.evolhumbehav.2013.07.003

level (Poteete & Ostrom, 2004; Somanathan, Prabhakar, & Mehta, 2007; Varughese & Ostrom, 2001) and may even provide long-term economic benefits (Anderson & Paskeviciute, 2006; Grin, 2003a, 2004; Ottaviano & Peri, 2006). Additionally, a recent re-analysis questions some of the original interpretation of Alesina et al.'s (1999) data (Gisselquist, 2013). Thus, the record is mixed as to whether ethnic or cultural diversity reduces cooperation. One problem that many of these studies face is that ethnic diversity (which we define here as a count of the number of ethnic groups) and ethnic fractionalization (an index on the same number) are coarse measures of social structure. Cooperation is much more likely to be determined by interactions at a finer scale. Inter-ethnic relationships between particular groups, each carrying distinct sets of expectations and behaviors, roles and statuses, may underlie the cooperative effect often attributed to ethnic diversity.

Ethnic dominance, or ethnic stratification, is a difference in social power between ethnic groups, and is a common and influential aspect of inter-ethnic relationships (Sidanius & Pratto, 2001), and may have strong effects on cooperation. Research demonstrating that ethnic prejudice is often created and reinforced when social status varies between ethnic groups (Pettigrew, 1998; Pettigrew & Tropp, 2006) supports this assertion. Although evidence indicates that ethnic diversity decreases cooperation, the influence of ethnic dominance on cooperation has not been measured directly. And, since ethnic dominance entails at least minimal levels of ethnic diversity, prior studies may have commingled the two effects. The present study uses behavioral experiments to separate and compare the cooperative effects of ethnic dominance with those of ethnic diversity.

Collier (2001) has suggested that ethnic dominance may be more damaging than ethnic diversity, providing a competing explanation for findings of reduced cooperation. Since ethnic dominance requires at least minimal ethnic diversity, the two factors are often de facto correlated. This leaves the open possibility that the observed cooperative reductions in multi-ethnic societies are not due to ethnic diversity *per se*, but rather to the effects of specific inter-ethnic relationships *between* ethnic groups including both ethnic difference and ethnic dominance.

India, being the second most ethnically diverse country in Asia, the 17th most diverse country globally (Fearon, 2003) and one of the world's most stratified societies, provides an opportunity to test the cooperative influence of both ethnic dominance and diversity and compare their effects. The historical influence of powerful rulers suggests that ethnic dominance is a critical factor in determining public goods provision (Banerjee et al., 2005). Previous research showing a negative effect of ethnic diversity on community resource management in India did not measure ethnic dominance (Naidu, 2009). However, Hoff and Pandey's (2006) experiment found that public awareness of caste membership reduced self-esteem in low caste individuals. Hoff and Pandey's result suggests that hierarchical caste interactions do influence outcomes. In this context author TW carried out ethnographic data collection and a public goods experiments to separate and compare the effects of (pure, non-stratified) ethnic diversity and (stratified, or hierarchically ranked) ethnic dominance on cooperation.

2. Methods

Following common field methods, our experimental design derived from preliminary ethnographic research (Efferson, Richerson, et al., 2007; Efferson, Takezawa, & McElreath, 2007b; Henrich et al., 2004). Ethnographic research in the Palani hills region of Tamil Nadu found that the traditional irrigation system is a cooperative public good in which farmers from all castes engage, with differing levels of formality, fairness and service quality (Waring, 2011). We framed a public goods experiment as a simulation the traditional irrigation system (Waring, 2011), and manipulated the game composition by varying the

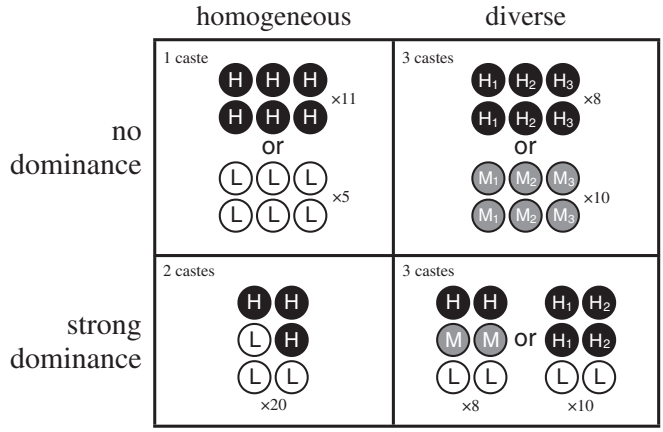

Fig. 1. Treatments varied the caste composition of groups. Treatments were composed of six players selected from castes in the H, M, and L categories. In treatments where alternative combinations were possible, each combination is denoted with 'or'. Treatment groups are represented as letter clusters with each letter representing an individual of the corresponding category. Subscripts denote different castes from the same category. Group multipliers denote replications.

numbers of players from local endogamous caste groups determined during prior ethnographic research (Waring, 2011; Waring, 2012). Caste communities were grouped into three stratified categories based on the prevalence of traditional village positions reserved for each. Groups with traditional leadership roles were designated H (high), groups with traditional servant roles were designated L (Low), and groups with neither role were assigned to the M (Middle) category (Table 1). These categories aligned approximately with general social standing and the Indian Government 'scheduled caste' status (See Waring, 2011, 2012 for complete ethnographic details).

In the experiment, a group of six players played a public goods game (PGG) over ten rounds. The game was designed to mimic the lack of anonymity within village society, while maintaining true individual anonymity. Players received complete information (contribution, share, income, earnings and caste) about all group members every round, but had no knowledge of who their five partners were. Every round, each player was allotted 10 Indian Rupees (INR), and was prompted to decide how much of that money to keep privately or to contribute voluntarily to a common fund. Every round, the common fund was doubled and divided evenly among all players. Participants were instructed on the game mechanics, and then tested on their knowledge of the game. Subsequently, participants played a practice

Table 1
Caste group categories.

Caste categories			
category	caste	people	traditional positions
H	Manadiar	299	Manadiar (leadership)
	Mudhaliar	1983	Manthiriar (leadership)
	Thevar	1786	Periyathanam (leadership)
M	Reddiar	250	none
	Asariar	192	
	Muslim	98	
	Pillai	45	
	Chettiar	27	
	Koundar	13	
	Naidu	<10	
L	Sakkliyar	911	Thandalkarar (servant)
			Neer-Nikum (servant)
			Vettiyan (servant)

For the purposes of the experiment caste categories were constructed as follows: Powerful castes, H, were those with inherited leadership roles (*thalaivar*) assigned to them, the Dalit castes, L, were those to which servant roles were assigned (e.g. *thandalkarar*). There was only one Dalit caste. Dalit castes are the traditional servant or 'untouchable' castes, and are subject to manifold discriminations in daily life. All other caste groups were assigned to the middle category, M.

game for four rounds. The numbers of individuals belonging to each within the group was publicly announced and a ten-round paid game commenced. A final survey was conducted, and participants were paid and dismissed.

Experiments were conducted from October to December 2008 with volunteers in Poombarai, an agricultural village of ~5000 people and 13 distinct caste communities. In total 432 individuals from 11 castes were separated into 72 treatment groups. Treatment groups were constructed by combining individuals from castes in the H, M, and L categories together in a game (Fig. 1) and announcing the caste composition of the group publicly. We used protocols standard in cross cultural experiment research (Henrich et al., 2010), including (i) random adult samples from each caste sub-population, (ii) stakes set at 1 day's wage (120 Indian Rupees), (iii) tested translations of Tamil scripts, (iv) one-on-one instruction, (v) pre-game comprehension testing, (vi) steps to avoid contamination and collusion, and (vii) no deception (See Appendix, available on the journal's website at www.ehbonline.org).

2.1. Analysis

We analyzed public good contributions with a model incorporating both individual round-by-round decisions and treatment-level variables. The contribution in rupees of player i in round j is denoted $y_{i,j}$. We model individual contributions a negative binomial random variable with mean $\mu_{i,j}$ and dispersion parameter k. We model the mean, $\mu_{i,j}$, as a mixture function of treatment variables and lagged contributions of both self and other participants, such that

$$\log\mu_{i,j} = \begin{cases} \mathbf{X_i}\,\mathbf{B}_T & \text{if } j = 1 \\ \gamma\mu_{ij-1} + (1-\gamma)\left(\mathbf{S}_{i,j-1}\mathbf{B}_S\right) & \text{if } j > 1 \end{cases} \quad (1)$$

The mixture parameter, γ, measures the relative influence of a player's own prior contribution in comparison to the average contribution by other participants in the previous round. **X** is a matrix of treatment variables, $\mathbf{B}_T$ is a vector of coefficients for treatment variables, and $\mathbf{B}_S$ is a vector of coefficients measuring the effect of average contributions from the previous round, $\mathbf{S}_{ij-1}$. This model proposes that treatment variables (such as caste diversity and hierarchical composition) have an initial impact on contributions in round one, then as the game progresses the predicted contributions are a function of lagged contributions of self and peers (weighted by the mixture parameter γ). Because treatment conditions last through out the game, our model is a highly conservative estimate of the strength of treatment variables. Almost any other formulation will increase the estimates of treatment strength. We estimated parameters by maximizing the likelihood function

$$L(k,\gamma,\mathbf{B}_T,\mathbf{B}_S) = \prod_i \prod_j \frac{\Gamma\left(k+y_{i,j}\right)}{\Gamma(k)y_{i,j}!}\left(\frac{k}{k+\mu_{i,j}}\right)^k\left(\frac{\mu_{i,j}}{k+\mu_{i,j}}\right)^{y_{i,j}} \quad (2)$$

using the BFGS optimization method in the R statistical computing language (R Core Team 2012). From our formulation above it follows that the percent change in contributions in round j as a result of treatment variables β_T is,

$$\frac{\partial\mu_j}{\partial\beta_T}\frac{1}{\mu_j} = \gamma^{j-1}\beta_T \quad (3)$$

Similarly, the percent change in contributions due to others' contributions is,

$$\frac{\partial\mu_j}{\partial\beta_S}\frac{1}{\mu_j} = (1-\gamma)\sum_{z=1}^{j-1}\gamma^{j-z-1}\beta_S \quad (4)$$

We fit two alternative behavioral models using this framework. The Ethnic Interactions Model uses average contributions from caste group categories (H, L, and M, see Table 1) as predictors for the current round's contribution, while the In-Group Model uses average contributions of individuals of one's own caste versus those of other castes as predictors. We define the two models by specifying the contrasting effects in the dynamic behavior term, $\mathbf{SB}_S$.

3. Results

Average contributions decline over time across all treatments (Fig. 2), as is common in public goods experiments without punishment or communication mechanisms (Zelmer, 2003).

The parameter estimates from both models suggest that both treatment-level and round-level factors influence contributions. The In-Group Model, which estimated behavioral effects by co-ethnic status (Fig. 3) performed significantly better (AIC = 26809) than the Ethnic Interactions Model (Fig. 4) which estimated the behavioral influences of caste categories (AIC = 26972). Estimates for both models were consistent with models that also included control variables for age, relatedness and reputation, which have known effects on behavior. Both models estimate that round-by-round learning has a stronger influence on contributions that did treatment variables. While treatment effect sizes are generally imprecise, they are negligible for diversity (the number of castes) and presence of middle castes, but we see a larger negative effect of caste dominance (the combined presence of both L and H players).

The cumulative effect of dominance is shown in Figure 5, where a 200% decline in contributions is expected due to caste dominance alone, *ceteris paribus*. This dominance effect relates to previous experiments in India which show that public announcement of caste membership can reduce the self-esteem in low caste players (Hoff & Pandey, 2006). In our experiment, caste membership was announced in all treatments, so the effect of playing in a group with high and low status castes together could not be due a low-caste self-esteem effect. However, both reductions in cooperation and self esteem are attributable in part to the expectations of low caste players given their daily interactions with high caste individuals.

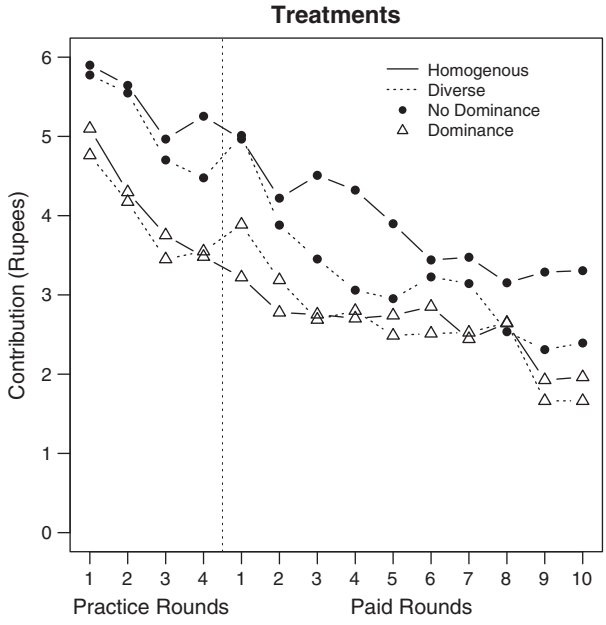

Fig. 2. Contribution trajectories by treatment, in Rupees. Treatments match the cells of Figure 1 in the following manner: Homogenous (upper left), Diverse (upper right), Dominant (lower left), Both diverse and dominant (lower right). N = 6048 choices (432 individuals × 14 rounds).

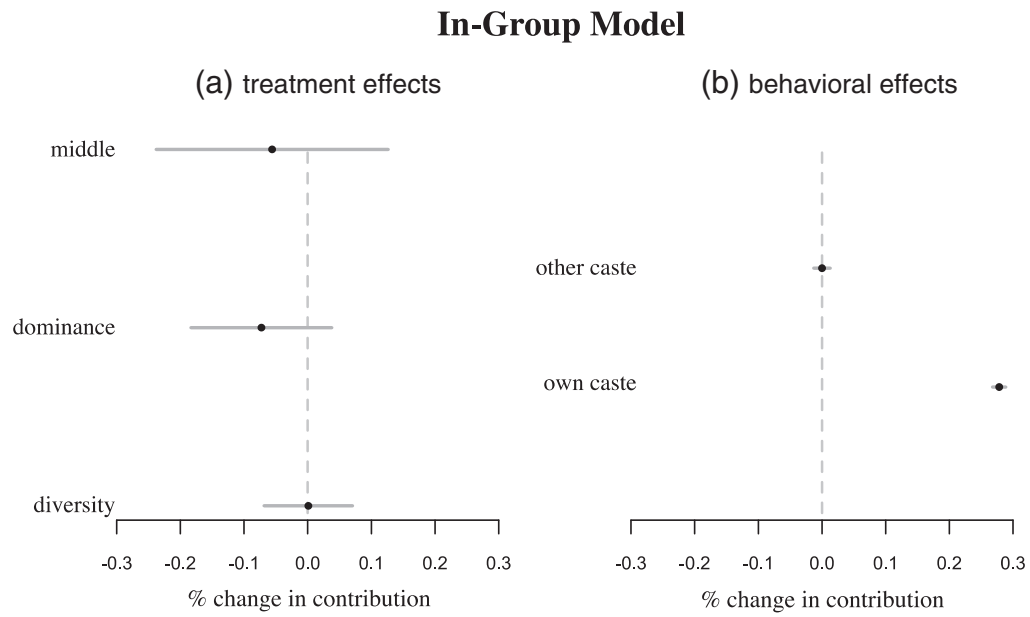

Fig. 3. Contribution effect estimates for the In-Group Model. Maximum-likelihood estimates of treatment effects (a) and co-ethnicity (b) with 95% confidence intervals. AIC = 26809, k = 3.3 (3.05, 3.58), and γ = 0.669 (0.631, 0.705). In (a), caste dominance is the strongest and most negative treatment effect. In (b), a player will increase his contribution by 30% of the increase in contribution of a co-ethnic peer, but not at all in response to increased contributions of non co-ethnic.

Both models agree on what lagged contribution information most influenced cooperation across rounds. Figures 3b and 4b show different versions of the same pattern. Figure 3b shows that In-Group Model estimates that individuals will increase contributions by ~30% of a previous increase by other players from the players' caste. Ethnic Interactions Model estimates in Figure 4b show that the influence of increases in one's hierarchical caste category (H, L, M) has the same ~30% effect, while estimates from other categories are much lower, and vary notably. This pattern constitutes strong evidence for conditional cooperation within a caste group. Figure 5b plots the percent increase in contribution levels if the participant's own caste contributes additional rupees throughout the game.

4. Discussion

Our results show between-group and within-group patterns of cooperation, and reveal that individuals hold a preference for ethnocentric cooperation. We find that ethnicity determines patterns of cooperation at both the treatment level and across rounds of the economic game. Three distinct ethnic factors influence cooperative behavior in the public goods experiment. First, when caste diversity is measured separately from ethnic dominance, it has negligible effects on contribution levels across all rounds. Second, ethnic dominance has a large cumulative negative impact across the experiment. Third, individuals of all castes display an in-group bias in their cooperative

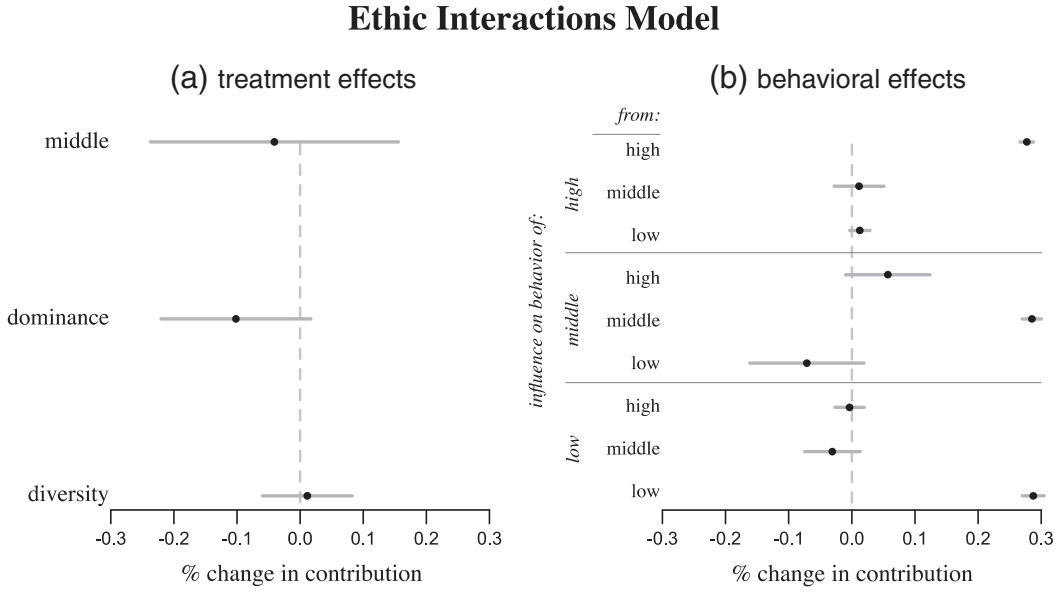

Fig. 4. Contribution effect estimates for the Ethnic Interactions Model. Maximum-likelihood estimates of treatment effects (a) and caste interactions (b) with 95% confidence intervals, where the left hand variables denote the linear effect of the mean contribution of each category (H, L, M) on the others. AIC = 26972, k = 3.14 (2.90,3.39), and γ = 0.652 (0.607,0.695). In (a), caste dominance is the strongest and most negative treatment effect. In (b), players respond most strongly to increases in contributions from those in their own category.

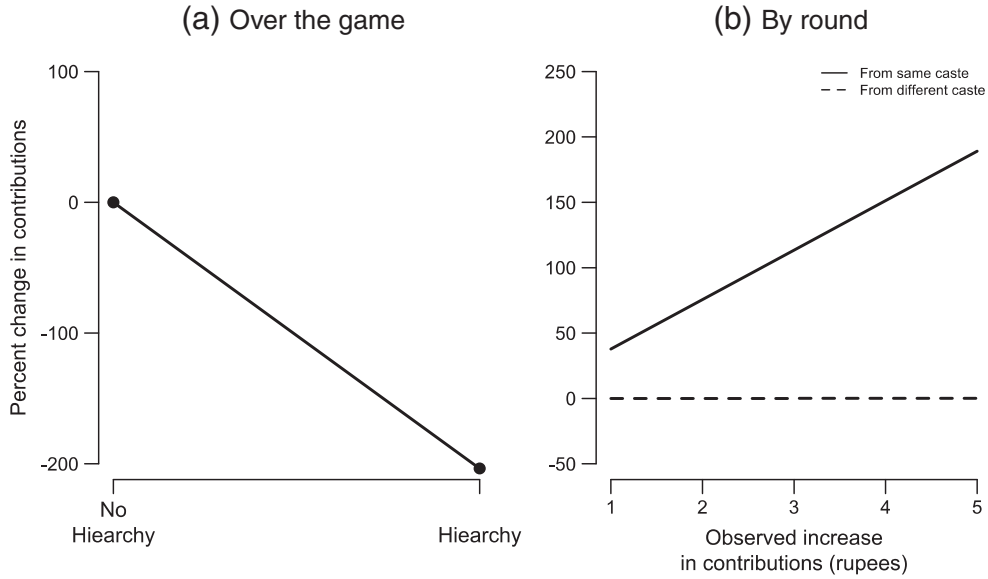

Fig. 5. Dominance and learning effects on public goods contributions. (a) The effects of caste dominance over the entire game and (b) the effects of others contributions from the previous round contributions on ego's contributions. Curves calculated from the fitted model using equation (3) and the maximum-likelihood estimates for the dominance covariate of the In-Group Model (Figure 4).

strategy, increasing contributions only in response to increases from co-ethnics. Our experiments also expand the mechanistic study of cooperation in human groups to multi-ethnic situations.

Increasing ethnic diversity by the addition of a single ethnic group did not reduce contributions over the entire game. Our results do not suggest, however, that ethnic diversity does not reduce cooperative potential in general. The experiment only measured a marginal change in the number of castes, and only in one study region. Previous work by TW suggests that diversity does damage cooperation in the study region (Waring, 2011; Waring, 2012).

Our primary conclusion is that ethnic dominance damages economic cooperation and the production of societal public goods more than ethnic diversity, using a conservative measure. This result contradicts the interpretation of regional economic studies on ethnic diversity (Alesina et al., 1999; Easterly & Levine, 1997; Miguel & Gugerty, 2005), which did not account for ethnic interactions such as dominance, and did not measure cooperation at the behavioral scale. Since the number of ethnic relationships grows geometrically with the number of ethnicities, ethnic diversity is naturally confounded with ethnic dominance, making it easy to overestimate the negative influence of ethnic diversity. Our results support Collier's (2001) proposition that ethnic dominance is of greater importance than ethnic diversity in determining social outcomes. However, India is a very hierarchical society with a long history of ethnic and racial dominance and repression. The ethnic forces revealed here are likely to be subtly or radically different in other cultures. New measurements will be needed that account for the influence of ethnic dominance. We consider this an important research priority.

The most striking result, numerically, is the evidence of ethnocentric preferences for cooperation. Participants behaved in a conditionally cooperative manner with members of their own caste or ranked caste group, increasing contributions in response to prior increases from co-ethnic peers, but not in response to those in other ethnic groups. Individuals effectively ignored cooperative increases by those belonging to other castes or caste groups. This finding coincides with the fact that contributions were highest in the homogeneous caste groups; people prefer to cooperate with co-ethnics.

Prior research on multi-caste third-party punishment experiments in India also supports the ethnocentric cooperative preference hypothesis (Fehr, Hoff, & Kshetramade, 2008a). Fehr and coauthors found that altruistic punishment was higher when both punisher and recipient are of the same caste. This effect constituted a sort of second-order ethnocentric preference for cooperation (for altruistic punishment), supporting the current finding that individuals also display first-order ethnocentric preferences (for cooperation itself). However, unlike (Fehr et al., 2008b), we do not find evidence that homogenous groups of high castes display greater levels of altruism than other groups once ethnic dominance is taken into account.

This evidence for ethnocentric cooperative preferences complicates the interpretation of recent experimental research. Experiments conducted by Habyarimana et al. (2007) suggest that individuals restrict their cooperation with non co-ethnics because social networks are typically disjoint between ethnic groups, limiting opportunities to punish non-cooperators. The supportive effect of pro-social punishment is well understood in the emergence and maintenance of cooperative cultural regimes (Boyd, Gintis, & Bowles, 2010; Boyd et al., 2003; Fehr & Gachter, 2002). Our experimental design excludes opportunities for punishment, and thus cooperation cannot be directly attributed to punishment within the experimental context. This suggests that humans exhibit ethnocentric preferences for cooperation even without opportunities for punishment.

We believe that the expectations of caste-based interactions in daily life may well influence observed game behavior. Caste-based discrimination and abuse are strong forces in India (Narula, 1999; Wilkinson, 2006), and in the study region (Waring, 2011). Altruistic punishment occurs within castes, as it does in most strong social groups, but we do not consider caste-based discrimination and violence to be a type of altruistic punishment. Punishment also occurs across caste lines in these villages, but generally not across boundaries between castes of equal power. Instead, high and middle castes tend to punish low caste, or 'Dalit,' individuals. Dalit discrimination takes the form of beatings and imposed social and economic restrictions, such as arbitrary limits on the attendance of Dalit children in public school (Waring, 2011; Waring, 2012). We hold that this discrimination is a form of coercive subjugation, by which Dalit contributions are kept higher and their derived benefits lower than for ruling castes (see Narula, 1999). Because Dalits are punished despite their cooperation, the ethnic dominance observed here is at least partly a form of antisocial punishment (Herrmann, Thöni, & Gächter, 2008).

We speculate that the antisocial punishment of ethnic dominance functions to reduce cooperation in the village as a whole, and between high and low castes in particular. Anecdotal evidence from Dalit

collaborators confirms that Dalits often reduce their cooperation when called upon by high caste people, because they assume that they will not benefit from any project they are asked to support.

Our results highlight the empirical gains that can be had by combining the typically disparate approaches of traditional ethnography and quantitative experimental games. Interactions between ethnic groups matter, and without hard-won knowledge of those ethnic interactions, they could be easily confounded with ethnic diversity. Of the ethnic effects revealed in this study, ethnic diversity (a count of the number of ethnic groups) is the simplest to measure, requiring little to no ethnographic knowledge of the study communities. This factor may explain the strength of some measurements of ethnic diversity, such as those based on population level data (Alesina et al., 1999). The other effects depend upon measures constructed from rigorous and time consuming study of the local social patterns, traditions and institutions (Waring, 2011; Waring, 2012). We suggest that these sorts of ethnic forces may have gone unmeasured because they require such a large investment to detect.

Recent research has suggested that prosocial preferences do not explain human cooperation in public goods games (Burton-Chellew & West, 2013), adding to a clash of perspectives on the interpretation of cooperation experiments in different cultures (Lamba & Mace, 2012; Henrich et al., 2012; Henrich et al., 2010). Our data clearly support the general existence of prosocial preferences, but also demonstrate that cooperation responds strongly to the culturally determined social and ethnic group membership of peers. Perhaps the most parsimonious explanation for the ethnocentric parochial altruism evidenced in our experiment is the tribal social instincts hypothesis (Richerson & Henrich, 2009), which suggests that humans have evolved skills for solving collective action problems in groups of ethnically marked collaborators. This experiment indirectly supports the cultural group selection theory of the emergence of human cooperative psychology and mechanisms of social identity (Henrich, 2004). Our data show that cooperation problems are solved by way of cultural and ethnic groupings, the boundaries of which are strong, and the interactions between which drive cooperative patterns at the community scale.

In an applied vein, these results suggest something much more significant: ethnic dominance has a cooling effect on cooperation at the community scale, and therefore social, civil and economic development. Ethnic dominance and ethnic violence are forms of antisocial punishment that have indirect negative effects on general cooperation. We believe that ethnic dominance should be a central research focus for behavioral scientists interested in improving society. This study provides some first measurements of the size of these effects, and emphasizes the urgent need for institutions designed to counteract ethnic dominance directly and to mediate its influence on cooperation.

Acknowledgments

This research was supported by the National Science Foundation, Award # BCS0823416 to TW, and was made possible by participants of Poombarai, and the hard work of V.P. Vetrivel and a team of dedicated research assistants including Suderson, Senthil, Kousalia, Mahendran, Matthew, and Michael. TW thanks Sharachchandra Léle and the Ashoka Trust for Research in Ecology and the Environment for guidance and institutional sponsorship, Traivs Lybbert and Tamil Nadu Agricultural University for the use of the data collection equipment, Richard McElreath, Peter Richerson, and Mark Lubell for guidance. Karthik Panchanathan and two anonymous reviewers provided meticulous comments and excellent guidance.

References

Alesina, Al, Baqir, R., & Easterly, W. (1999). Public goods and ethnic divisions. *Quarterly Journal of Economics*, *114*(4), 1243–1284.

Anderson, C. J., & Paskeviciute, A. (2006). How ethnic and linguistic heterogeneity influence the prospects for civil society: A comparative study of citizenship behavior. *The Journal of Politics*, *68*(4), 783–802.

Baland, J. -M., Bardhan, P., & Bowles, S. (Eds.). (2007). *Inequality, cooperation, and environmental sustainability*. Delhi: Oxford University Press.

Banerjee, A., Iyer, L., & Somanathan, R. (2005). History, social divisions, and public goods in rural India. *Journal of the European Economic Association*, *3*(2–3), 639–647.

Bell, A. V., Richerson, P. J., & McElreath, R. (2009). Culture rather than genes provides greater scope for the evolution of large-scale human prosociality. *Proceedings of the National Academy of Sciences*, *106*(42), 17671.

Boyd, R., et al. (2003). The evolution of altruistic punishment. *Proceedings of the National Academy of Sciences*, *100*(6), 3531.

Boyd, R., Gintis, H., & Bowles, S. (2010). Coordinated punishment of defectors sustains cooperation and can proliferate when rare. *Science*, *328*(5978), 617–620.

Boyd, R., & Richerson, P. J. (2009). Culture and the evolution of human cooperation. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *364*(1533), 3281.

Boyd, R., & Richerson, P. J. (1985). *Culture and the evolutionary process.* Chicago: University of Chicago Press.

Boyd, R., & Richerson, P. J. (1987). The evolution of ethnic markers. *Cultural Anthropology*, *2*(1), 65–79.

Burton-Chellew, M. N., & West, S. A. (2013). Prosocial preferences do not explain human cooperation in public-goods games. *Proceedings of the National Academy of Sciences*, *110*(1), 216–221.

Choi, J. -K., & Bowles, S. (2007). The coevolution of parochial altruism and war. *Science*, *318*, 636–640.

Collier, P. (2001). Implications of ethnic diversity. *Economic Policy*, *16*(32), 127–166.

De Cremer, D., & Van Vugt, M. (1999). Social identification effects in social dilemmas: A transformation of motives. *European Jouranl of Social Psychology*, *29*, 871–893.

Easterly, W., & Levine, R. (1997). Africa's growth tragedy: Policies and ethnic divisions*. *Quarterly Journal of Economics*, *112*(4), 1203–1250.

Efferson, C., Richerson, P. J., et al. (2007a). Learning, productivity, and noise: An experimental study of cultural transmission on the Bolivian Altiplano B. *Evolution and Human Behavior*, *28*, 11–17.

Efferson, C., Lalive, R., & Fehr, E. (2008). The coevolution of cultural groups and ingroup favoritism. *Science*, *321*(5897), 1844–1849.

Efferson, C., Takezawa, M., & McElreath, R. (2007b). New methods in quantitative ethnography. *Current Anthropology*, *48*(6), 912–919.

Erev, I., Bornstein, G., & Galili, R. (1993). Constructive intergroup competition as a solution to the free rider problem: A field experiment. *Journal of Experimental Social Psychology*, *29*, 463–478.

Fearon, J. D. (2003). Ethnic and cultural diversity by country*. *Journal of Economic Growth*, *8*(2), 195–222.

Fehr, E., & Gachter, S. (2002). Altruistic punishment in humans. *Nature*, *415*(6868), 137–140.

Fehr, E., Hoff, K., & Kshetramade, M. (2008a). Spite and development. *The American Economic Review*, *98*(2), 494–499.

Fehr, E., Hoff, K., & Kshetramade, M. (2008b). Spite and development. *Economics of transition*. New Orleans: American Economic Association.

Gisselquist, R. M. (2013). Ethnic divisions and public goods provision, revisited. *Ethnic and Racial Studies*, 1–23.

Gneezy, A., & Fessler, D. M. T. (2012). Conflict, sticks and carrots: War increases prosocial punishments and rewards. *Proceedings of the Royal Society B: Biological Sciences*, *279*(1727), 219–223.

Grin, F. (2003a). Language planning and economics. *Current Issues in Language Planning*, *4*(1), 1.

Grin, F. (2004). On the costs of linguistic diversity. In P. van Parijs (Ed.), *Cultural diversity versus economic solidarity* (pp. 193–206). Brussels: Deboeck Université Press.

Gunnthorsdottir, A., & Rapoport, A. (2006). Embedding social dilemmas in intergroup competition reduces free-riding. *Organizational Behavior and Human Decision Processes*, *101*(2), 184–199.

Gürerk, Ö., Irlenbusch, B., & Rockenbach, B. (2006). The competitive advantage of sanctioning institutions. *Science*, *312*(5770), 108–111.

Habyarimana, J., Humphreys, M., Ponser, D. N., & Weinstein, J. M. (2007). Why Does Ethnic Diversity Undermine Public Goods Provision? *American Political Science Review*, *101*(4), 709–725. http://dx.doi.org/10.1017/S0003055407070499.

Henrich, J. (2004). Cultural group selection, coevolutionary processes and large-scale cooperation. *Journal of Economic Behavior & Organization*, *53*(1), 3–35.

Henrich, J., et al. (2012). Culture does account for variation in game behavior. *Proceedings of the National Academy of Sciences*, *109*(2), E32–E33.

Henrich, J., et al. (2004). *Foundations of human sociality: Economic experiments and ethnographic evidence from fifteen small-scale societies.* Oxford: Oxford University Press.

Henrich, J., et al. (2010). Markets, religion, community size and the evolution of fairness and punishment. *Science*, *327*, 1480–1484.

Henrich, J., & Henrich, N. (2007). *Why humans cooperate: A cultural and evolutionary explanation.* Henrich and Henrich, City: New York: Oxford University Press.

Herrmann, B., Thöni, C., & Gächter, S. (2008). Antisocial punishment across societies. *Sc*, *319*, 1362–1367.

Hoff, K., & Pandey, P. (2006). Discrimination, social identity, and durable inequalities. *The American Economic Review*, *96*(2), 206–211.

Horowitz, D. L. (2000). Ethnic groups in conflict, updated edition with a new preface (2nd ed.). Berkeley, CA: University of California Press.

Hur, Y. (2013). Racial diversity, is it a blessing to an organization? Examining its organizational consequences in municipal police departments. *International Review of Administrative Sciences*, *79*(1), 149–164.

Lamba, S., & Mace, R. (2012). Reply to Henrich et al.: Behavioral variation needs to be quantified at multiple levels. *Proceedings of the National Academy of Sciences*, *109*(2), E34.
McElreath, R., Boyd, R., & Richerson, P. J. (2003). Shared norms and the evolution of ethnic markers. *Current Anthropology*, *44*(1), 122–129.
Miguel, E., & Gugerty, M. K. (2005). Ethnic diversity, social sanctions, and public goods in Kenya. *Journal of Public Economics*, *89*(11–12), 2325–2368.
Naidu, S. C. (2009). Heterogeneity and collective management: Evidence from common forests in Himachal Pradesh, India. *World Development*, *37*(3), 676–686.
Broken people: Caste violence against India's untouchables. (1999). Human Rights Watch. New York, NY.
Ottaviano, G. I. P., & Peri, G. (2006). The economic value of cultural diversity: Evidence from US cities. *Journal of Economic Geography*, *6*(1), 9.
Pelled, L. H., Eisenhardt, K. M., & Xin, K. R. (1999). Exploring the black box: An analysis of work group diversity, conflict and performance. *Administrative Science Quarterly*, *44*(1), 1–28.
Pettigrew, T. F. (1998). Intergroup contact theory. *Annual Review of Psychology*, *49*, 65–85.
Pettigrew, T. F., & Tropp, L. R. (2006). A meta-analytic test of intergroup contact theory. *Journal of Personality and Social Psychology*, *90*(5), 751.
Pitts, D., & Jarry, E. (2007). Ethnic diversity and organizational performance: Assessing diversity effects at the managerial and street levels. *International Public Management Journal*, *10*(2), 233–254.
Posner, D. M. (2004). The political salience of cultural difference: Why Chewas and Tumbukas are allies in Zambia and adversaries in Malawi. *American Political Science Review*, *98*(04), 529–545.
Poteete, A. R., & Ostrom, E. (2004). Heterogeneity, group size and collective action: The role of institutions in forest management. *Development and Change*, *35*(3), 435–461.
Puurtinen, M., & Mappes, T. (2009). Between-group competition and human cooperation. *Proceedings of the Royal Society B: Biological Sciences*, *276*(1655), 355–360.
Richerson, P., & Henrich, J. (2009). *Tribal social instincts and the cultural evolution of institutions to solve collective action problems*. Rochester, NY: Social Science Research Network Available at: http://papers.ssrn.com/abstract=1368756 [Accessed April 30, 2013].
Richerson, P. J., & Boyd, R. (2005). *Not by genes alone: How culture transformed human evolution.* Chicago: University of Chicago Press.
Ruttan, L. M. (2006). Sociocultural heterogeneity and the commons. *Current Anthropology*, *47*(5), 843–853.
Sääksvuori, L., Mappes, T., & Puurtinen, M. (2011). Costly punishment prevails in intergroup conflict. *Proceedings of the Royal Society B: Biological Sciences*, *278*(1723), 3428–3436.
Sidanius, J., & Pratto, F. (2001). *Social dominance: An intergroup theory of social hierarchy and oppression.* Siddanius & Pratto, New York, NY: Cambridge University Press.
Somanathan, E., Prabhakar, R., & Mehta, B. S. (2007). Collective action for forest conservation: Does heterogeneity matter? In J. -M. Baland, P. Bardhan, & S. Bowles (Eds.), *Inequality, cooperation, and environmental sustainability* (pp. 234). New Delhi, India: Oxford University Press.
Tan, J. H. W., & Bolle, F. (2007). Team competition and the public goods game. *Economics Letters*, *96*(1), 133–139.
Varughese, G., & Ostrom, E. (2001). The contested role of heterogeneity in collective action: Some evidence from community forestry in Nepal. *World Development*, *29*(5), 747–765.
Waring, T. M. (2012). Cooperation dynamics in a multi-ethnic society: A case study from Tamil Nadu. *Current Anthropology*, *53*(5), 642–649.
Waring, T. M. (2011). Ethnic forces in collective action: Diversity, dominance, and irrigation in Tamil Nadu. *Ecology and Society*, *16*(4), 1.
Watson, W. E., Kumar, K., & Michaelsen, L. K. (1993). Cultural diversity's impact on interaction process and performance: Comparing homogeneous and diverse task groups. *Academy of Management Journal*, *36*(3), 590–602.
Wilkinson, S. I. (2006). Votes and violence: Electoral competition and ethnic riots in India. New York, NY: Cambridge University Press.
Williams, K. Y., & O'Reilly, C. A. (1998). Demography and diversity in organizations: A review of 40 years of research. *Research in organizational behavior*, *20*, 77–140.
Wilson, D. S., & Wilson, E. O. (2007). Rethinking the theoretical foundation of sociobiology. *The Quarterly Review of Biology*, *82*(4), 327–348.
Zelmer, J. (2003). Linear public goods experiments: A meta-analysis. *Experimental Economics*, *6*(3), 299–310.