

# WHY ARE SOCIAL INEQUALITIES SO DURABLE?

## An Experimental Test of the Effects of Indian Caste on Performance

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Abstract. If discrimination against an historically oppressed social group is dismantled, will the group forge ahead? This paper presents experimental evidence that a history of social and legal disabilities may have persistent effects through its impact on expectations. We ran eight experimental treatments employing 642 junior high school student volunteers in village India. When the subjects' social identity (caste) was announced, low-caste but not high-caste individuals performed much worse under a variety of economic incentives, compared with a control group whose caste identity was not announced. When a non-human factor (a random draw) was introduced that in part determined rewards, the caste gap disappeared. The experimental results suggest that when caste identity is public information, low-caste subjects anticipate that their effort will be poorly rewarded.

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Economists have increasingly recognized the importance of expectations for behavior. Expectations, not just fundamentals, can drive outcomes. But the role of expectations has been studied primarily in settings where a change in expectations is incorporated into prices in a single market, or induces a recession or boom. The role of expectations has not been widely explored with respect to issues of inequality and, in particular, the consequences of inequality when people transact. It is not that economists do not recognize the importance of expectations in this context, but that they have not yet devised a way to observe them. Experimental methods may provide a way of doing so. In this paper, we experimentally test the hypothesis that when an individual's social identity is made public, but not otherwise, individuals will respond differently to economic incentives depending on their social group: members of historically oppressed groups will fear being treated prejudicially, and their mistrust will undermine motivation. Because in many countries large segments of the population—defined by race, ethnicity, gender, or caste—were until recently denied due process, it is of great social and economic concern whether a history of second-class citizenship, and personal experience of discrimination in some domains, dampen individuals' responses to economic incentives.

In Uttar Pradesh, India, we run a controlled experiment where groups of six junior high school boys—three from a traditional Untouchable caste and three from high castes—perform the task of solving mazes. We manipulate the salience of caste in two ways:

- (1) *Announcement of caste*: The Experimenter announces, in some groups but not others, each participant's name, village, father's and grandfather's names, and caste.

- (2) *Segregation*: We segregate some experimental groups by caste. The segregation is common knowledge because the Experimenter announces caste as in (1).

We find no significant caste differences in performance exist when caste identity is not announced. But low- and high-caste individuals adapt very differently to the announcement of caste and to segregation by caste. When caste is announced, low-caste subjects underperform high-caste subjects under a variety of incentive structures, and caste segregation deepens the effect. The announcement of caste depresses the performance of low-caste participants in all treatments where rewards depend solely on absolute or relative performance. The effects are large: the announcement of caste reduces average payoffs by 42 percent for the low caste.

One possible explanation is that the announcement of caste triggers a loss of self-confidence. To examine this hypothesis, we use an experimental treatment where individuals, having become familiar with one level of difficulty of mazes, are given the opportunity to choose a higher or lower level, at correspondingly higher or lower piece rates. A large psychological literature finds a link between self-confidence and the difficulty of task that individuals choose (Dweck and Leggett 1988). But in this treatment, low-caste participants show no less self-confidence than high-caste participants.

Another possible explanation is that the announcement of caste, by communicating that the Experimenter knows and is concerned with the caste identity of participants, induces the low caste to anticipate that they would be judged prejudicially. A rational response would be for the low caste to expend less effort. To investigate this hypothesis, we introduce a non-human factor in the assignment of payoffs: one of the six participants in a group is chosen randomly at the end of the experiment and paid a high piece rate for each

maze he has solved; the other participants receive nothing. If belief in Experimenter bias causes the decline in average performance of the low caste when caste is announced, then introducing a neutral factor (a random draw) to determine who shall receive a reward should attenuate this effect. We find that the effect is not only attenuated but fully offset.

The caste system in India can be described as a highly stratified social hierarchy, in which largely endogamous groups of individuals are invested with different social status and social meaning. A representative statement is Gupta (2000, p. 19): “Though there is no way by which those in a caste society can actually distinguish unfailling natural markers of difference, yet they justify caste stratification on the ground that different castes are built of *different natural substances*” (emphasis added). The caste system is only one of many examples all over the world where, historically, social practices that created extreme inequality across groups defined e.g. by race, gender, or ethnicity, were attributed not to society but to nature or divinity.<sup>1</sup> Laws on the books can be changed with the stroke of a pen, but ideas about nature or divinity are not so easily changed. The central hypothesis that this paper examines is that long after the entitlements of dominant social groups to special privileges have been formally abolished—or the conditions that gave rise to those entitlements have changed—the expectations and social meanings that historical conditions created may remain and perpetuate inequality. Loury (2002) develops a related argument in *The Anatomy of Racial Inequality*, in which he argues that the ideological legacy of slavery in the United

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<sup>1</sup> Two examples are illustrative: The US Supreme Court (1857) characterized African-Americans as “an inferior class of beings,” and wrote in 1873 in a case upholding women’s exclusion from the legal profession that it is “divine ordinance, as well as the nature of things” that bars women from pursuing careers independent of their husbands’: “This is the law of the Creator. And the rules of civil society must be *adapted* to the general constitution of things.” [83 US 130 (1873), cited in Sunstein, 1995, p. 336, emphasis added].

States stigmatizes Blacks and that stigma is a major factor in the persistence of Black-White inequality. As Loury, North (1990), Rao and Walton (2003), and others have argued, formal institutions are crude instruments of change because their effect depends on their interaction with informal institutions (culture).<sup>2</sup> A contribution of this paper is to establish evidence of a mechanism whereby historical differences across social groups in treatment influence present responses to economic incentives.<sup>3</sup>

As we wish to better understand how the caste system affects the behavior of individuals and how the system has persisted over time, we begin with a brief discussion of the institution before turning to the experimental design and the results.

## I. A Short Background on the Caste System

The Indian term for caste, *jati*, specifies a group of people having a specific social rank, claiming a common origin, and linked to one or more traditional occupations. Caste is hereditary and members of a caste typically practice endogamy. The caste system is made up of four distinct social classes (*varnas*) arranged in hierarchical order.<sup>4,5</sup>

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<sup>2</sup> Engerman and Sokoloff (1997, 2002), Acemoglu, Johnson and Robinson (2002), and Banerjee and Iyer (2002) provide striking new evidence that historical institutions that denied large segments of the population opportunities for economic advancement have long, lingering consequences. In explaining the reasons for “institutional overhang,” these scholars have emphasized the effect of past institutions on current opportunities. Our paper suggests that an additional mechanism depends on expectations.

<sup>3</sup> We do not survey earlier, limited experimental work on the effect of status on earnings because a survey is in Ball *et al.* (2001). Their paper presents an experiment in which status characteristics affect earnings, but the causal mechanism is entirely different from that considered here. The mechanism in Ball *et al.* is a *preference* for trading with a higher-status individual and not, as here, an *expectation* that low-status persons will be treated unfairly.

<sup>4</sup> There are hundreds of *jatis* or endogamous groups in each linguistic area of India, which can be characterized as belonging to one of these four or five groups (also referred to in English by the word “caste”).

<sup>5</sup> The earliest expressions of caste can be found in India’s ancient religious scriptures known as the Vedas, which are thought to have been compiled between 1500 BC and 1000 BC. The first of the four Vedas is the Rig Veda, which contains a hymn about the first man created, Purusa, who is sacrificed in order to give rise to the four *varnas* (castes): “The *Brahmin* was his mouth, his two arms were made the ruler [*Kshatriya* or *Thakur*, king and warrior], his two thighs the *Vaishya*, from his feet the *Shudra* [servant class] was born.”

Brahmins (priests), Kshatriyas or Thakurs (rulers and warriors), Vaishyas (traders), Shudras (servile laborers). There is a fifth group, the Untouchables (also known as 'dalits'), who were in the classical Hindu view of society considered too lowly to be counted within the class system. The traditional occupations of Untouchable castes such as waste removal, tanning, and scavenging caused higher caste Hindus to despise them socially and view them as polluting and thus “untouchable.”

The legal scholar Galanter (1984, p. 15) catalogs the disabilities that were typically imposed on Untouchables up through the period of British colonialism: denial or restriction of access to temples and public facilities such as wells used by upper castes, schools, courts, roads, and post offices; exclusion from most profitable employment and relegation to menial occupations; liability to unremunerated labor for higher castes; residential segregation requiring them to live outside the village; and restrictions on life style—*e.g.* use of footwear and bicycles was prohibited in many areas. *Manu Smriti*, an Indian text written probably around the 3<sup>rd</sup> century AD,<sup>6</sup> describes the social stations of various castes. In one place, it states: “But the dwellings of the Untouchables shall be outside the village; And dogs and donkeys should be their wealth.” In another place, it states: “A Brahmin may confidently seize the goods of a Shudra; for the Shudra can have no property, his master may take his possessions.” And in another, “No collection of wealth must be made by a Shudra, even though he be able to do it; for a Shudra who has acquired wealth, gives pain to the Brahmin.”<sup>7</sup>

With independence, India adopted a constitution (in 1950) that stripped upper castes of all privileges under the law and established reservations for the so-called

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<sup>6</sup> MacDonnell, 1962.

<sup>7</sup> *Manu Smriti*, Ch. X, Verse 51; Ch. 8, verse 417; Ch.10, verse 129. Translations in *The Laws of Manu* (1991) and Ambedkar (1946, p. 39).

Scheduled Castes—former Untouchables and Shudras—in government and the universities. Caste restrictions are followed much less strictly in India today than a few decades ago. However, the social hierarchy of the caste system remains a visible part of the society, especially in rural India. Marrying outside one’s caste is still rare. In rural North India (the setting of this study), it is common to find the Untouchable castes living in a separate quarter on the outskirts of the village. In a household survey carried out near the site of our experiment, 56 percent of Scheduled Caste men report that they sit on the ground or remain standing when visiting an upper caste household. Likewise, 58 percent of upper caste men say that when a Scheduled Caste person visits their houses, he sits on the ground or remains standing.

## **II. Experimental Design**

The objective of the experiment is to determine whether increasing the salience of caste changes the ability or propensity of the low-caste subjects to respond to economic incentives. Gneezy, Niederle, and Rustichini (2003) showed that mazes are an appropriate task to assign to study different incentive schemes.<sup>8</sup> Our experimental design builds on their work.

### **A The task**

Participants in the experiment were asked to solve mazes in two 15-minute rounds. The only skill required is the ability to look forward to detect dead ends. In each of the two rounds, the subject received a packet of 15 mazes to solve.<sup>9</sup> The number of mazes solved in each round are the primary dependent variables. The advantages of having

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<sup>8</sup> Summarizing their results, Gneezy *et al.* (p. 9) stated, “Men do not simply solve mazes for fun, independently of the incentive scheme at hand, solving mazes appears to require real, costly effort.”

<sup>9</sup> The mazes can be found at <http://games.yahoo.com/games/maze.html>. We used mazes of level 2, where 1 = easy and 5 = difficult. The mazes were enlarged to fit A-4 paper.

subjects participate in two rounds are that in addition to across-subject comparisons, we can make within-subject comparisons of effort levels, which have more statistical power; and we obtain a better measure of effort because we observe the effect of learning over the two rounds. The potential for learning is large, as 87 percent of the subjects had never seen mazes before.<sup>10</sup>

## **B The methods**

The site of the experiment was a village in central Uttar Pradesh, India. Running an experiment in a village of a poor country presents certain challenges, which influenced the experimental design. First, because literacy rates are low, even among students,<sup>11</sup> Experimenters gave instructions verbally. Because classrooms have no furniture, subjects solved mazes on paper copies pinned to clipboards. The experiment was almost double-blind—the Experimenters (except Pandey) did not know the hypotheses of the study, and the grader of the mazes did not know the caste of the subjects.

A second challenge was finding representative subjects who would feel comfortable in a classroom setting. We chose as subjects 6<sup>th</sup>- and 7<sup>th</sup>-graders. In a household survey conducted in a village near the site of the experiment, we found that 100 percent of children of the lowest caste (Chamar) age 11-12 were in school; whereas the fraction of rural children attending high school in Uttar Pradesh according to the National Sample survey (1995-96) is 59 percent.<sup>12</sup> Ambady *et al.* (2001) provide experimental evidence that children internalize cultural beliefs and stereotypes at an early age.

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<sup>10</sup> As reported in individual, post-play interviews with an experimenter not involved in the maze game.

<sup>11</sup> In a post-play literacy test, 40 percent of the low-caste subjects and 28 percent of high-caste obtained a zero out of a possible score of three on a test of the ability to recognize very simple words.

<sup>12</sup> The fraction of low-caste children attending high school in Uttar Pradesh would be lower than 59 percent.

But it was easier to recruit subjects than it would have been in a developed country.<sup>13</sup> We recruited boys from the lowest caste, Chamar<sup>14</sup>, and the three highest castes: Thakur, Brahmin, and Vaishya respectively constitute 70, 24, and 6 percent of the high-caste subjects.

At the very beginning of the game instructions (included in the Appendix), the Experimenter gave participants the show-up fee of 10 rupees (one-fourth of the daily unskilled wage) to drive home the fact that the children were playing for money. She illustrated how to solve a maze by first solving a trivially easy maze on a large wall poster with an erasable surface, and then solving on a second large wall poster a maze of the same difficulty level as the ones used in the experiment. The Experimenter allowed participants five minutes to solve one practice maze. She explained the reward system just before Round 1 and again before Round 2. As a check, she asked each child a question about the reward system using a hypothetical example of scores. She did not proceed until the child had answered a question correctly.

The performance and earnings of each participant were revealed only to him. As soon as the mazes from an experimental session were graded (normally within two hours), the earnings were distributed in sealed envelopes to the participants, who were asked not to open them until they returned home. To promote trust, participants received a piece of fruit on entering the room of the experiment, a “consolation prize” of two

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<sup>13</sup> Throughout most of the period of the experiment, schools were closed. To recruit children, we visited homes each evening to ask parents' permission to pick up their children the next day to drive them to the nearby junior high school that served as the site of the experiment. We told the parents that participants would be paid for showing up and additional rewards depending on performance. We stated that our purpose was to study children in India. In only a few instances, parents refused to let their children participate, and the reason was that their neighbor was angry that we had not paid him money for driving his child to the junior high school instead of letting us transport the child.

<sup>14</sup>Chamars are the principal caste of Untouchables in the survey area. Current censuses of India distinguish only very broad caste groups. In the 1971 census, the population of Untouchables in Uttar Pradesh was 19 million, of whom 10 million were Chamars.

rupees if they solved no mazes, and full awards to all winners who tied in a tournament.<sup>15</sup>

The rewards for solving mazes were ‘real money’: not counting the show-up fee, the top performers earned 2.5 times the daily unskilled wage in a session that lasted about one hour; average earnings were slightly less than one-half the daily wage.

### **C The experimental treatments**

The focus of the experiment is the way individuals adapt when they know that the Experimenter knows, and is concerned with, their caste membership. In one condition, the Experimenter called out each subject’s name, village, father’s and grandfather’s names, and caste. In the control condition, no announcement was made; subjects could presume that the Experimenter was not aware of their caste.<sup>16</sup> Subjects were also likely not to know the caste identity of the other subjects in their group, since we drew subjects from several different villages. In post-play interviews, low- and high-caste subjects, respectively, reported knowing on average 1.40 and 1.47 of the other five in the group.

Table 1 describes the treatments used in the experiment. Besides the announcement of caste, we also varied the incentive systems across treatments. As discussed above, a subject in each treatment solved mazes in two 15-minute rounds. The incentive system might change across rounds, but when subjects played Round 1, they did not know that the reward condition might change in Round 2. All but one of the treatments used, in the first round, a piece rate incentive scheme of one rupee (2 US cents) per maze. The incentive scheme of Round 2 varied across treatments. Names of

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<sup>15</sup> Our assistants maintained a peaceful atmosphere in the school courtyard where children waited to participate in the experiment or to be paid. Parents of the children were free to wait there, too. Our assistants distributed box lunches at midday.

<sup>16</sup> In India, Untouchables are generally not distinguishable by any physical markings from the rest of the population, but in a given locality untouchables might readily be identified. At the site of the experiment, we believe that the appearance of 11- and 12- year old boys does not reveal caste except in particular cases where a child’s clothing and grooming (either very poor or very good) may reveal it.

the treatments generally correspond to the Round 2-incentive scheme.<sup>17</sup> A subject's earnings were the sum of the payoffs in Rounds 1 and 2 and the show-up fee.

The third independent variable in the experiment was the caste composition of the group. In all treatments, the groups consisted of six boys. A group included three high-caste and three low-caste boys in every treatment except Single Caste, where subjects in a group were drawn exclusively from the low caste or from the high castes.

We conducted the experiment in January and March 2003, using the same staff and site. We replicated each treatment conducted in January ten times with different participants;<sup>18</sup> in March we replicated each treatment at least six times.<sup>19</sup> On each day, children were randomly assigned to treatments.<sup>20</sup> Overall, we report 107 sessions with 642 participants.

### III. Results When Caste is Not Announced

The treatments where the Experimenter does not announce caste serve as a point of comparison for many of the treatments and so merit our attention first. We consider first a treatment that uses a piece rate incentive in both rounds. Then we consider a treatment that uses a piece rate incentive in Round 1, and a tournament incentive in Round 2. We describe these two treatments below.

**Piece Rate Treatment.** Participants participate in two identical rounds. At the beginning of the first round, and again at the beginning of the second round, participants are told that their rewards consist of 1 rupee for every maze they solve.

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<sup>17</sup> The exceptions are treatments 5 and 8.

<sup>18</sup> We inadvertently conducted one extra treatment of Single Caste.

<sup>19</sup> The weather was much colder in January and classrooms are unheated. To check for bias arising from differences in experimental conditions between months, we use the  $p$ -value of the Mann-Whitney test for rounds in January and March with identical reward and information conditions: Round 1 of Piece Rate with Names, Random Winner, Choice, and Mixed Tournament with Names. The  $p$  value is .95, and so we report the pooled results. Using the same method, we also find no significant Experimenter bias.

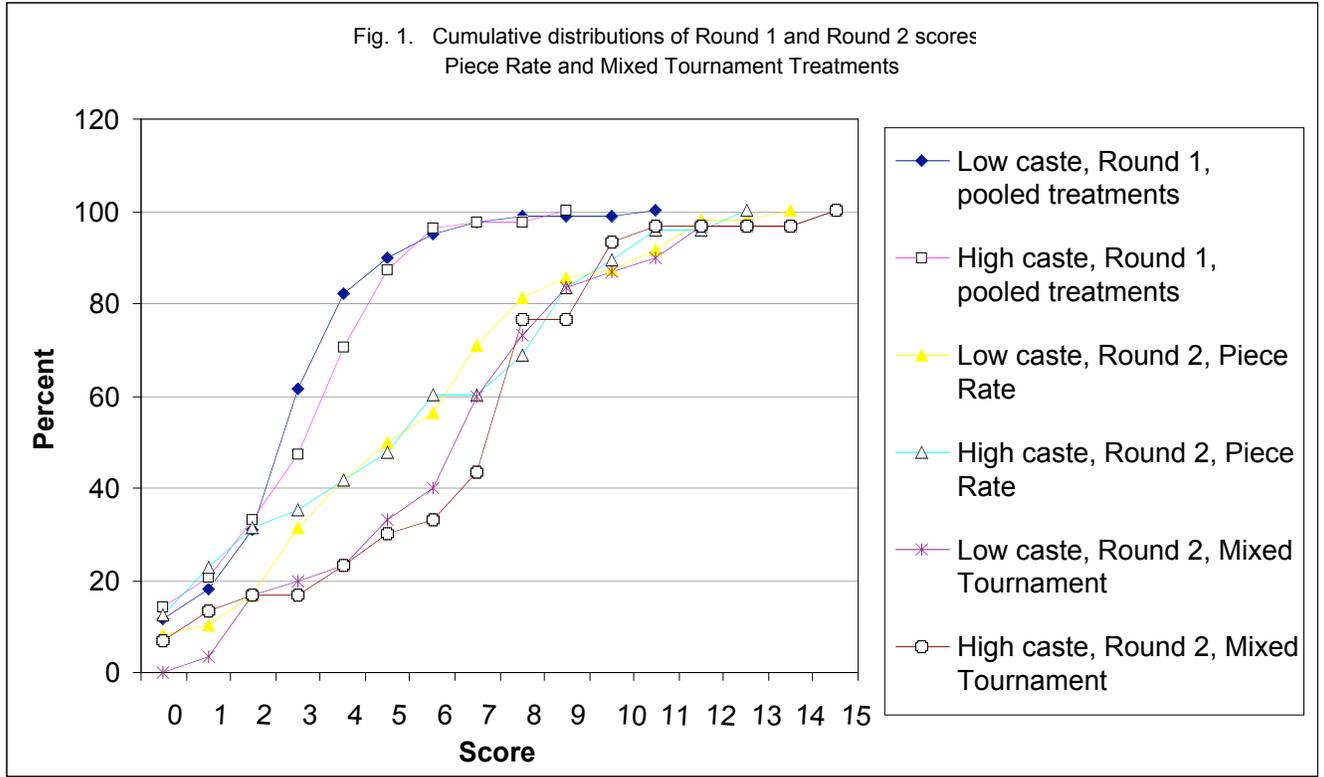
<sup>20</sup> On each day children were recruited from a different but overlapping set of villages. In the working paper version of our paper (Hoff and Pandey 2003, Table A-4), we report a robustness check for differences in samples across days. Our results are robust.

**Mixed Tournament.** In the first round, participants are told that their rewards consist of 1 rupee for every maze they solve. In the second round, participants are told that only the participant who solves the most mazes will be paid 6 rupees for every maze he solves. The other participants in the group will not receive any payment for their performance in the second round.

As can be seen from Figure 1 and Table 2, caste is irrelevant to performance in the treatments where caste is not announced. Under each set of conditions—Round 1 piece rate, Round 2 piece rate, and Round 2 tournament—the cumulative distribution functions for low and high caste track each other closely. The distributions for low- and high-caste scores are not significantly different using the two-sided Mann-Whitney  $U$ -test.<sup>21</sup> In the Piece Rate treatment, the  $p$ -values are .45, .86, and .33, respectively, for Rounds 1 and 2 and for individual improvement across rounds, denoted by  $\Delta$  = Round 2 score – Round 1 score. In the Mixed Tournament treatment, the comparable  $p$ -values each exceed .50.

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<sup>21</sup> Except where otherwise indicated, throughout the paper distributions are compared by using the  $p$ -value of the two-sided Mann-Whitney  $U$ -test.



As Figure 1 shows, scores improve markedly between rounds. The average improvement between Rounds 1 and 2 of the Piece Rate treatment is more than one standard deviation of the Round 1 score: the proportionate increase is 89 percent for low caste and 74 percent for high caste. Since few (13 percent) of subjects had seen mazes before, it is not surprising that the learning effect is large.

A comparison of the cumulative distributions of scores under the piece rate and tournament incentives shows the effect of competition. If we assume that subjects believe they are *ex ante* equally likely to win, then the tournament provides the same expected return per maze as the piece rate incentive, but effort should increase because it determines the probability of winning. The improvement in mean performance between Round 2 piece rate and Round 2 tournament was 23 percent for the low caste (*p*-values of the one-sided Mann-Whitney test are .09 for Round 2 and .15 for  $\square$ ). The improvement

in mean performance was 19 percent for the high caste ( $p$ -value .11 for Round 2 and .05 for  $\square$ ).

These results are encouraging because they show that the subjects were motivated by the incentives to solve mazes, were capable of achieving large improvements in maze-solving skill between rounds, and were responsive to the higher incentives for effort provided by the tournament scheme. Furthermore, the irrelevance of caste to performance when caste is not announced suggests factors that do *not* produce differences in performance. Low- and high-caste subjects have very different backgrounds. Only 14 percent of low-caste subjects have a mother with at least primary schooling and 42 percent have a father with at least primary schooling, whereas the comparable figures for high-caste subjects are 42 percent and 80 percent. But the difference in parents' education is not reflected in a caste gap in performance.<sup>22</sup> In general, a history of developmental disadvantage leads to patterns of capacities and dispositions that can perpetuate inequalities, but the maze game appears to be unrelated to differences between low and high castes in prior familial or group-based educational experience.

#### **IV. The Effect of the Announcement of Caste**

To investigate whether announcing a participant's social identity (caste) changes his performance, we consider two new treatments in which everything is the same as in the Piece Rate and Mixed Tournament treatments except that personal information about the six participants in a group is announced. At the beginning of the session the

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<sup>22</sup>This result tallies with our finding in regression equations that mother's and father's education are not significant predictors of performance in the maze game, controlling for caste and other individual variables (see our working paper, Tables A-5 - A-11).

Experimenter turns to each participant and states his name, village, father's and grandfather's names, and caste; and asks him to nod if the information is correct. The Experimenter uses the traditional name, Chamar, for the low caste. This name is still in widespread use in the area in which we conducted the experiment. The name Chamar is recorded in the schools' enrollment books. Villagers, including children, commonly refer to a village person by the traditional name for his caste: a Chamar caste person is referred to as Chamar and a Thakur caste person as Thakur.

### A. Piece Rate

Figure 2 and Table 3 show that for the *low* caste, the announcement of caste is debilitating. The treatment effect of the announcement of caste is to shift back the cumulative distribution of Round 2 scores for the low caste in Figure 2. On average, low-caste scores fall by 14 percent, 25 percent, and 39 percent, in Rounds 1 and 2 and  $\square$  ( $p$ -values .29, .04, and .01, respectively).

For the *high* caste, the announcement improves performance, but not significantly ( $p$ -values are .83, .44, and .44, respectively, for Rounds 1, 2, and  $\square$ ).

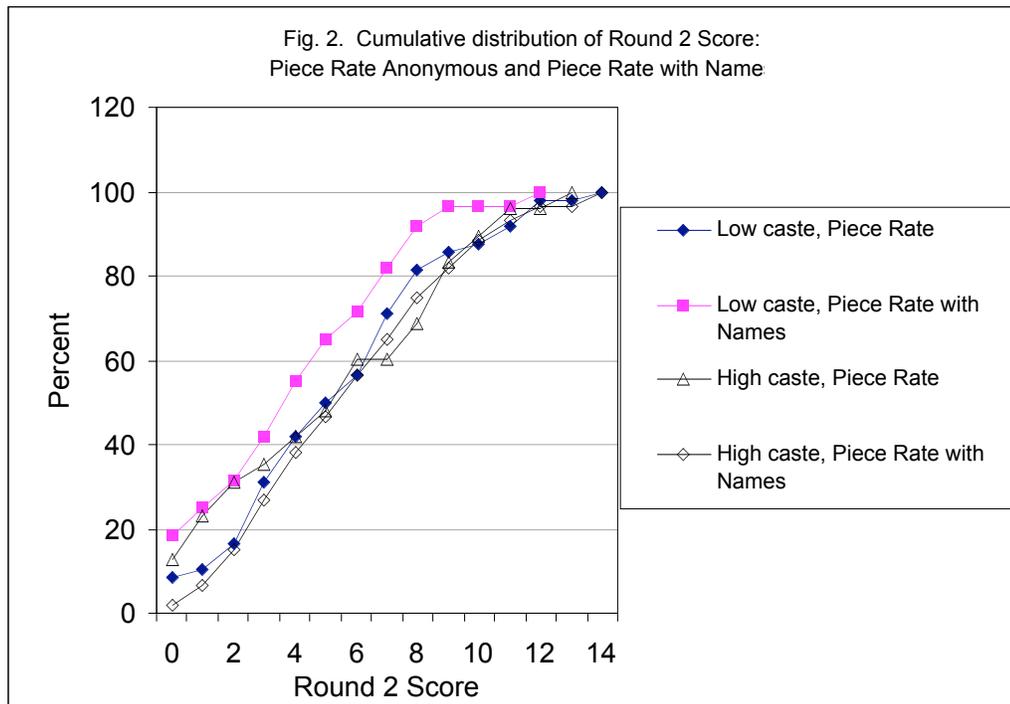
The difference between the way low and high castes adapt to the announcement of caste creates a significant caste gap in Piece Rate with Names ( $p$ -values are .04, .006, and .03 for Rounds 1 and 2 and  $\square$ , respectively).<sup>23</sup> The caste gap in mean performance in Round 2 is 1.83 mazes (average performance is 4.28 mazes for the low caste and 6.11 mazes for the high caste), compared to -0.2 mazes when caste is not announced (average

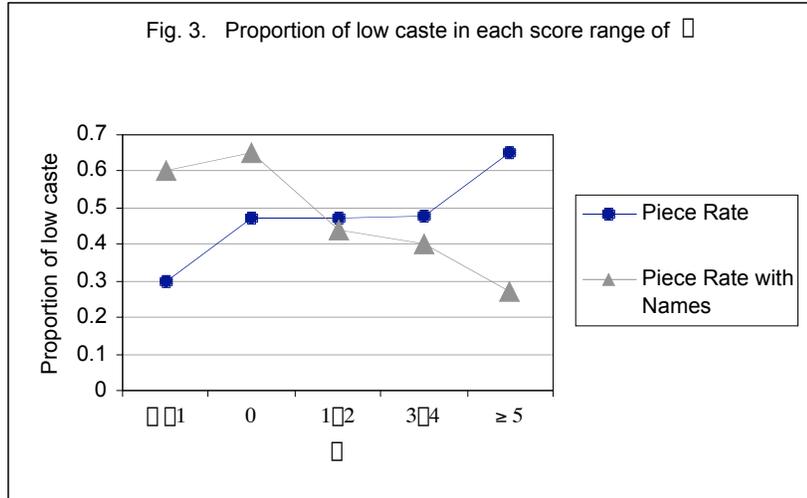
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<sup>23</sup> Because the first round of all but one of our experimental treatments use the piece rate incentive and mixed caste groups, we pool those results to obtain another check on the effect of the announcement of caste under the piece rate scheme. As shown in last four columns of Table 3, the  $p$ -value of the test that compares performance by caste in piece rate (no-names) is .34, and in piece rate with names is .15. Thus the same basic pattern emerges in the pooled data and the unpooled data, but the caste gap is not significant for the pooled Round 1 data of piece rate with names. This is not surprising since the treatment effect on low-caste performance of moving from Piece Rate to Piece Rate with Names is not significant in Round 1.

performance of 5.72 mazes for the low caste and 5.54 mazes for the high caste) .

Underlying the caste gap is the marked effect of the announcement of caste on low-caste subjects' learning scores (□). Figure 3 shows the fraction of low-caste subjects among all participants whose performance improved or worsened by a given amount between rounds. Among participants whose scores worsened in the second round (□ □ -1), the fraction of the low caste was 30 percent in the control condition, but 60 percent when caste names were announced. Among subjects whose scores improved by 5 mazes or more, the fraction of low-caste subjects was 65 percent in the control condition, but 27 percent when caste names were announced. Thus, the treatment effect is to shift weight in the top tail of the distribution of learning scores from low- to high-caste subjects, and to shift weight in the bottom tail from high- to low-caste subjects.





The debilitating effect on the low caste of the announcement of caste is not due to a momentary shock, since the drop in their scores is significant only in the second round. The larger effect in Round 2 and  $\square$ , compared to Round 1, might be accounted for by two factors. First, because the mazes are difficult, much of the variation in Round 1 may be random variation:<sup>24</sup> the low-caste subjects could be affected, but all the scores are so low that there is not enough variation in Round 1 relative to random variation to detect systematic differences by caste. Second, higher effort should have a payoff in greater learning about how to solve a maze, which would naturally tend to be concentrated in Round 2. Both of these factors suggest that systematic behavioral differences across caste will be more salient in Round 2. Because of this and because the experimental conditions in most treatments vary only in Round 2, for many of the comparisons made, the Round 2-score and  $\square$  are used.

The experimental results show that social groups with demonstrably similar ability to perform under piece rate incentives nonetheless perform very differently if

<sup>24</sup> The 11- to 12-year-old subjects in our experiment were asked to solve the same level of mazes as the engineering students in Israel who were the subjects in the experiment of Gneezy *et al.* (2003). In the five-minute practice period of each experimental session, few subjects succeeded in solving the practice maze.

social identity is announced. We emphasize that if some or all subjects believe that their caste is observable, our results would only be more striking, as in that case what drives the change in behavior is increasing the salience of caste to the subjects, rather than making what had been private information, public information.

## **B. Tournaments**

We next consider the effect of the announcement of social identity when the incentive scheme is a tournament. As shown in Table 4, for the *low*-caste, the effect of announcing caste lowered mean performance by 30 percent and 46 percent, respectively, in Round 2 and  $\square$  ( $p=.009$  and  $.007$ ). The decline in performance is similar in percentage terms to the fall that occurred under the piece rate incentive (25 percent and 39 percent). The low caste performs slightly better, but not significantly so, in the tournament with names compared to piece rate with names: the  $p$ -value of the one-sided Mann-Whitney test is  $.23$  and  $.33$ , respectively, for Round 2 and  $\square$ .

For the *high*-caste subjects, the announcement of caste under the mixed tournament incentive lowered average performance. A conjectural explanation for the fall in high-caste performance is that a high-caste subject, knowing that he is strategically interacting with Untouchables, might expend less effort because he believes that it is easy to win against low-caste competitors, and so the marginal return to effort is reduced. Alternatively, he might disengage in disgust. Mean high-caste performance fell by 20 percent (1.37 mazes) in Round 2 and by 36 percent (1.15 mazes) in  $\square$  ( $p = .04$  for Round 2 and  $.03$  for  $\square$ —see Table 4).<sup>25</sup> High caste perform worse (though not significantly so)

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<sup>25</sup> In contrast, under the piece rate incentive scheme, the announcement of caste had no significant effect on high caste performance. This is true not only when we compare each round of Piece Rate (no names) with Piece Rate with Names, as shown in Table 3, but also when we compare Round 1 of Mixed Tournament

in the mixed tournament with names compared to piece rate with names: mean Round 2 score falls by 11 percent (Tables 3 and 4). The decrement to performance from announcing caste in the mixed tournament more than fully offsets the boost to performance that would otherwise be obtained from the tournament incentive.

There is no significant caste gap in performance under the mixed tournament incentive with names ( $p = .26$  and  $.66$ , respectively, for Round 2 and  $\square$ ). The fall in *low*-caste performance caused by the announcement of caste names is similar in magnitude to the fall in *high*-caste performance from the *interaction* of the announcement of caste names with the mixed tournament incentive.<sup>26</sup>

A way of summarizing the main results so far is to express them in terms of payoffs. We use as a measure the difference between the sum of average earnings in Rounds 1 and 2 in the no-announcement and announcement conditions, divided by average earnings in the announcement condition. This measure is an attempt to answer the question, *If social identity did not affect behavior, what would be the effect on average earnings?* Comparing Piece Rate with Names to Piece Rate, the percentage loss is 29 percent for the low caste and -9 percent for the high caste (that is, the high caste

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(no names), which uses piece rates, with Round 1 of Mixed Tournament with Names ( $p$ -value  $.49$ ), or, pooling all treatments that use the piece rate incentive in Round 1 ( $p$ -value  $.47$ —see Table 3, column 7).<sup>26</sup> Different forces seem to be driving the lack of response by each caste to the tournament incentive scheme in Round 2 of Mixed Tournament with Names. For the low caste, it appears to be poor learning that hampers the ability to compete in Round 2, whereas for the high caste, it is the non-response to competition *per se*. To test that interpretation, we ran the two rounds of Mixed Tournament with Names in reverse order. In the “Reverse Order” treatment, Round 1 uses the tournament scheme, and Round 2 uses the 1-rupee-per-maze incentive scheme. If we compare Round 1 of Reverse Order with Round 1 of Piece Rate with Names, the only difference in experimental conditions is the use of the tournament incentive in the former and the piece rate in the latter; and we find that the low caste perform significantly better in Round 1 of Reverse Order, whereas high-caste performance does not significantly change. Thus, the low caste respond to tournament incentives but the high caste do not (when caste in mixed caste groups is announced). If we compare Round 1 of Reverse Order with Round 2 of Mixed Tournament with Names, the only difference in experimental conditions is the presence of a learning effect in the latter; and we find low-caste performance does not significantly change, whereas high-caste performance significantly improves. (Table A-1 of our working paper reports the game data and statistical tests for Reverse Order.)

*gain*). Comparing Mixed Tournament with Names to Mixed Tournament, the percentage loss is 49 percent for low caste and -5 percent for high caste.<sup>27</sup> Combining these four treatments, the announcement of caste reduces average payoffs by 42 percent for the low caste and -6.5 percent for the high caste.

The next section will investigate why low and high castes adapt differently to the announcement of caste.

## **V. Why does the announcement of caste affect behavior?**

The announcement of caste could change the behavior of low-caste individuals through at least three channels: loss of trust that effort will be rewarded, loss of self-confidence, and direct effects on individuals' intrinsic valuation of performing well. We will try to disentangle these effects.

### **A. Low-caste expectations**

One possible explanation why low-caste performance falls when caste is announced is that knowing that the experimenter knows and is concerned with their caste, the low caste may expect that the promised incentive payments will not be fairly awarded. If the low-caste subjects believe—based on the lessons of history, personal experience, and the ongoing reality of village life—that the reward system is biased against them, the announcement of caste could be a cue that causes them to project onto this new situation those existing attitudes. Mistrust undermines motivation. The low caste could be thinking, *The reward system will be biased against me, so why try?*

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<sup>27</sup> In the Mixed Tournament, the Round 2 average payoff for each caste is computed conditioning on the probability of a low- or high-caste person winning the tournament.

This hypothesis predicts that a change in the reward scheme that introduces a demonstrably objective, non-human factor into the assignment of payoffs will improve the performance of the low caste but not of the high caste. To test this, we consider a new experimental treatment in which, in Round 2, one randomly chosen subject in the group is paid at the rate of 6 rupees per maze; the others receive nothing.

**Random Winner.** At the beginning of the session, the experimenter announces the name, village, father's and grandfather's names, and caste of each participant. In the first round, participants are told that their rewards are 1 rupee for every maze they solve. In the second round, participants are told that only one of them (though they do not know which one) will be paid 6 rupees per maze that he solves. This participant would be chosen at random at the end of the experiment, and other participants in the group would not receive any payment for the mazes they solved in Round 2. Explaining the concept of randomness was facilitated by the use of slips of paper on which each participant wrote his name, and from which the experimenter's assistant showed how one name would be chosen one after Round 2 was over.

Thus, the expected payoffs in Round 2 of Random Winner and in Piece Rate with Names are identical, but now a random draw determines who will receive the reward of 6 rupees per maze.

Figure 5 and Table 5 compare three treatments: Piece Rate, Piece Rate with Names, and Random Winner. The figure shows that the Random Winner reward scheme more than fully closes the caste gap that emerged in Piece Rate with Names (where the low caste underperformed the high-caste by an average of 30 percent in Round 2 and the gap was highly significant— $p$ -value .006). As measured by learning scores ( $\square$ ), the treatment effect reverses the caste difference at a level that is nearly significant: the  $p$ -value is .11 for  $\square$ .<sup>28</sup> The solid (respectively dotted) lines in the figure represent

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<sup>28</sup> It is possible that this result reflects lower risk aversion by the low caste than the high caste. But two facts militate against that explanation. The first is that low-caste participants are poorer than high caste, with average household landownership less than 40 percent of the level of the high-caste participants. See Table A-5 of the working paper version of the paper. The second is that a large difference in risk aversion

statistically significant (insignificant) treatment effects as measured by the  $p$ -values.<sup>29</sup>

We next consider whether we have a significant treatment effect for each caste, *i.e.*, a significant change in performance between the Piece Rate with Names incentive and the Random Winner incentive. For the low caste, the treatment effect is significant ( $p$ -value .07 for Round 2 and .05 for  $\square$ ). The average  $\square$ -score is 57 percent higher in Random Winner than in Piece Rate with Names. It is striking that the Random Winner treatment effect appears to *override* the effect of the announcement of names, for no significant difference in low-caste performance exists between Piece Rate (no names) and Random Winner ( $p$ -value .90 for Round 2 and .85 for  $\square$ ).

The high caste adapts very differently to the Random Winner treatment: No significant differences exist in their performance among the three treatments—Random Winner, Piece Rate with Names, and Piece Rate. Further, average high-caste performance in Random Winner is lower than that in Piece Rate with Names and Piece Rate, although not significantly.<sup>30</sup>

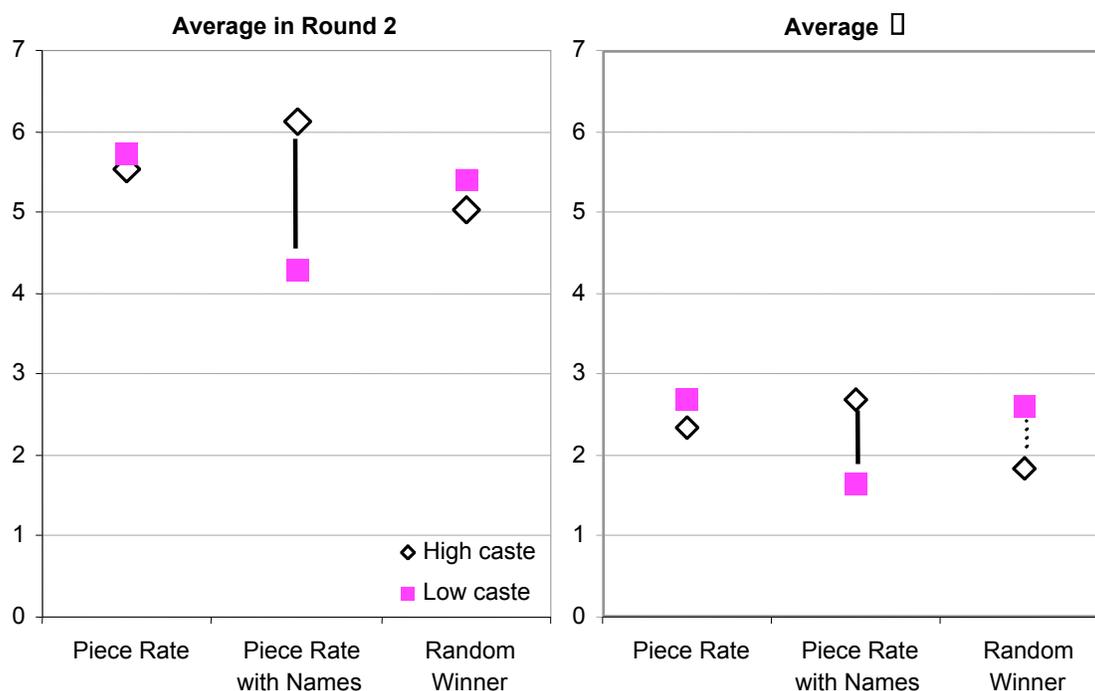
**Fig. 5. Average performance in Piece Rate, Piece Rate with Names, and Random Winner.** The announcement of caste under the piece rate incentive creates a caste gap, which the Random Winner incentive reverses.

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across castes would be expected to create a caste gap in the Mixed Tournament treatments, but no such gap exists.

<sup>29</sup> Nothing changes when we measure statistical significance by the  $t$ -test, which assumes normality, instead of by the Mann-Whitney test, which is non-parametric. The  $p$ -values for the caste gap based on a  $t$ -test of mean comparison (for high and low castes) are as follows. In Piece Rate (no-names),  $p$ -values are .80 and .51 for Round 2 and  $\square$  respectively. In Piece Rate with Names,  $p$ -values are .003 and .02 for Round 2 and  $\square$  respectively. In Random Winner,  $p$ -values are .61 and .15 for a *reverse* caste gap for Round 2 and  $\square$ , respectively.

<sup>30</sup> Comparing the performance of high-caste subjects in Random Winner and Piece Rate with Names, the  $p$ -value is .25 for Round 2, and .15 for  $\square$ .



A possible explanation for these results is that individuals adapt according to how they expect to be treated. When social identity is public, behavioral differences are induced among innately equal individuals whom historical processes have partitioned into categories and hierarchized, with those at the bottom denied opportunities for economic and social advancement.<sup>31</sup> The effect is offset if a non-human agent plays a

<sup>31</sup> A basic distinction emphasized in Cohen and Steele (2002) is between mistrust in *oneself* when social identity is salient, and mistrust in the procedural fairness of *others* when social identity is public. Given that the content of the stereotype of a low-caste person is that he is *unworthy* of high economic rewards, this experiment cannot distinguish between these two kinds of mistrust. In particular, we cannot reject the view that the Random Winner treatment, compared to Piece Rate with Names, improves low-caste performance because the even-handed way that the names of low- and high-caste subjects are tossed into the jar from which the winner's name is to be chosen, changes the *self-image* of a low-caste participant from that of a socially unworthy person to that of a worthy person.

Ideally one would like to undertake this experiment among Hindus living in a community without a recent history or current experience of oppressing Untouchables, and with Experimenters who were themselves Untouchables. (Being educated Indian women, the Experimenters in the present study would have been recognizably high caste.) In this context, if the announcement of caste had no effect on performance, that would provide some evidence that distrust of authority figures, and not an internalized social identity of unworthiness in the eyes of authority figures, caused the performance differential we

role in allocating the rewards to effort.<sup>32</sup>

## B. Self-confidence

A second possible explanation why low-caste performance falls when caste is announced is that increasing the salience of a social identity whose worth is generally impugned lowers the self-confidence of the low-caste relative to the high-caste subjects. A reliable result in the psychology literature is that increasing the salience of a social identity associated with a negative stereotype hurts self-confidence and performance in the domain of the stereotype (Steele, Spencer, and Aronson 2002), while activating a social identity associated with a positive stereotype improves performance (Shih, Pittinsky, and Ambady, 1999, Ambady *et al.* 2001). Thus, the joint hypothesis of “stereotype susceptibility” and correspondence between caste hierarchy and stereotyped ability ranking predicts that the announcement of caste would significantly raise *high*-caste performance. But this did not happen. Under the piece rate incentive, the treatment effect was insignificant (the  $p$ -value more than .40 for Rounds 1 and 2 and □; Table 3). Under the mixed tournament incentive, the treatment effect was significant and *negative* ( $p$ -value .04; Table 4).

This joint hypothesis would also predict that the announcement of caste depresses the self-confidence of the low caste relative to that of the high caste. In the treatment we

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observed when caste was announced. But this distinction relates to mental processes that are beyond the scope of the present study, in which we tested whether the announcement of caste causes low-caste subjects to anticipate that their efforts will not be rewarded.

<sup>32</sup>The rational actor model could apply consciously or otherwise. The conjecture that the model applies consciously would predict that the announcement of caste affects the *persistence* of effort as measured by the number of mazes that subjects attempt. For the four treatments conducted in March—Piece Rate, Piece Rate with Names, Mixed Tournament, and Mixed Tournament with Names—we have data on the highest number of maze that a subject solved per round. The announcement of caste does not significantly affect this measure of persistence—both for low and high castes; see Table A-3 of our working paper. This is not surprising, since the related literature on “stereotype threat” does not generally find evidence that stereotype threat reduces effort but only that it reduces outcomes (Steele *et al.* 2002, 397).

next describe, we try to measure whether the high and low castes feel differentially competent in solving mazes. We measure whether low- and high-caste subjects make different decisions when they are given the choice of the difficulty level at which they will perform the task.

**Choice** At the beginning of this treatment, the experimenter announces the name, village, father's and grandfather's names, and caste of each participant. In the first round, participants are told that their rewards are 1 rupee for every maze solved. In the second round, participants are asked to choose the level of difficulty of the mazes. They are told that their choice will be secret and that the piece rate reward will be higher, the higher the level of difficulty, as follows: easier than before (0 rs.), same level of difficulty as before (1 rs.), bit harder (2 rs.), hard (3 rs.), hardest (4 rs.).

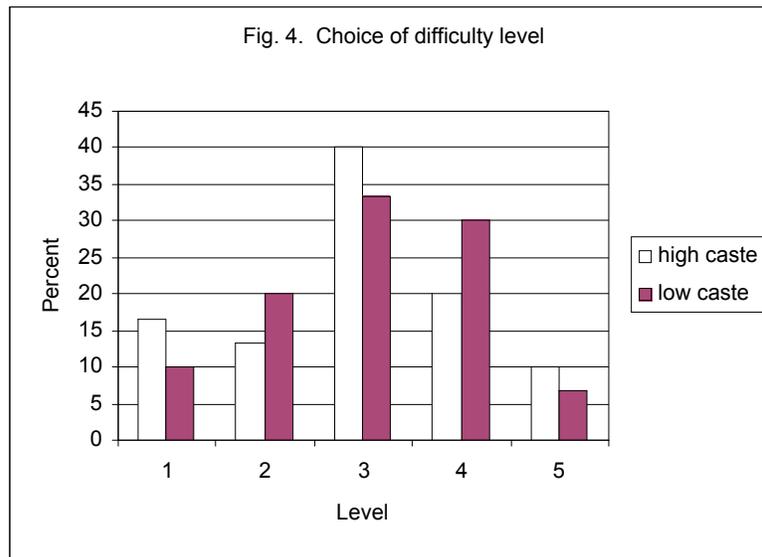
An individual's optimal choice is increasing in his assessment of his ability,<sup>33</sup> and depends as well on his estimate of the actual difficulty of each level and on his aversion to risk and ambiguity. Because low-caste subjects have lower academic achievement than high-caste subjects (as measured by a post-play test) and also come from households with lower education levels, we might expect the low caste to have a lower assessment of their ability even if caste has no independent effect on self-confidence. If risk aversion is decreasing in wealth, and low- and high-caste individuals have the same preferences, then we would again expect low-caste individuals to choose a lower level of difficulty. We find, however, that low-caste participants showed no less self-confidence than high-caste participants.

Figure 4 shows the results. There is no significant difference by caste in the

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<sup>33</sup> The link between feelings of competence and task choice is demonstrated in psychology experiments; see Dweck and Leggett 1988. It is easy to demonstrate such a relationship theoretically in the particular case of risk neutrality. Let  $\phi(g, e)$  capture an individual's beliefs about his productivity at solving mazes of a given grade and payoff level  $g$  and effort  $e$ , where higher self-confidence means that  $\phi$  falls less steeply as the grade increases. Then a risk-neutral subject will maximize the product  $g\phi(g, e)$  and choose a higher level of difficulty, the less steeply  $\phi$  falls with respect to  $g$ .

choices made ( $p$ -value .73).



When we control for individual and family background variables —the participant’s previous exposure to mazes and mother’s and father’s education and occupation—then the choices of the level of difficulty made by the low caste exceed (although not significantly) the choices made by the high caste.<sup>34</sup> The results from the regression are encouraging because they suggest that choice is a good test of self-confidence: Mother’s schooling, father’s schooling and previous exposure to mazes, each have a positive and significant effect on the difficulty level of maze chosen. In our sample, there is thus no support for the idea that the factor driving the behavioral changes for low-caste participants is that making caste public lowers their self-confidence.

The beliefs underlying the caste system shed light on our results. The classical Hindu religious texts justified the oppression of Untouchables by the theory of *karma* and rebirth, where “the moral balance of an individual’s actions in previous lives is manifested in the station into which he is reborn” (Galanter 1984, p. 11; Gupta, 2000, pp.

<sup>34</sup> Regression results are reported in Table A-2 of our working paper.

2-3). The Untouchables are stereotyped as impure and unworthy, not unintelligent.

### C. History

The announcement of caste did not, either explicitly or implicitly, raise the issue of the symbolic meaning of caste. If expectations drive the change in low-caste behavior, then a treatment that implicitly refers to the historical meaning of caste should exacerbate the decline in low-caste performance caused by the announcement of caste. We consider a final treatment that implicitly raises the stigma of untouchability by the way that subjects in the experiment are grouped. In this treatment, called Single Caste, the experimental conditions are the same as in Mixed Tournament with Names, except that the group is composed of six individuals drawn only from the low caste or only from the high castes.

Segregation deepens the effect on the low caste of the announcement of caste. Consider first the caste gap. Figure 6 and Table 6 show the caste gap under the three tournament treatments. When caste is not announced, there is no caste gap ( $p$ -value .72). The caste gap opens slightly (.71 mazes) but is not significant when caste is announced ( $p$ -value .26). The gap widens (to 1.8 mazes) and becomes significant when castes are segregated ( $p$ -value .02)<sup>35</sup>

The treatment effect from segregation on the low caste is highly significant. Comparing Single Caste and Mixed Tournament (No-Names), the  $p$ -value is .0009, .0000, and .0002 for Rounds 1 and 2 and □, respectively. Comparing Single Caste and Mixed Tournament with Names, the  $p$ -value is .01, .02 and .06 for Rounds 1 and 2 and □,

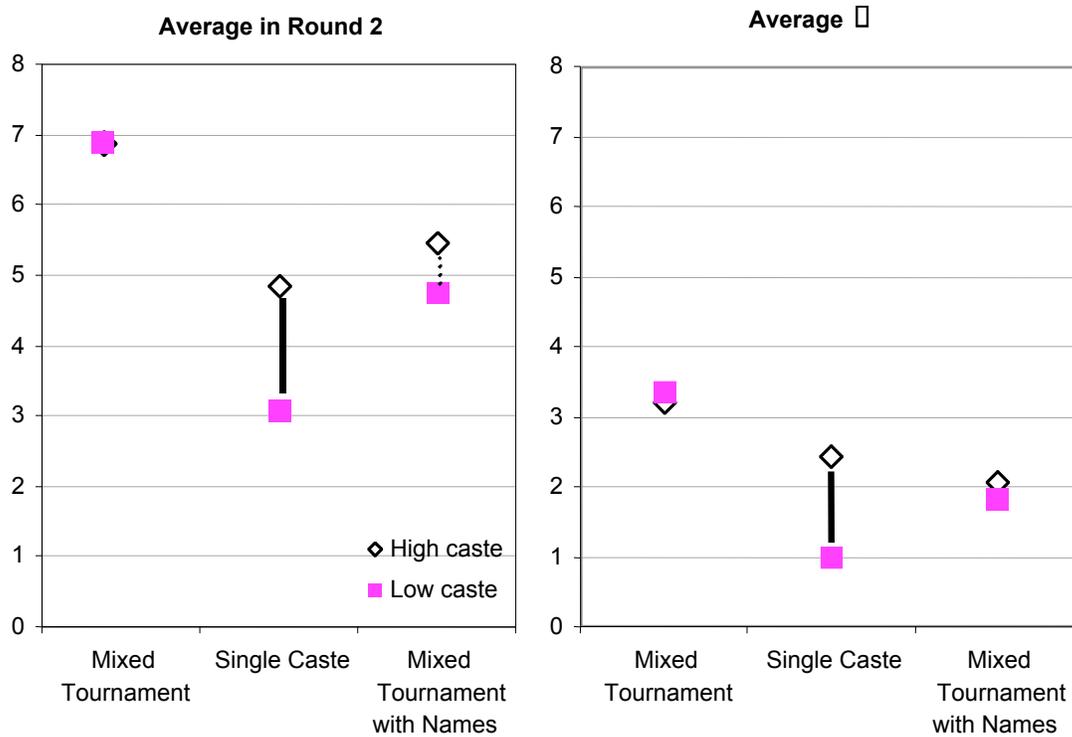
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<sup>35</sup> The statistical significance (or insignificance) of the caste gap is robust using the  $t$ -test, which assumes normality, instead of the non-parametric Mann-Whitney tests. The  $p$ -values for the caste gap based on a  $t$ -test of mean comparison (for high and low castes) are as follows. In Mixed Tournament (no-names),  $p$ -values are .97 and .79 for Round 2 and □ respectively. In Single Caste,  $p$ -values are .01 and .005 for Round 2 and □ respectively. In Mixed Tournament with Names,  $p$ -values are .24 and .59 for Round 2 and □, respectively.

respectively.

Segregating subjects by caste does not explicitly convey information, but rather implicitly refers to the historical treatment of Untouchables, who were not allowed to sit in a classroom in proximity with the upper castes, since even the nearness of Untouchables was deemed to be polluting. We conjecture that the separation of high and low castes influences expectations because expectations depend on the social meanings that context conveys.<sup>36</sup> We consider the treatment effect of segregation on the high caste below.

**Fig. 6. Average performance in Mixed Tournament, Mixed Tournament with Names, and Single Caste.** Segregation creates a significant caste gap in performance.



<sup>36</sup> The effect of framing on economic behavior is central to the work of Kahneman and Tversky (2000).

#### **D. High-caste expectations and social norms**

An irony uncovered by this experiment is that making caste identity public not only hurts the low caste a great deal, but also hurts high-caste performance on balance. This is consistent with the notion that the announcement of caste causes a shift to expectations of payoffs that are partly exogenous—that depend on social identity rather than effort. While the low caste subjects may expect that they will be judged prejudicially, the high caste may expect to obtain a high return despite low effort because they will be viewed as intrinsically worthy.

We consider first the treatment effect of Single Caste under the piece rate incentive (Round 1). High-caste performance significantly declines compared with the pooled, mixed-caste, piece rate with names trials ( $p$ -value .04), and also compared with the mixed-caste, piece rate, *no*- names treatment ( $p$ -value .01).<sup>37</sup>

We consider next the effect of the Single Caste treatment under the tournament incentive (Round 2). Again high-caste performance declines significantly: on average, it declines by 2.0 mazes in Single Caste (tournament) compared with the mixed-caste tournament (no names);  $p$ -value .02. However, when the benchmark is the Mixed Caste Tournament with Names, the treatment effect is not significant ( $p$ -value .41). Two offsetting changes may explain this result: By implicitly raising the idea of “high-caste entitlement,” segregation *hurts* performance, but by removing the strategic interaction with low-caste individuals and thus the intrinsic disutility of competing across a wide social divide, segregation in a tournament *improves* performance. As shown in Figure 6,

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<sup>37</sup> The decline in performance of the high caste in the Single Caste treatment, Round 1, is not caused by an outlier group. To check this, we use the participants in the Mixed Tournament treatment (no-names) to construct groups of six high-caste children (we use every two successive sessions). After dropping the high-caste groups with the worst average Round 1 score in each of the two treatments (Single Caste and Mixed Tournament), the decline in Round 1 performance for Single Caste compared to Mixed Tournament remains significant for the high caste.

the decrement in high-caste performance from the announcement of caste under the mixed tournament incentive is similar to the decrement from the announcement of caste *together with* caste segregation. No significant difference exists between high-caste performance in the Single Caste treatment and Mixed Tournament with Names (the  $p$ -value .41 for Round 2 and .53 for  $\square$ ).

## VI Overview of the effects of social context on the caste gap

Figure 7 summarizes our central results on the caste gap. For each decile, it shows the proportion of low-caste participants among all the participants whose performance measured by  $\square$  ranks them above this decile.<sup>38</sup> For example, if the top 10 percent of subjects were to be selected based on performance in Piece Rate, the figure shows that this would result in a low-caste proportion of approximately 60 percent: low-caste outperform high caste at the highest levels of performance. But the comparable figure for Piece Rate with Names is 16 percent; in that social context, low-caste are starkly underrepresented at the highest levels of performance.

If there were no caste differences in performance, all graphs would be at the 50 percent line in Figure 7. The graphs of the two treatments where caste names are not announced are in fact at the 50 percent line except for the top performers, where the graphs are above the line for the top-scoring deciles, indicating that the low caste is *over*represented among the best performers. The 50 percent line divides the six graphs in Figure 7 fairly

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<sup>38</sup> There is, in general, more than one participant whose performance ranks him just at the border between two deciles. In that case, we include low- and high-caste proportionally, according to their representation among participants whose performance is exactly the decile performance. That is, we calculate the proportion of high- and low-castes earning the score at the boundary and at both sides of the boundary, and reallocate high- and low-castes in this same proportion to both sides of the boundary.

We do not include here the variant of Figure 7 using Round 2 scores, instead of  $\square$ , because the same basic features hold: the graphs for Piece Rate with Names and Single Caste (with Names) lie everywhere below the 0.5 line, Random Winner is the highest graph, and Single Caste is the lowest graph.

cleanly into two groups: the treatments where caste is not announced, together with Random Winner, are in the top half; the treatments where caste is announced, except for Random Winner, are in the lower half. These results are highly robust.<sup>39</sup>

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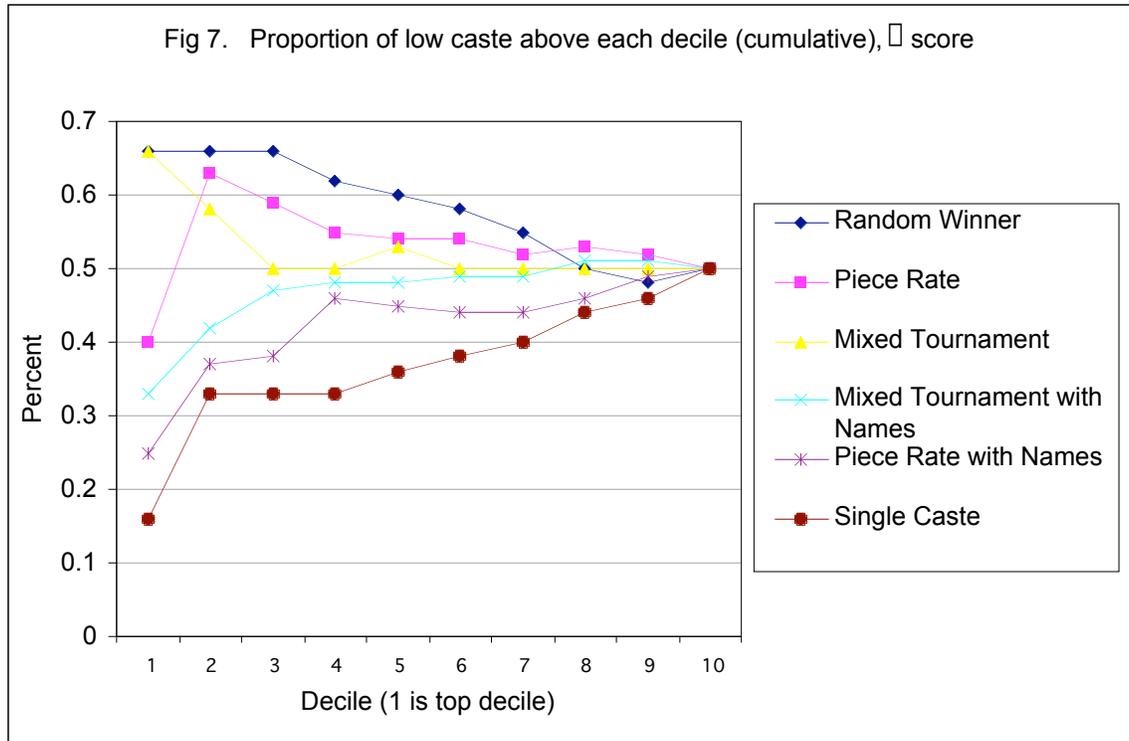
<sup>39</sup> We use information obtained in post-experiment questionnaires to check whether differences in the subjects assigned to different treatments could account for our results. A possible source of such differences is that on any given day, we undertook at most three treatments, and we drew the sample of children on each day from a different but overlapping set of villages. Pooling all treatments together except Choice, we create a dummy for each treatment. We regress performance on treatment dummies,  $t_i$ , interacted with high and low caste respectively, controlling for child characteristics in vector  $Z_{ij}$ , where treatment is denoted by  $i$  and child by  $j$ . The variable  $high_{ij}$  is a dummy equal to 1 if child  $j$  in treatment  $i$  is high caste and 0 otherwise. The variable  $low_{ij}$  is a dummy equal to 1 if child  $j$  in treatment  $i$  is low caste and 0 otherwise. Thus the coefficients,  $b_{hi}$  and  $b_{li}$ , on the dummy for each treatment  $i$  are allowed to differ by caste.  $Z_{ij}$  includes parents' education, parents' occupation, the child's prior exposure to mazes, and the number of children known to each subject in his group.

Regression estimates of the following equation are estimated by OLS for each of the dependent variables—Round 1 and 2 scores and  $\square$ :

$$Maze\ score_{ij} = a + b_{hi} t_i * high_{ij} + b_{li} t_i * low_{ij} + c * Z_{ij} + error_{ij}$$

If caste, rather than other observable differences, statistically accounts for a caste gap in performance, then the coefficients on the particular treatment dummy,  $t_i$ , interacted with high ( $b_{hi}$ ) and low caste ( $b_{li}$ ) will be significantly different from each other.

We find that all of the caste gaps reported above are significant and, in addition, a significant caste gap emerges in Mixed Tournament with Names, Round 2. Thus, in *every* treatment where caste is announced except Random Winner, high caste significantly outperforms low caste. Regression results are reported in our working paper, Table A-4.



Single Caste gives the low caste the lowest representation among all performance deciles, whereas randomness in the determination of the winner gives the low caste the highest representation. If the top 30 percent of subjects were to be selected based on performance in Single Caste, this would result in a low-caste representation of .33; the comparable figure for Random Winner is .66. As social context and incentive schemes change, subjects adapt dramatically differently depending on their caste.

## VII. Is Caste Just Class?

Compared to the high caste, low-caste subjects are less likely to have educated parents,

and their parents own only 39 percent as much land on average.<sup>40</sup> A low-caste individual's behavior might change as the education and wealth of his family rise if such an individual was viewed differently by others and was freed from rural subordination. We use a multivariate regression to try to distinguish caste from class: Within each treatment, performance (scores in Round 1, Round 2 and  $\square$ ) is regressed on caste, controlling for the education and occupation of the father and mother, the subject's previous exposure to mazes, and the number of other subjects he knows in the group. If the caste gap falls, then some of the "caste effect" should be interpreted as a "class effect." There is no systematic fall in the caste gap. In Piece Rate with Names, the caste gap estimated in the regression is 1.96 (in Round 2-scores) and .97 (in  $\square$ ), compared to a raw caste gap of 1.83 (Round 2) and 1.02 ( $\square$ ). For Single Caste, the estimated gap is 1.92 (Round 2) and 1.34 ( $\square$ ), compared to a raw caste gap of 1.78 (Round 2) and 1.43 ( $\square$ ). These regression coefficients are all significant.<sup>41</sup>

Because of the difficulty of obtaining information on land ownership, the sample size is much smaller when we control for land. Perhaps for that reason, the statistical significance of caste disappears in Piece Rate with Names. But the estimated caste gap in Single Caste is large and significant, and we obtain for the first time a significant caste gap in Mixed Tournament with Names. Further, the *reverse* caste gap in Round 2 of Piece Rate (no-names) becomes larger and significant. The evidence suggests that the effect of caste is not an artifact of class differences between low and high castes.

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<sup>40</sup> Although the standard deviation of landholdings is higher for high caste: the standard deviation is 2.29 for high caste compared to 1.10 for low caste. The correlation between land ownership and caste is .43. All regression results are reported in our working paper, Tables A-6-A-11.

<sup>41</sup> It is possible that parents' education is measured with error, so that the effect of parents' education is underestimated. Parents' occupations are less likely to be measured with error since 11-12 year-olds will know what their parents do. The measurement error in land is unlikely to be correlated with caste or to be large, as we collected the land data independently and checked questionable entries with the Land Records administrator.

## VIII. Conclusion

This paper provides experimental evidence that a social identity—a product of history and culture—creates a pronounced economic disadvantage through its effect on expectations. In the experiment, participants had a sociocultural category to which they belonged activated by announcing caste names and by composing groups entirely of members of low or high castes. In controlled settings, where any possible difference in treatment towards castes was removed, social identity affected behavior, largely because it affected expectations. The experiment provides evidence for an additional explanation, *beyond differences in access to various resources*, why social inequalities tend to reproduce themselves over time.

We see the value of the experiment as suggesting a more general dynamic underlying the perpetuation of inequality in many societies than has been broadly recognized in the economics literature. Individuals view the world through the lens of historically created social identities. When those identities are public, social groups will differ in the way that they view and respond to economic opportunity. The differences in behavior are not a consequence of a preexisting ‘culture of poverty’ of the disadvantaged social group, but of the historical processes that divided human beings into categories and shaped their expectations.

Not only do these findings provide an explanation of the persistence of historical inequalities across social groups, but they also suggest how corrosive the effects can be. In the experiment, the caste system debilitates the low caste and hurts even the high castes. To the extent that our findings can be generalized to economic performance, they

suggest that the aggregate effect on the society of expectations associated with caste can be viewed as unambiguously negative.

Table 1. Experimental design

Treatment	Is caste announced?	Incentive in Round 1	Incentive in Round 2	Caste Composition of Groups	Number of Subjects
1 Piece Rate	No	1 rs. per maze	1 rs. per maze	3 High, 3 Low	96
2 Mixed Tournament	No	1 rs. per maze	Tournament	3 High, 3 Low	60
3 Piece Rate with Names	Yes	1 rs. per maze	1 rs. per maze	3 High, 3 Low	120
4 Mixed Tournament with Names	Yes	1 rs. per maze	Tournament	3 High, 3 Low	120
5 Reverse Order	Yes	Tournament	1 rs. per maze	3 High, 3 Low	60
6 Random Winner	Yes	1 rs. per maze	One randomly chosen subject in the group is paid at the rate of 6 rs. per maze; the others receive nothing	3 High, 3 Low	60
7 Choice	Yes	1 rs. per maze	Subjects choose the difficulty level of the maze, and are paid a piece rate depending on the level	3 High, 3 Low	60
8 Single Caste	Yes	1 rs. per maze	Tournament	6 High or 6 Low	66

Table 2. Summary of game data and statistical tests—  
All treatments where caste is not announced

Treatment and sample size <i>n</i>	Piece Rate ( <i>n</i> = 96)		Mixed Tournament ( <i>n</i> = 60)		Piece Rate and Mixed Tournament: Pooled trials of Round 1 ( <i>n</i> =156)	
	High caste	<i>Low caste</i>	High caste	<i>Low caste</i>	High caste	<i>Low caste</i>
<b>Round 1</b> Mean	3.18 (2.12)	<i>3.02</i> ( <i>2.10</i> )	3.63 (2.07)	<i>3.43</i> ( <i>1.79</i> )	3.35 (2.10)	<i>3.17</i> ( <i>1.99</i> )
MW <i>p</i> by caste	<b>.45</b>		<b>.56</b>		<b>.34</b>	
<b>Round 2</b> Mean	5.54 (3.93)	<i>5.72</i> ( <i>3.52</i> )	6.83 (3.50)	<i>6.8</i> ( <i>3.36</i> )		
MW <i>p</i> by caste	<b>.86</b>		<b>.72</b>			
□ Mean	2.35 (2.82)	<i>2.70</i> ( <i>2.39</i> )	3.2 (2.35)	<i>3.36</i> ( <i>2.57</i> )		
MW <i>p</i> by caste	<b>.33</b>		<b>.85</b>			

*Notes.* In the figures reported in this and the following tables, Roman type signifies high-caste subjects, italics signifies low-caste subjects, and boldface signifies Mann-Whitney test statistics. Standard deviations are in parentheses.

MW *p* by caste gives the *p*-value of the Mann-Whitney test for high and low castes compared under the same experimental conditions.

Table 3. Summary of game data and statistical tests—Piece rate incentives

Treatment and sample size <i>n</i>	Piece Rate ( <i>n</i> = 96)		Piece Rate with Names ( <i>n</i> = 120)		Pooled trials of Round 1, No-Names * ( <i>n</i> = 156)		Pooled trials of Round 1, with Names** ( <i>n</i> = 360)	
	High caste	Low caste	High caste	Low caste	High caste	Low caste	High caste	Low caste
<b>Round 1</b>								
Mean	3.18 (2.12)	3.02 (2.10)	3.43 (2.16)	2.61 (1.99)	3.35 (2.10)	3.17 (1.99)	3.22 (2.04)	2.87 (1.84)
MW <i>p</i> , Names vs. No Names	□		.83	.29	□		.47	.30
MW <i>p</i> by caste	.45		.04		.34		.15	
<b>Round 2</b>								
Mean	5.54 (3.93)	5.72 (3.52)	6.11 (3.42)	4.28 (3.20)				
MW <i>p</i> , Names vs. No Names	□		.44	.04				
MW <i>p</i> by caste	.86		.006					
□ Mean	2.35 (2.82)	2.70 (2.39)	2.68 (2.58)	1.66 (1.98)				
MW <i>p</i> , Names vs.No Names	□		.44	.01				
MW <i>p</i> by caste	.33		.03					

Note. MW *p*, Names vs. No Names, gives the *p*-value of the Mann-Whitney test with and without the announcement of caste names, holding constant the incentive scheme.

\*Includes Piece Rate and Mixed Tournament treatments.

\*\*Includes Piece Rate with Names, Mixed Tournament with Names, Choice, and Random Winner treatments.

Table 4. Summary of game data and statistical tests—Mixed Tournaments

	Mixed Tournament with Names ( $n = 120$ )		Mixed Tournament ( $n = 60$ )	
	High caste	Low caste	High caste	Low caste
<b>Round 2</b>				
Mean	5.46 (3.27)	4.75 (3.36)	6.83 (3.50)	6.8 (3.36)
MW $p$ by caste	<b>.26</b>		<b>.72</b>	
MW $p$ , Names vs. No-Names	<b>.04</b>	<b>.009</b>	□	
□ Mean	2.05 (2.60)	1.81 (2.12)	3.2 (2.35)	3.36 (2.57)
MW $p$ by caste	<b>.66</b>		<b>.85</b>	
MW $p$ , Names vs. No-Names	<b>.03</b>	<b>.007</b>	□	

Table 5. Summary of game data and statistical tests—Random Winner, Piece Rate with Names, and Piece Rate

Treatment and sample size $n$	Random Winner ( $n = 60$ )		Piece Rate with Names ( $n = 120$ )		Piece Rate ( $n = 96$ )	
	High caste	Low caste	High caste	Low caste	High caste	Low caste
<b>Round 2</b>						
Mean	5.03 (2.91)	5.4 (2.62)	6.11 (3.42)	4.28 (3.20)	5.54 (3.93)	5.72 (3.52)
MW $p$ by caste	<b>.61</b>		<b>.006</b>		<b>.86</b>	
MW $p$ (Piece Rate)*	<b>.55</b>	<b>.90</b>	<b>.44</b>	<b>.04</b>	□	
MW $p$ (Piece Rate with Names)**	<b>.25</b>	<b>.07</b>	□			
□ Mean	1.83 (1.85)	2.6 (2.23)	2.68 (2.58)	1.66 (1.98)	2.35 (2.82)	2.70 (2.39)
MW $p$ by caste	<b>.11</b>		<b>.03</b>		<b>.33</b>	
MW $p$ (Piece Rate)*	<b>.54</b>	<b>.85</b>	<b>.44</b>	<b>.01</b>	□	
MW $p$ (Piece Rate with Names)**	<b>.15</b>	<b>.05</b>	□			

\*MW  $p$  (Piece Rate) gives the  $p$ -value of the Mann-Whitney test for Piece Rate compared against each of the other treatments.

\*\*MW  $p$  (Piece Rate with Names) gives the  $p$ -value of the Mann-Whitney test for Piece Rate with Names compared against each of the other treatments.

Table 6. Summary of game data and statistical tests—  
Single Caste, Mixed Tournament, and Mixed Tournament with Names

		Single Caste ( <i>n</i> = 66)		Mixed Tournament Treatments				Pooled trials under piece rate incentive, with Names* ( <i>n</i> = 360)	
				No-Names ( <i>n</i> = 60)		With Names ( <i>n</i> = 120)			
		High caste	<i>Low caste</i>	High caste	<i>Low caste</i>	High caste	<i>Low caste</i>	High caste	<i>Low caste</i>
Round 1, Piece rate incentive	Mean	2.4 (1.99)	2.05 (1.30)	3.63 (2.07)	3.43 (1.79)	3.41 (1.93)	2.93 (1.74)	3.22 (2.04)	2.87 (1.84)
	MW <i>p</i> by caste	<b>.63</b>		<b>.56</b>		<b>.26</b>		<b>.15</b>	
	MW <i>p</i> (Single Caste)	□ □		<b>.01</b>	<b>.0009</b>	<b>.02</b>	<b>.01</b>	<b>.04</b>	<b>.01</b>
Round 2, Tournament Incentive	Mean	4.83 (3.14)	3.05 (2.32)	6.83 (3.50)	6.8 (3.36)	5.46 (3.27)	4.75 (3.36)		
	MW <i>p</i> by caste	<b>.02</b>		<b>.72</b>		<b>.26</b>			
	MW <i>p</i> (Single Caste)	□ □ □		<b>.02</b>	<b>.0000</b>	<b>.41</b>	<b>.02</b>		
□	Mean	2.43 (2.19)	1 (1.82)	3.2 (2.35)	3.36 (2.57)	2.05 (2.60)	1.81 (2.12)		
	MW <i>p</i> by caste	<b>.008</b>		<b>.85</b>		<b>.66</b>			
	MW <i>p</i> (Single Caste)	□ □		<b>.14</b>	<b>.0002</b>	<b>.53</b>	<b>.06</b>		

\* Includes Round 1 of Piece Rate with Names, Mixed Tournament with Names, Choice, and Random Winner.

\*\*MW *p* (Single Caste) gives the *p*-value of the Mann-Whitney test for the Single Caste treatment compared against each of the other treatments.

## References

- Acemoglu, Daron, Simon Johnson, and James A. Robinson. 2002. "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution," *Quarterly Journal of Economics* 117 (4): 1231–94.
- Ambady, Nalini, Margaret Shih, A. Kim, and Todd L. Pittinsky, 2001. "Stereotype Susceptibility in Children: Effects of Identity Activation on Quantitative Performance," *Psychological Science* 12: 385-90.
- Ambedkar, B. R. 1946. *Who Were the Shudras? How They Came to Be the Fourth Varna in the Indo-Aryan Society*. Bombay, India: Thacker and Company.
- Ball, Sheryl, Catherine Eckel, Philip Grossman, and William Zame, "Status in Market." *Quarterly Journal of Economics* 116 (1): 161-188.
- Banerjee, Abhijit, and Lakshmi Iyer. 2002. "History, Institutions and Economic Performance: The Legacy of Colonial Land Tenure Systems in India," Massachusetts Institute of Technology, Department of Economics.
- Cohen, Geoffrey L. and Claude M. Steele. 2002. "A Barrier of Mistrust: How Negative Stereotypes Affect Cross-Race Mentoring." In Joshua Aronson, ed., *Improving Academic Achievement*. Amsterdam: Elsevier Science Publishers.
- Dweck, Carol S. and Ellen L. Leggett. 1988. "A Social-Cognitive Approach to Motivation and Personality," *Psychological Review*, 45, 256-273.
- Engerman, Stanley L., and Kenneth L. Sokoloff. 1997. "Factor Endowments, Institutions, and Differential Paths of Growth among New World Economies: A View from Economic Historians of the United States." In Stephen Haber, ed., *How Latin America Fell Behind: Essays on the Economic Histories of Brazil and Mexico, 1800–1914*. Stanford, Calif.: Stanford University Press.
- \_\_\_\_\_. 2002. "Factor Endowments, Inequality, and Paths of Development among New World Economies," *Economia* 3 (1): 41–109.
- Galanter, Marc. 1984. *Competing Equalities: Law and the Backward Classes in India*. Berkeley, CA: University of California Press.
- Gneezy, Uri, Muriel Niederle, and Aldo Rustichini. 2002. "Performance in Competitive Environments: Gender Differences," *Quarterly Journal of Economics*, 118, 1049-1074.
- Gupta, Dipankar. 2000. *Interrogating Caste: Understanding Hierarchy and Difference in Indian Society*. New Delhi: Penguin Books.

- Hoff, Karla and Priyanka Pandey. 2003. "Why Are Social Inequalities So Durable? An Experimental Test of the Effects of Indian Caste on Performance." World Bank Research Paper, forthcoming.
- Kahneman, Amos and Daniel Tversky, eds. 2000. *Choices, Values, and Frames*. Cambridge, UK: Cambridge University Press.
- The Laws of Manu*, translated by Wendy Doniger and Brian K. Smith. 1991. New Delhi: Penguin Books. [ISBN 0-14-044540-4]
- Loury, Glenn C. 2002. *The Anatomy of Racial Inequality*. Cambridge, MA: Harvard U. Press.
- MacDonnell, Arthur A. 1962. *A History of Sanskrit Literature*, New Delhi: Motilal Banarsidas.
- North, Douglass C. 1990. *Institutions, Institutional Change and Economic Performance*. New York: Cambridge University Press.
- Rao, Vijayendra and Michael Walton. 2003. "Culture and Public Action: An Introduction." In *Culture and Public Action*, Stanford University Press, V. Rao and M. Walton, eds. Forthcoming. Available at <http://www.cultureandpublication.org>.
- Shih, Margaret, Todd Pittinsky, and Nalini Ambady. 1999. "Stereotype Susceptibility: Identity Salience and Shifts in Quantitative Performance," *Psychological Science* 10 (1): 80-83.
- Steele, Claude M., Steven J. Spencer, and Joshua Aronson. 2002. "Contending with Group Image: The Psychology of Stereotype and Social Identity Threat," *Advances in Experimental Social Psychology* 34: 379-441.
- Sunstein, Cass R. 1995. "Gender, Caste and Law." In: Martha Nussbaum and Jonathan Glover, eds. *Women, Culture and Development*, Oxford, UK: Clarendon Press, 332-59.

## Appendix: Instructions (translated from Hindi)

*The setting is a classroom with three erasable wall posters—one shows a trivially easy maze, another shows a maze of the same level used in the experiment, and the third is blank. Places on the floor mat are set for six children. At each place is a piece of fruit, a clipboard with a practice maze, and a pencil.*

### I. Piece Rate

1. You are about to participate in a game of puzzles. You will take part in two games. In both games you will have to solve puzzles. The games will take about half an hour.
2. To participate in these games every child will receive 10 rupees. *Experimenter distributes a 10-rupee note to each child.* In addition you might get more rewards in the game. This money will be given to every child in an envelope after the games are over.
3. Now I will show you how to solve a puzzle. *Experimenter illustrates each of her statements by drawing on the poster with the trivially easy maze, which she solves.* In this puzzle there is one child. The child has to go to the ball. The solution is a path that takes the child to the ball. The black lines are walls. The child cannot cross a wall. So the path that you draw cannot cross a line. If it crosses a line, then it will be considered incorrect. You can erase or cross out mistakes. There is an eraser on top of your pencil. And you can also draw a path back if you meet a dead-end. You can solve a maze forwards or backwards.
4. Now I will show you how to solve a puzzle like the one you will have to do. *Experimenter illustrates each of her statements by drawing on the poster with the Level 2 maze, which she solves.* The solution is the path that takes the child to the ball. If you draw an incorrect line, you can erase it or cross it out, and you can also draw a path back if you meet a dead-end.
5. Now I will ask you to solve a puzzle as practice. It will take you about five minutes to do this. If you don't understand something or your pencil breaks, raise your hand, and I will come to you. *Experimenter allows five minutes for the children to work on the practice maze.*
6. I am passing out a booklet of puzzles [*the booklets for Round 1*]. This booklet contains 15 pages. Every page has a puzzle on it. To solve these, you will have 15 minutes. If you are not able to do one puzzle, you can proceed to the puzzle on the next page. During the game you should not talk to each other. If you talk to each other, then you will not get any reward in the game.
7. In this game, you will get 1 rupee for each puzzle that you solve. So if you solve 1 puzzle, then you will get 1 rupee. If you solve 2 puzzles, then you will get 2 rupees. If you solve 3 puzzles, ... *Experimenter illustrates the rules by writing the following table on the blank poster:*

1 puzzle	1 rupee
2 puzzles	2 rupees
3 puzzles	3 rupees
...	
10 puzzles	10 rupees
...	
15 puzzles	15 rupees

Experimenter checks that each child understands the payment system by asking a question to each child in turn, as follows: Suppose you solve \* puzzles. How many rupees will you be given? For \*, the experimenter uses, in turn, 4, 7, 9, 12, 14, 5.

Each child will get his reward in an envelope at the end of the game.

8. Now we will begin the game. After 10 minutes, Experimenter tells the children that 5 minutes of the game remain. When the timer rings, she collects the packets.

9. We are going to play the game one more time. Experimenter passes out the booklets for Round 2.

10-P. The second game is just like the first game. I want to review the rewards again. Experimenter repeats steps 7 and 8. For \*, she uses in turn, 5, 14, 12, 9, 7, 4.

11. We will begin the game. After 10 minutes, Experimenter tells the children that 5 minutes of the game remain. When the timer rings, she collects the packets.

## 2. Mixed Tournament

The same as Piece Rate except that Step 10-T replaces 10-P:

10-T. In this game, only one child will get a reward. The child who gets the reward is the one who solves the greatest number of puzzles. His reward will be 6 rupees for each solved maze. So if he solves 1 puzzle, he gets 6 rupees; if he solves 2 puzzles, he... Experimenter completes the following table:

1 puzzle	6 rupee
2 puzzles	12 rupees
6 puzzles	36 rupees
10 puzzles	60 rupees
15 puzzles	90 rupees

To illustrate the game, suppose the six children listed here (Experimenter points to the names she has written on the blank poster) were playing the game and suppose they solved the number of puzzles shown here.

	<u>Number of puzzles solved</u>	<u>Reward</u>
Seeta	4	0 rupees
Reeta	3	0
Geeta	6	36 rupees
Kavita	2	0
Sunita	5	0
Radha	1	0

The winner would be Geeta. She solved the largest number of puzzles. And she would get 36 rupees. No other child would get any money in this game. Experimenter checks that each child understands the reward system by changing one or two numbers in the table and then asking him what the rewards would be.

## 3. Piece Rate with Names

The same as Piece Rate except that Step 0 is added.

0. *Experimenter reads out, for each child in turn, the child's name, village name, father's name, grandfather's name if available, and caste.*

#### **4 and 8. Mixed Tournament with Names and Single Caste**

The same as Mixed Tournament except that Step 0 above is added.

#### **5. Reverse Order**

The order of steps is 0 through 6, 10-T, 9, 7, and 8.

#### **6. Random Winner**

The same as Piece Rate with Names except that Step 10-R replaces 10-P:

**10-R.** In this game, only one child will get a reward. The child who gets the reward will be the one whose name we choose from a jar. Each child should write his name on the card and then fold it in half. *Experimenter passes out a yellow card to each child, and then collects the cards after the children have written their names on them. Experimenter puts all the cards into a glass jar.*

At the end the game, my assistant will choose the winner's name from the jar. I will illustrate this: *The assistant shakes the jar and picks out a name, and the experimenter writes the money prizes on the blank poster.*

1 puzzle	6 rupee
2 puzzles	12 rupees
..	
6 puzzles	36 rupees
..	
10 puzzles	60 rupees
..	
15 puzzles	90 rupees

Only one child's name will be picked. The other children will not get any money in this game. At the end of the game, my assistant will go to another room and in privacy she will pick out the winner's name.

*Experimenter checks that each child understands the reward system by asking each child, using the actual names of the children in the group and hypothetical scores that she writes on the blank poster, a question that follows the model: "If Sandeep got 10 puzzles right and Pradeep got 5 puzzles right, and Pradeep's name is picked, who would win? How much money would the \* get?" Then she modifies the scores and the hypothetical winner of the random draw, and asks the next child a question following the same model.*

#### **7. Choice**

The same as Piece Rate with Names except that Step 10-C replaces 0-P.

10-C. This game will be just the same as the first one, except that I will ask each of you to choose the level of difficulty of the puzzles. The payment that you will receive for solving a puzzle depends on its difficulty level.

Easy	_ rupee per maze
Same as before	1 rupee per maze
A bit harder	2 rupees per maze
Hard	3 rupees per maze
Hardest	4 rupees per maze

So the harder the puzzle, the more difficult it is to solve many puzzles, but the greater the payment for each solution.

*Experimenter presents examples and checks each child's understanding in turn.*

Sanjay solves 4 mazes of the same level of difficulty as before. What does he earn?

Sanjay solves 4 mazes that are a bit harder. What does he earn?

Sanjay solves 4 mazes that are the hardest. What does he earn?

Now I am going to ask you to go one-by-one to my assistant and tell her the level you wish to choose. Your choice is a secret. No other child will know the choice you make.