



# Cultural impediments to learning to cooperate: An experimental study of high- and low-caste men in rural India

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**We report experimental findings on how individuals from different cultures solve a repeated coordination game of common interest. The results overturn earlier findings that fixed pairs are almost assured to coordinate on an efficient and cooperative equilibrium. Subjects in the prior experiments were US university students, whereas the subjects in our study are men drawn from high and low castes in rural India. Most low-caste pairs quickly established an efficient and cooperative convention, but most high-caste pairs did not. The largest difference in behavior occurred when a player suffered a loss because he had tried to cooperate but his partner did not: In this situation, high-caste men were far less likely than low-caste men to continue trying to cooperate in the next period. Our interpretation is that for many high-caste men, the loss resulting from coordination failure triggered retaliation. Our results are robust to controls for education and wealth, and they hold by subcaste as well as by caste status. A survey we conducted supports the ethnographic evidence that more high-caste than low-caste men prefer to retaliate against a slight. We find no evidence that caste differences in trust or self-efficacy explain the caste gap in cooperation in our experiment. Our findings are of general interest because many societies throughout the world have cultures that lead individuals to (mis)perceive some actions as insults and to respond aggressively and dysfunctionally.**

coordination | cooperation | human universals | retaliation | honor

This paper explores the effect of culture on individuals' ability to coordinate on efficient conventions. In many economic settings, both efficient and inefficient conventions would be sustainable if all agents believed that the given convention would be followed (1, 2). There is no consensus on the mechanism by which a convention is selected. Nonetheless, it has been observed in experiments with US university students that small groups of individuals who interact repeatedly are, by and large, able to coordinate on an efficient convention (3, 4). However, in many parts of the world we observe persistent dysfunction and waste that could be ameliorated if only it were possible to overcome institutional inertia and shift society from an inefficient convention to an efficient one. This has specifically been observed in rural north India (5). We report field experiments conducted in that part of the world that shed light on how individuals from different cultures may approach coordination problems in a very different manner. We argue that these cultural differences can result in divergent coordination outcomes. Specifically, we find that individuals from low castes are able to coordinate efficiently, similarly to the university students studied in prior work. Individuals from high castes, in contrast, coordinate far less efficiently. We present evidence that this difference can be attributed to cultural differences in the perception of a loss as an insult and to different norms about how to respond or retaliate to a perceived insult. Thus, consistent with other recent work, we find that the coordination process will depend on the details of culture, since culture shapes perception and norms and varies

from one population to another (e.g., refs. 6–9). Our findings shed light on the potential causes of inefficient conventions and lay the foundation for future work on how to improve the efficiency of coordination.

The coordination game that our subjects played was the Stag Hunt. It has been called the “exemplar of the central problem of the social contract” (10, 11). Each player chooses between two actions—to hunt a hare (“Hare,” for short), which yields a modest but riskless payoff, or to hunt a stag (“Stag,” for short), which yields a high payoff provided that the others in the group hunt stag. The names of the actions come from a story told by Jean-Jacques Rousseau. In the *Discourses on the Origin of Inequality*, Rousseau imagines a hunting party in humanity's pre-history. A hunter alone can always catch a hare, but it is a meager meal. In contrast, a stag is caught only if all members of the group keep their posts. If anyone in the group sees a hare and chases after it, the stag escapes. For each person to catch a hare is not a socially efficient outcome, but it is an equilibrium. The problem of forming a cooperative convention is the problem of converging to a common understanding that all members of the group will hunt the stag.

From each of 10 villages in the Indian state of Uttar Pradesh, we selected representative samples of men to play a repeated Stag Hunt. The men were drawn both from high castes (officially “General Castes,” at the top end of the caste hierarchy) and low castes (officially “Scheduled Castes,” formerly untouchables and now also called “Dalits,” at the bottom end of the caste hierarchy). We selected Uttar Pradesh for its potential to provide insights on how culture affects coordination: First, there is evidence that the region has an unusually poor ability to form cooperative conventions. Researchers have observed that the villagers do not coordinate on simple tasks of common interest such as timing planting to maximize output, drainage of household wastewater to keep dirt paths dry and safely passable, and sanitation (5, 12). Second, high and low castes have different cultures (13) but live in many of the same villages (in separate

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hamlets) and speak the same language. In our experiment, the same team taught the Stag Hunt game to both sessions that we held in all 10 villages. Since our high-caste and low-caste subjects are more like each other in language and location than are groups in different countries, they are in that respect better comparison groups for studying the impact of culture on coordination. The disadvantage of using high and low castes to study culture's impact is that they historically occupied radically different positions in the economic, political, and social structure. However, there has been significant convergence in status in the 70 years since the caste system was officially abolished at Indian independence. The groups now overlap in the distribution of education and wealth, which permits us to control for these characteristics.

Caste, which includes a system of conjugal regulation and dietary and dining restrictions, has existed in South Asia for almost 3,000 y, but its content and meaning have evolved over time. [The levels of caste endogamy in India have been so great for so long that its consequences can be seen in the population genetics. Genetic research shows that many current distinctions between caste groups are ancient (14).] Only with British colonial rule was a system developed that put all Hindus into castes and all castes under a hierarchical order. British efforts to codify customary law and the associated misinterpretations of certain textual laws made society more rigidly caste-bound and congealed social identity around the single idea of caste (15–17). Based on tradition, low castes were consigned to occupations considered polluting to Hindus (e.g., leatherwork and pig rearing), which made them “untouchable” to other castes. Despite its legal prohibition, much of the tradition of caste still exists in rural India. A 2001–2002 national survey found that at least some norms of Untouchability continued to be practiced in almost 80% of villages (18), sometimes with high economic costs to the low castes. For instance, in the ground water market in North India in 1997–1998, discrimination caused low-caste buyers of irrigation water to have agricultural yields that were 45% higher if they resided in a village where water sellers were of the same caste than if they lived in a village where water sellers were of higher caste (19).

In our Stag Hunt experiment, each subject played 10 rounds of the Stag Hunt, five rounds with a player of the same caste status and another five rounds with a player of different caste status. We found, contrary to prior experimental results, that only in one broad cultural group—the low castes—did most pairs of men quickly form the cooperative convention. Among high-caste men, most pairs did not form an efficient convention, and some even formed the inefficient convention. High castes and low castes are broad categories that include subcastes with distinct cultures and distinct meanings and obligations related to honor. However, our findings persist even when we control for subcaste. After documenting this fact, we focus on identifying the cause of the failure of high-caste pairs to cooperate. We present many pieces of evidence that attitudes toward status and honor are more plausible explanations for the difference in coordination outcomes than are differences in education, wealth, kinship structure, trust, or self-efficacy.

The event in which the largest difference in behavior between high- and low-caste players occurred was in the period immediately following coordination failure. In a coordination failure, the player who tries to cooperate suffers a loss equal to half of his endowment for the period. We call the payoff to the loser in a coordination failure the “loser’s payoff.” The high- and low-caste players appear to interpret the loser’s payoff differently or, if they interpret it in the same way, to differ in their preference for retaliation. Since the loser’s payoff would have been avoided if the other player had cooperated, it might be categorized as a slight, for which the culturally appropriate response may be retaliation.

We do not have experimental variation that can definitively prove that differences between high- and low-caste men in perceptions and in norms for honor and retaliation cause the differences in

coordination. However, we are able to rule out leading alternative explanations, and we present indirect evidence that supports our view that this particular cultural mechanism is a key factor. First, we show that the results are robust to controlling for wealth, education, and a measure of trust. Wealth could affect behavior because retaliation is costly: Punishing the other player after getting the loser’s payoff may be a luxury in which only better-off people indulge. Another reason that wealth could affect behavior is that rich people may act more selfishly than others (20): One may hypothesize that greater wealth is associated with a sense of entitlement. A third reason that wealth might matter is that an individual with more wealth might be less content with noncooperation, which could increase his desire to retaliate against a player who fails to cooperate with him.

On the other hand, wealth could also have the opposite effect on preferences and could increase the desire to retaliate. Households in extreme poverty depend more on insurance from others to cope with risk. The loss from the loser’s payoff may mean more to poorer individuals than to richer individuals and may be more salient to them. Thus, they could be more upset and therefore respond more strongly than persons from better-off households if they get the loser’s payoff.

Our results on the effect of caste are robust to the inclusion of proxies for wealth and for interactions between wealth and caste. The results also persist when we restrict the sample to the poorest players, those who live in thatched mud huts. In fact, the gap between high and low castes in the response to the loser’s payoff is larger for individuals who live in mud huts than for those who do not. This means that viewing retaliation as a luxury or as an expression of feelings of entitlement of the rich does not explain why high-caste participants disproportionately retaliate. In our experiment, the feeling of entitlement appears to be associated with caste, not class.

Another possible explanation is that caste is linked to kinship structures, which would make the relationship between a participant and the anonymous other with whom he interacts depend on the players’ caste statuses. However, norms of village exogamy and caste endogamy apply to all castes and are policed by the traditional *panchayats*, which in Uttar Pradesh remain active and powerful because they are linked with political parties (21). Nearly all marriages occur within a caste and are arranged between two families who live in different villages and are of different clans. Thus, the caste status of the partner per se does not imply kinship. [The fault lines in rural India are between castes, not between clans as they are, for example, in parts of Africa, tribal regions of S. Asia, and the Middle East where clans have their own rural territory to administer (22). Unlike tribes, castes are deeply embedded within political society. They are not a survival of ancient times but are something that took on a new form under British rule.]

To further link caste status with cultural norms for retaliation, we implemented a vignette-based survey using representative samples of high-caste and low-caste men from each of 22 hamlets in Uttar Pradesh. These individuals were presented with hypothetical scenarios in which one person harms another. We asked each person in the sample how he would respond to the harm. In cases in which the motivation behind the harmful activity was ambiguous, a much larger proportion of high-caste than low-caste respondents said they would retaliate in an extralegal manner; in contrast, many low-caste subjects said they would respond nonaggressively or not at all.

The caste difference in the survey responses is consistent with ethnographic work that documents a much greater concern for status and honor among high castes than among low castes (23, 24). We discuss this work in more detail below. In the culture of honor, “honor” is synonymous with a reputation for responding aggressively to perceived offenses. This reputation, it is believed, deters others from challenging one’s authority or position. The culture of honor has been described as a “mediative concept” through which individuals interpret reality (25) and as “a code

for both interpretation and action” (26). Thus, our experimental and survey findings are consistent with the hypothesis that cultures differ in what they construe as a slight and/or in preferences for retaliation. Construal is an underutilized idea in economics (27). Individuals from different cultural traditions may differ in their concerns and default assumptions about how the world works. They may disagree on which facts are the most salient and on which causal narrative is the most appropriate. We will present evidence supporting the view that high-caste men are more likely than low-caste men to construe a loss as a slight rather than as a misunderstanding.

Finally, we assess and reject two alternative explanations based on trust and self-efficacy. We implemented the following trust game in Uttar Pradesh: One subject, the principal, decides whether to “invest” an endowment with another subject, the agent. The agent can then unilaterally decide how to share the investment plus the return with the principal. As measured by the proportion of principals who invested, trust was slightly higher in pairs in which the principal and agent were both high caste than in the other types of pairs.

Self-efficacy is a belief in one’s ability to affect the environment. If low-caste men have a lower sense of self-efficacy than high-caste men, it could explain the caste gap in retaliation. We administered a standard psychological test of self-efficacy (28) on high-caste and low-caste men and found no significant difference between them.

This paper contributes to a growing body of research on cross-cultural differences in punishment and cooperation. While this literature is large, we highlight some especially close connections. Herrmann et al. (29) argue that many societies exhibit antisocial punishment, wherein individuals who deviate in a prosocial manner are punished. In our experiment, it is the relatively antisocial “going it alone” that results in punishment behavior if the other player tries to cooperate; what seems to differ across cultures is the extent to which this is perceived as an offense worthy of punishment, as opposed to simply a misunderstanding. However, like Herrmann et al., we link punishment behavior to norms for revenge and honor. In a comparison of US and Chinese populations, Jackson and Xing (30) argue that culture affects behavior in coordination games of opposing interests. In contrast, our work focuses on coordination in common-interest settings and on the role of punishment norms in shaping conventions. In recent work, Enke (31) argues that historical kinship systems play a significant role in determining which mechanisms are used to enforce prosocial behavior. The castes represented in our samples exhibit similar kinship systems. We therefore discount them as a potential explanation of our findings. However, like Enke, we find that the mechanisms that a cultural group uses to enforce cooperation (such as revenge taking) are related to the extent of cooperation with anonymous others. Finally, in contrast to the aforementioned work, we use within-country analyses across castes, rather than within- and between-country analyses across ethnicities. This allows cleaner identification of cultural perception and social norms as a driver of variation in economic behavior.

## Results

**Study 1. The Coordination Game.** Our first study was the laboratory-in-the-field experiment of the Stag Hunt game shown in Fig. 1. In each period, a subject was given an endowment of six blue tokens, worth six rupees. A player had to choose between contributing six or two tokens to a pool. If he contributed six tokens, he would gain an additional four tokens if the other player with whom he was paired also contributed six tokens, but he would lose half his endowment for the period if the other player contributed two tokens. We gave players a new endowment each period to frame the outcome of the strategies (2, 6) as a loss to the player who had contributed six tokens. If the player contributed two tokens, he would gain one additional token

		Player 2	
		Contribute 6 (Hunt stag)	Contribute 2 (Hunt hare)
Player 1	Contribute 6 (Hunt stag)	4	-3
	Contribute 2 (Hunt hare)	1	1

Fig. 1. Payoffs in the Stag Hunt.

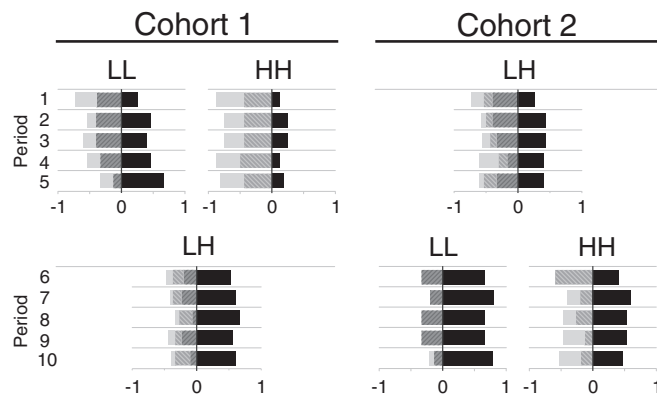
regardless of the choice of the other player. Contributing two tokens corresponds to “going it alone.”

This game has two pure-strategy Nash equilibria: Both contribute six tokens or both contribute two tokens. The former Pareto dominates, and hence we refer to it as the “efficient” or “cooperative” outcome, whereas the latter equilibrium is the inefficient outcome.

The high- and low-caste players never saw each other; they played in different locations. No subject knew the identity of the player with whom he was paired. A participant was told only that the other player in his pair was a high- (“General”) caste man in his village or a low- (“Scheduled”) caste man in his village. Each subject played the Stag Hunt using a plastic “game box.” The box was divided into bins that corresponded, for each round of the game, to the contributions by the player and his partner and to the player’s gross return on his investment. The plastic tokens represented rupees. A player indicated his contribution by literally moving tokens from his endowment into the contribution bin. Similarly, the experimenter put tokens into bins to communicate the partner’s move and the outcome of the round for the player. Thus, throughout the experiment, each subject had access to an explicit visual record of the history of play with his partner. A participant played the Stag Hunt for five periods with a high-caste man and for five periods with a low-caste man, with a separate game box for each five periods (*SI Appendix, Fig. S1*). We assigned the order to subjects randomly. Here we use the label “Stag” to refer to the action “contribute six tokens,” and the label “Hare” to refer to “contribute two tokens.” However, the experiment was explained to the participants in neutral language: invest six tokens or two tokens.

In the first period, most players played Stag, but the proportion was greater for low-caste than for high-caste participants: 68% for low caste, 53% for high-caste;  $P < 0.05$ . Considering the trends in pair outcomes over periods 1–5, there is a striking difference: The proportion of pairs consisting of two low-caste (henceforth LL) players at the efficient coordination equilibrium increased over periods 1–5 from 27% to 67% ( $P < 0.001$ ). In contrast, there was no statistically significant time trend in the proportion of high-caste (HH) or mixed-caste (LH) pairs at the efficient equilibrium (Fig. 2). At period 5, pluralities of both HH and LH pairs were in miscoordination or inefficient coordination. The findings for HH and LH pairs differ sharply from the finding in prior work with US university students that the frequency of efficient coordination increases over the first five periods and then stays at that high level.

In periods 6–10, LL pairs generally maintained the efficient, cooperative outcome: Between 67% and 80% of pairs played Stag/Stag in each period. In contrast, there was again no time trend in the proportion of HH pairs at the cooperative equilibrium. Note that the observations of no trend in cooperation in HH pairs for periods 1–5 and 6–10 are independent, since all



**Fig. 2.** Results of the Stag Hunt. An expansion of the black bars across periods suggests the emergence of the cooperative convention. An expansion of the white bars suggests the emergence of the noncooperative convention.

players who were in HH pairs in the first five periods were in LH pairs in the next five periods.

In period 6, 60% of HH pairs were in miscoordination. The percentage in the inefficient, noncooperative equilibrium rose from zero in period 6 to 33% in the last two periods. HH pairs that moved to the noncooperative equilibrium were generally moving from an outcome of coordination failure, since almost 90% of H players who reached the cooperative equilibrium continued to play Stag in the next period. Once the noncooperative equilibrium was reached, 74% of subjects in HH pairs continued to play Hare in the next period.

In the final period of a fixed pairing (periods 5 and 10), the proportion of pairs at the cooperative equilibrium was more than two times larger for LL than for HH pairs: 73% for LL, only 32% for HH, and 50% for LH pairs ( $P < 0.05$ ). Compared with HH pairs, LH pairs were more likely to be in the cooperative equilibrium, but, just as for HH pairs, they had no time trend toward greater cooperation. In the last period, the share of LH pairs was not significantly different from 50% ( $P < 0.05$ ).

To understand the pair outcomes, we need to unpack how individual behavior varied by caste. *SI Appendix, Table S1* shows, for all periods, the proportion of subjects who played Stag (column 1). Column 2 shows the proportions in the initial period of a pairing. Columns 3–6 show the proportions in all subsequent periods of a pairing conditional on the outcome in the preceding period. Thus, *SI Appendix, Table S1* considers just one period of the multiperiod history of pairings. *SI Appendix, Table S2* avoids this reductionism by showing the proportion of subjects playing Stag in periods 2 and 7 conditional on the outcome in the preceding period of the pairing. Both tables show that after reaching the cooperative equilibrium, roughly 90% of players in all pair types continued to play Stag in the next period (the range was 83–94%). We may say that a “convention” was under way in the sense of Lewis (1): Most players conformed to this equilibrium, and it was self-perpetuating.

For histories other than Stag/Stag, behavior differs substantially by caste. In *SI Appendix, Table S1*, the largest difference occurs after a player received the loser’s payoff, that is, after Stag/Hare. In the next period, 71% of low-caste players chose Stag compared with only 42% of high-caste players ( $P < 0.05$ ). The gap is even starker if one compares the single-caste pairs in *SI Appendix, Table S1*: 68% for LL and 32% for HH pairs. It is the only history after which the caste difference, shown in the seventh and eighth rows of *SI Appendix, Table S1*, is statistically significant.

High-caste men have greater average wealth, income, and education than low-caste men (*SI Appendix, Fig. S2 and Table S3*). In our sample, the 10th percentile of the high- and the low-caste men are landless or virtually landless. High-caste men in the 90th percentile of wealth own 15 acres, and those in the 95th percentile own 6 and 13 acres, respectively. Of the high-caste participants, 60% completed high school, compared with 30% of the low-caste participants. Many houses in the villages are one- or two-story brick houses, but the poorest households live in thatched mud huts. Inhabitants of mud huts make up 19% of high-caste and 63% of low-caste participants. Based on the 1997–1998 Survey of Living Conditions in Uttar Pradesh, land ownership, high school completion, and house type together explain 30–40% of the variation in consumption in both the high and low castes (32).

We use probit regressions to test whether differences by caste in the probability of playing Stag can be explained by controlling for wealth and education (Table 1). We also control for unobserved individual characteristics—differences in trust and prosociality—by including the player’s first-period action as a control variable. We call this variable a player’s “type.” The baseline case in the regressions in Table 1 is a player in an LL pair. There is a modest, marginally significant difference between low- and high-caste individuals in single-caste pairs in the initial period: High caste is associated with a 13.5-percentage point lower likelihood of playing Stag. By far the largest behavior difference between high and low castes occurs after a player receives the loser’s payoff: High caste is associated with a 36-percentage point lower likelihood of playing Stag in the subsequent period ( $P < 0.01$ ). Also, if we control for type, wealth proxies, and education, then high caste is associated with a 40-percentage point lower likelihood of playing Stag in the subsequent period ( $P < 0.01$ ). Differences after other one-period histories are insignificant ( $P > 0.1$ ).

In *SI Appendix, Table S4*, we report the same regressions as in Table 1 except that the baseline case is a low-caste player on average across LH and LL pairs, rather than a low-caste player in an LL pair. The results are similar. In all regressions, the coefficients on land holdings, high school completion, and housing type are individually and jointly insignificant.

The large and significant effect of caste on a player’s behavior after he gets the loser’s payoff also holds very strongly if we consider only periods 2 and 7 (*SI Appendix, Table S5*), and in this case there is also an impact of a player’s high-caste status after the other player gets the loser’s payoff. One reason might be that although the first player (who did not try to cooperate) would not feel slighted, he suspects that the other player does and will retaliate, which makes continuing to play Hare the best response.

The estimated effect of caste is robust when we run the regressions separately on inhabitants of thatched mud huts and inhabitants of houses made of some permanent materials and also when caste is interacted with nonmud house (*SI Appendix, Tables S6 and S7*). The impact of caste status is almost twice as large for inhabitants of mud huts: Compared with the baseline case of a player in an LL pair, a player in an HH pair is 72 percentage points less likely to play Stag after getting the loser’s payoff ( $P < 0.05$ ). For nonmud hut inhabitants, the impact is a reduction of only 38 percentage points ( $P < 0.05$ ). The larger absolute impact of caste status on inhabitants of mud huts suggests that being impoverished amplifies a high-caste man’s concern for his status, his perception of a loss as a slight, and his adherence to high-caste norms to retaliate against a slight.

For those who do not live in mud huts, there is also a large impact of caste (42 percentage points,  $P < 0.001$ ) on the probability of playing Stag after the event Hare/Stag, that is, after the other player gets the loser’s payoff. As noted above, this might occur

**Table 1. Probit regressions of the likelihood of playing Stag**

Dependent variable: probability of playing Stag (relative to a player in an LL pair)

Independent variable	If the outcome in the preceding period was									
	Initial period		Stag/Stag		Stag/Hare		Hare/Stag		Hare/Hare	
	1	2	3	4	5	6	7	8	9	10
HH	-0.135 (0.0735)	-0.135 (0.0890)	0.0194 (0.0466)	0.0303 (0.0385)	-0.364** (0.110)	-0.402** (0.115)	-0.192 (0.107)	-0.140 (0.123)	-0.233 (0.190)	-0.249 (0.189)
H in LH	-0.101 (0.102)	-0.0947 (0.108)	-0.000367 (0.0568)	0.00553 (0.0620)	-0.126 (0.129)	-0.173 (0.131)	-0.201* (0.0958)	-0.128 (0.129)	-0.0935 (0.217)	-0.110 (0.209)
L in LH	0.0530 (0.0882)	0.0984 (0.0973)	0.0247 (0.0365)	0.0116 (0.0387)	0.0431 (0.119)	0.0673 (0.117)	-0.191 (0.117)	-0.130 (0.130)	0.0320 (0.169)	0.00130 (0.160)
Type		0.356*** (0.0547)		0.0969* (0.0443)		-0.0176 (0.0647)		0.177 (0.120)		-0.107 (0.106)
Land		0.00592 (0.00405)		-0.00154 (0.00241)		0.00558 (0.00486)		-0.00187 (0.00653)		-0.00753 (0.00776)
High school		0.00595 (0.0799)		0.00246 (0.0407)		-0.0748 (0.0810)		-0.0434 (0.103)		-0.181 (0.122)
Nonmud house		0.0558 (0.0636)		0.0224 (0.0482)		0.0936 (0.0863)		0.0391 (0.100)		0.0492 (0.104)
N	242	242	452	452	181	181	181	181	154	154
Pseudo R <sup>2</sup>	0.017	0.101	0.002	0.030	0.082	0.091	0.019	0.036	0.042	0.078

\* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ . Marginal effects are reported, with clustered standard errors (SEs) in parentheses. Columns 1 and 2 show the initial period of fixed pairings. The remaining columns show periods 2–5 and 7–10 conditional on the outcome in the preceding period of the fixed pairing. The preceding period outcomes Stag/Stag, Stag/Hare, Hare/Stag, and Hare/Hare mean that the player chose the first option and the partner chose the second. Type = 1 if the player played Stag in period 1 and the period is greater than 1; otherwise, type = 0. Players were organized into fixed pairs in groups of four, such that individuals A, B, C, and D were assigned to pairs A;B and C;D for periods 1–5 and to pairs A;C and B;D for periods 6–10. SEs are clustered by these four sets of players.

because the participant predicts that the other player will retaliate, in which case the best response is to play Hare.

The high and low castes, which each make up 21% of the population of India (33), are constituted of many endogamous groups. Every participant in the Stag Hunt experiment except for one identified himself as a member of one of four groups, which we will call “subcastes.” Our regression results are robust when we control for subcaste instead of caste status (*SI Appendix, Table S8*). There are no significant differences between the two low-status subcastes or between the two high-status subcastes in the probability of playing Stag. However, a significant difference exists between each low-status and each high-status subcaste.

Thus, we find no evidence that covariates of caste—individual characteristics of wealth and education—explain the difference in behavior between high caste and low caste. On the other hand, the evidence is consistent with the hypothesis that cultural characteristics drive the caste gap in this behavior and specifically drive the difference in behavior after the loser’s payoff. In the next section, we further explore caste differences in attitudes toward punishment in settings that resemble the loser’s payoff.

**Study 2: Concern for Status and Honor.** Study 2 investigates cultural differences in responses to a loss when there is ambiguity in the motives of the person who inflicts the loss. The study was a vignette-based survey. In each vignette, a man named Dinesh is perceived to behave in a way that harms a man named Mahesh, who retaliates violently by beating him. (The names Dinesh and Mahesh are not associated with a caste.) In *SI Appendix, Table S9* column 1 summarizes the vignettes (*SI Appendix, Section B* presents them in full). The first vignette, V0, is the control, since here Dinesh unambiguously violates the law: He is a known thief who robs Mahesh’s house, and the police jail him. In vignettes V1–V3, Dinesh causes harms that are not unambiguous violations of law. In V4, the “harm” is marriage that violates the social norm of caste endogamy, which is one of the most deeply rooted caste norms. (We give the actors in the vignette high-caste last names when presenting V4 to high-caste responders and give the actors low-caste names when presenting the vignette

to low-caste responders.) In every vignette, the victim beats Dinesh in retaliation for the harm he has imposed.

In the survey, respondents were first asked whether they thought that the victim was justified in beating Dinesh. For the control vignette, the distribution of responses is not significantly different between high and low castes (*SI Appendix, Fig. S3*), which suggests they have in common a norm for responding violently when they suffer a loss from unambiguously illegal behavior. However, for V1–V4, substantially more high-caste than low-caste men thought violent punishment was justified (*SI Appendix, Fig. S4*). In V4, over 70% of high-caste respondents but only 22% of low-caste respondents said the violent response was justified. A one-sided  $t$  test rejects the null hypothesis that more low- than high-caste men thought that the beating was justified, with  $P < 0.05$  for V1–V2 and  $P < 0.001$  for V3–V4.

A respondent was presented with only two vignettes. After describing a vignette and asking him if he thought beating Dinesh was justified, there was an open-ended question: “What would you have done if you were the wronged party?” High-caste men were more likely than low-caste men to say they would respond aggressively, whereas low-caste men were more likely to think about how to deescalate a conflict and offer a conciliatory response. In the open-ended questions for V1–V3, 37% of high-caste men stated that they would do something aggressive, versus only 17% of low-caste men. For V4, the caste gap in responses was more extreme: 78% of high-caste men said they would respond with aggression, versus only 35% of low-caste men ( $P < 0.01$  for each vignette V1–V4). Examples of aggressive responses were

“I would do the same as Mahesh because I lost my honor.”

“I would do tit for tat; otherwise people will think I am weak.”

“I would do the same; it is wrong to cause a loss.”

“I would do the same as Mahesh because a mistake is a mistake.”

Examples of nonaggressive responses were

“I would talk and find an agreement.”

“I would deal with it peacefully.”

“I would do nothing, tolerate it.”

“I would forgive.”

Individuals responded most emotionally to the last vignette, which was about intercaste marriage. This is a socially prohibited act in rural North India. All subcastes in a region are ranked. Marriage of a woman from a higher-ranked subcaste to a man of a lower-ranked subcaste impairs the honor of the higher-ranked subcaste; in North India, the offense is frequently avenged by honor killings of the bride and groom (34). In their open-ended responses to this vignette, 57% of high-caste respondents mentioned *izzat*, roughly translated as “male honor,” compared with only 27% of low-caste respondents. Only one respondent to a vignette other than V4 mentioned *izzat*.

To assess whether concerns for male honor as in *izzat*—as distinct from concerns for status, property, money, or respect—are greater for high- than for low-caste men, we constructed a variable for the difference in an individual’s responses to two categories of vignettes (V4 compared with V1, V2, or V3). There was a significant caste difference in this variable. Compared with a low-caste man, a high-caste man was 21 percentage points more likely to say that a violent response to intercaste marriage was justified than to say that a violent response to property damage or harassment was justified [ $b = 0.21$ ,  $SE\ b = 0.08$ ;  $t(148) = 2.59$ ,  $P = 0.02$ ]. Concern with honor as opposed to status has the consequence that it can lead an individual to retaliate against a loss no matter how small the loss and no matter why it occurred. The anthropologist Mandelbaum (35) writes that although honor is hard-earned, it “has to be continually reaffirmed in practice, reinforced in action, defended against challenge, and rewon and advanced in competition.” A reputation for honor may be believed to deter others from threatening one’s property, which is useful in the absence of strong legal institutions, historically the situation in India.

Caste differences in concern for status and in concern for honor are both potential explanations for the caste differences in behavior in the Stag Hunt. High-caste players may construe the loser’s payoff as a harm to which they should retaliate. The only way to retaliate is to play Hare, denying the other player the potential benefits of cooperation. In contrast, low-caste players may construe the loser’s payoff as the outcome of a misunderstanding. To overcome it, they continue to play Stag. Even if they view the loser’s payoff as a harm that arose knowingly from another person’s action, they may not wish to retaliate, just as in the survey very few low-caste men wanted to beat up a man who had dug a canal through their field.

We constructed a simple model (36) that shows that frequent retaliation in response to the loser’s payoff makes the cooperative convention unsustainable. To sustain a convention, individuals must expect that others will follow it. The expectations are shaped largely by precedent: Cooperative play in the past creates the expectation of cooperative play in the future. The expectation of future conformity is a reason to go on conforming, since to conform is to achieve an outcome that satisfies one’s own preferences. Regardless of the strength of that expectation, individuals will occasionally violate the convention by mistake or because of extreme circumstances, resulting in coordination failure. Miscoordination events may by themselves have a small impact on expectations of future behavior and thus may not lead to a breakdown of the efficient convention. However, retaliatory responses to miscoordination will magnify the destabilizing effect on beliefs about future behavior. As the convention becomes weaker, miscoordination becomes more likely, which leads to further retaliation. Learning by precedent eventually slows down as individuals place smaller and smaller weight on new observations of the other player’s behavior. Our model shows that if a player places sufficiently high value on

punishing the other player in the period after he gets the loser’s payoff, the efficient convention is unsustainable.

**Comparison with Earlier Ethnographic Evidence on Caste and with Experimental Evidence on Aversion to Negative Inequality.** Based on field evidence in rural Uttar Pradesh, Chowdhry (37) characterizes high-caste concern with male honor (*izzat*) this way: “Possession and control of land, money, and women are associated with *izzat* . . . . If a male needs to inflict violence to safeguard these ‘possessions’ or his honor, it is not only accepted, it is valorized . . . . In the ideal of hegemonic masculinity, there is disallowance of all transgressions . . . [a] defining characteristic of masculinity . . . has been the concept of revenge . . . . [M]en who are seen as being recalcitrant in defending their ‘honor’ through violence in the face of those who defile it are condemned as effeminate. A popular saying is ‘[he] is wearing bangles,’ which is to say that such men are ‘women’ and not ‘men.’ The Dalits are not considered men at all by upper caste men.”

Even the marginalized sections of the high castes “claim to share the masculine attributes of their higher-class members” (37). Anxiety about their fall from their ancestors’ high-wealth class may explain why the probability of playing Stag after the loser’s payoff is 33 percentage points lower, other things being equal, among high-caste players who live in mud huts than among high-caste players who do not:  $-71.5$  percentage points for those who live in mud huts compared to  $-38.4$  percentage points for those who do not (*SI Appendix, Table S6*).

As children, high-caste males are taught to retaliate against slights. In a popular TV show in India, high-caste men in the audience shared being taught in childhood to avenge an insult by other children ([www.satyamevjayate.in](http://www.satyamevjayate.in)). On the TV show, one man described his mother telling him after he had come home hurt from a fight that he would get no dinner until he beat up the boys who had hurt him.

The high castes in India view caste identity as something that is fixed by birth: In Hindu teachings, one’s caste identity is a consequence of good (for the high caste) or bad (for the low caste) acts committed in earlier lives. High-caste individuals expect other high-caste individuals, but not low-caste individuals, to act morally and they devalue them in status if they do not; this is an example of a “black sheep effect” (34). This effect sheds light on the difference between the responses of high-caste men to the loser’s payoff in HH and LH pairs. After receiving the loser’s payoff, a high-caste player whose partner is high caste may feel that the partner has not upheld the moral norms that high-caste individuals are expected to observe. Table 1, in which the baseline category is an LL pair, shows that in the period after getting the loser’s payoff, a high-caste player is 40 percentage points less likely to play Stag if his partner is also high caste ( $P < 0.01$ ) but is only 17 percentage points less likely to play Stag if his partner is low caste ( $P > 0.05$ ).

Although a growing number of low-caste villagers have accumulated wealth, they continue to be reminded of their low ritual status. In a well-known case in 2003, a Dalit killed a high-caste boy for sexually harassing Dalit girls. High-caste men retaliated by burning down the homes of Dalits in the village (37).

In cultures in which status is linked to honor—defined as the unwillingness to accept a slight without revenge—revenge is common. A proverb in the tribal Pukhtoon society in Afghanistan and Pakistan is that “He is not a Pukhtoon who does not give a blow in return for a pinch” (38). Although they comprise less than one-third of the white population of the United States, men and women from the South commit about half of all lovers-triangle murders and argument-related homicides in the United States (39). When insulted, white Southern males, but not white Northern males, have surges of cortisol and testosterone (40). Many white US Southerners are descendants of herdsmen from Anglo-Scot borderlands who had a strong culture of honor. Homicide is

higher in the counties of the US South with higher proportions of people of Scots-Irish ancestry, and the positive relationship is confined to violence related to a self-protective ethic (41).

Results of a survey of two male prisons in India are consistent with the hypothesis that retaliation is more important for high-caste men than for low-caste men. High-caste men had committed 84% of the murders and 61% of the assaults but only 26% of the thefts (42).

When a player earns the loser's payoff in the Stag Hunt, his net payoff for the period is lower than the other player's. Therefore, it is relevant to examine experiments that have examined social norms about relative payoffs. In India, Mani (43) finds that if a husband in the experiment receives a smaller share of the payoffs to the couple than his wife, he will often choose to reduce the couple's payoffs (and thus his own payoff) to deny his wife a modest one-time monetary gain. Controlling for participants' income, education, and family size, Mani finds that this behavior is least prevalent among the low castes and the tribal populations.

The binary-choice dictator games in Fehr et al. (44) shed light on the aversion of men in India to receiving a payoff that is less than that of the men with whom they are paired in the game. The experiment formed anonymous pairs of high-caste men and anonymous pairs of low-caste men. The protocol made it transparent that no one (including the experimenter) could learn the choice made by any individual player. The findings were that the high-caste men in the dictator role were very averse to getting a payoff lower than that of the men with whom they were paired. High-caste men in the dictator role valued the recipients' payoffs highly and significantly negatively, while the low-caste men in the dictator role valued the recipients' payoffs weakly positively.

**Studies 3 and 4. Testing Alternative Hypotheses.** Study 3 considers whether a caste difference in trust can explain the caste difference in cooperation in the Stag Hunt. We implemented a binary version of the trust game in 2007. Two players were anonymously paired. Each was given an initial endowment of 50 rupees (equivalent to the daily unskilled wage). One player (the principal) had a binary choice: to invest all or none of the 50 rupees. If he chose to invest, the other player (the agent) received a total of 200 rupees. Then the agent made a binary choice: to send back to the principal 100 rupees or nothing. If subjects were completely self-interested, the agent would seize the entire 200 rupees, and the unique equilibrium would be that the principal invests nothing. A positive investment is an indication that the principal trusts the agent to pay a return. To ensure anonymity within pairs, we drew the players in a given pairing from different villages. Our results were that there were no significant differences across types of pairs in the proportion of principals who invested. The proportion of principals who invested was insignificantly higher for HH pairs (80%) than for the other types of pairs (*SI Appendix, Fig. S5*). We asked the principals: Do you believe that the agent will send you back 100 rupees if you invest? There were no significant differences in principals' beliefs by the caste status of the principal or the agent.

Study 4 tests for caste differences in self-efficacy. The subjects were presented with four statements that took positions on different aspects of one's locus of control, e.g., "I have no trouble making and keeping friends." The respondents were asked if they felt that the statements described them. *SI Appendix, Table S10* reports the statements and the proportion of men who answered "yes" or "no" to the question whether the statements described them. Some gave equivocal answers or were unable to respond. Not only did the responses not vary significantly by caste, but the point estimates indicate that, if anything, low-caste men have greater locus of control than high-caste men. For example, the second row of *SI Appendix, Table S10* shows that 84% of low-caste men disagreed with the statement that they had a hard time finding others to help them, compared with 77% of high-caste men.

## Discussion and Conclusion

The main finding of this paper is that, contrary to earlier work with subjects in US universities, it is not a human universal that the efficient and cooperative convention will typically emerge in interactions between two people in situations in which there is a coincidence of interests. The cooperative convention did not emerge in most high-caste pairs of men in our experiment in North India, whereas it did emerge in most pairs of low-caste men. [By starting with very small groups, entrants who are aware of the group's history can be added to create efficiently coordinated large groups (4).] The largest divide between the behavior of the high-caste and low-caste players occurred after a player incurred a loss (the loser's payoff) in a coordination failure. A high-caste man was much less likely than a low-caste man to continue to try to cooperate in the period after he incurred the loss. Our leading hypothesis is that the high-caste player was slighted by the noncooperative behavior of the other player or felt injured by getting a lower payoff than the other player and that this feeling spurred him to retaliate. We found no basis for several alternative explanations, including wealth, education, trust, and self-efficacy. The poor ability of high-caste men to coordinate efficiently is consistent with pervasive inefficient coordination that has been observed in Uttar Pradesh, a polity that has been characterized as suffering from "social and political inertia" (5).

It is increasingly recognized that culture influences conceptualization, reasoning, and decision making. A well-known example is that subjects in Western, educated, industrial, rich, and developed (WEIRD) societies and subjects in non-WEIRD societies have different perceptions, judgments, and behavior (45). This paper presents evidence of the effects of culture on economic behavior in a different context—forming a convention to cooperate. Based on experiments with US university students, it was believed that in repeated coordination games of common interest, a fixed pair was almost assured to form the efficient convention. This paper is evidence that culture can impede or even block the emergence of an efficient cooperative convention and sheds light on how to overcome the impediments.

## Methods

### Study 1.

**Participants.** In 2006, we recruited 122 male subjects in the block Bakshi Ka Talab in the district of Lucknow. In each of 10 villages, we recruited an equal number (generally six) of high-caste and low-caste subjects using systematic sampling that covered the entire village. As an example, if the village had only one low-caste hamlet and if 30 households resided there, every fifth household would be selected. The villages we selected were those where we had done previous work. After explaining to a household that we were using a game to study how people behave, we asked if one man in the household would volunteer to take part in the game, in which he would earn money. In every selected household, a person volunteered.

**Procedure.** The same team of experimenters handled all sessions, and the same team leader explained the game to all participants. Most team members were students at Lucknow University. At the beginning of each session, the team leader explained the game first in one site and then in the other site. Each site had only high-caste or only low-caste participants. Every subject was assigned his own personal monitor who stayed with him until the experiment was over. The monitor reviewed the rules of the game with the subject and tested his understanding. Two subjects did not understand the game and were dismissed. To ensure full information on the history of play in a fixed pairing, each monitor gave his subject a game box in period 1 and a second game box in period 6 (*SI Appendix, Fig. S1*). A subject was not allowed to talk to anyone except his monitor for the duration of the experiment. After the 10th period, players received their payoffs in private and in cash. Each session lasted about 4 h. Mean earnings were 77 rupees, ~150% of the unskilled daily wage. In postplay interviews, the subjects were asked about their landholdings, education, and type of housing.

### Study 2.

**Participants.** The survey was conducted in 22 hamlets in the same area in which we had conducted the Stag Hunt experiment. We recruited 121 high-caste

men and 120 low-caste men in the same way we had recruited subjects for the Stag Hunt experiment. Respondents were drawn from the same block and district near Lucknow. Half of the hamlets sampled for the survey are also represented in the Stag Hunt sample.

**Procedure.** The design follows a format developed by social psychologists for measuring moral attitudes (28). Subjects were presented with vignettes. To prevent cross-contamination in the response and to leave to last the vignette on intercaste marriage, which upset some respondents, we asked each respondent about only one of the vignettes V0–V3 and then asked about V4 (on intercaste marriage). We used two versions of the vignette: For high-caste respondents, Dinesh Bania marries Mahesh Thakur's daughter; Bania and Thakur are both high caste, but Thakur is slightly higher status. For low-caste respondents, Bania and Thakur were changed to the low castes Pasi and Chamar, respectively, with Pasi being slightly higher in status.

In the difference-in-differences regression, the dependent variable is the difference in response to the question "Was the action justified?" (1, 0) between V4 and the other vignette (V1, V2, or V3) about which the respondent was asked. Regression includes a constant term. SEs are clustered at the village level. We have one observation per respondent because a respondent had at most two responses—one in V4 and at most one in V1 or V2 or V3. We omit responses to V0.

### Study 3.

**Participants.** We recruited subjects for the role of principal and agent from two nonoverlapping sets of villages in central Uttar Pradesh randomly chosen from all villages within a 2.5-h drive from Unnao. Informants in each village told us the neighborhoods in which the different castes in the village lived. In public places in the neighborhoods, the recruiters asked individuals if they were interested in participating in an experiment about decision making that would last 2 h and in which they would earn some money. We recruited five or six subjects for a single treatment from a given village. No subjects were from the same household. No subject participated in more than one treatment. Age ranged from 24 to 50 y. The numbers of pairs were 26 LL, 34 LH, 30 HH, and 30 HL.

**Procedure.** To ensure that subjects understood the instructions, the rules of the game were explained to them at great length. Subjects who did not pass a basic test of comprehension did not go on to participate in the game. Individual sessions were held inside a Toyota Qualis car with experimenter and

subject facing each other across a table that supported a game board. Each subject made his decision in private in the car while the experimenter waited outside. A player indicated his choice by moving coins on the game board.

### Study 4.

**Participants.** We selected participants from seven of the villages in which we had conducted the Stag Hunt experiment and recruited them in the same way that we had recruited subjects for the Stag Hunt experiment. We conducted the survey in 2013 involving 62 men, 30 high-caste and 32 low-caste.

**Procedure.** We employed a survey design from the psychology literature (46). A caveat is that the survey has been validated in the United States but has not been validated in the study setting. Therefore, in interpreting findings from the survey, one must keep in mind that they may be affected by the bias that comes from applying questions that are validated for subjects in WEIRD societies to subjects in a non-WEIRD society.

**Ethics Statement.** The World Bank does not have an ethics committee to review research proposals, nor does it use an internal review board. However, the Bank reviews all research by its staff as part of the funding process. The Bank does not require signed agreement statements by subjects, and it would not be practical in our case since some are illiterate and only one-third of the low-caste subjects have a high school (10th grade) education. We obtained oral consent from all participants. We explained to all participants that our studies were about social behavior in villages. All participants in our experiments were told that they were free to leave at any time. We recruited all participants with the help of research assistants. In most villages, we hired one or two local people who knew the village well to help us. We obtained personal information about the participants only in the Stag Hunt experiment and told the participants that no personal information about them would be shared with anyone except the research team.

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