

Determining the extent of taste-based discrimination:
Evidence from a field experiment in India*

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August 10, 2020

Abstract

We present a novel method that enables us to distinguish choices that are unambiguously statistically discriminatory from choices that are consistent with both taste-based and statistical discrimination. By eliciting patients' preference rankings of physicians of different castes and experiences in a controlled field experiment, we estimate that as much as 57 percent of caste discrimination in the demand for healthcare in Uttar Pradesh, India, can be the results of taste-based discrimination. Using additional information from a survey and a lab-in-the-field experiment to bound the extent of taste-based discrimination, we narrow the figure to no more than 23 to 31 percent. The results imply an overwhelming size of statistical discriminators, which have important implications for the use of Affirmative Action policies.

JEL: I15, J15, O12

Keywords: Field experiment, taste-based discrimination, statistical discrimination, health, Affirmative Action.

*We are particularly grateful to Birendra Rai, who provided invaluable suggestions and comments at various stages of this project. We would also like to thank Farzana Afridi, Anja Benschaul-Tolonen, Gaurav Datt, Ashwini Deshpande, Kevin Lang, John A. List, Nidhiya Menon, Gautam Rao, conference and seminar participants at the Australasian Development Economics Workshop (ADEW), the Australia-India Development Economics Workshop in Delhi, the Centre for Development Economics and Sustainability's (CDES) Conference at Monash, the Centre for Health Economics at Monash University, Centre for the Study in African Economies Conference (CSAE) and the University of Queensland for useful comments and suggestions. We gratefully acknowledge the funding support from the Indian Institute of Technology (IIT) Kanpur, the Monash Business School, and the Australia-India Council at the Department of Foreign Affairs and Trade (DFAT). This project is registered in the AEA's registry for randomized control trials as AEARCTR-0002385

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1 Introduction

The economics literature posits two major sources of discrimination: taste-based and statistical. The first is due to the fact that agents dislike some categories of the population while statistical discrimination occurs in an environment of imperfect information where agents form expectations based on limited signals that correlate with some observable characteristics. To empirically differentiate these two theories of discrimination is challenging because differential treatments across groups are often consistent with the predictions of both taste-based and statistical discrimination. By focusing on caste discrimination, this paper develops a novel methodology that identifies individual choices that are distinctively statistically discriminatory in nature and choices that are consistent with both taste-based and statistical discrimination.

We conduct a controlled experiment in the field to elicit real patients' preference rankings of different physicians that allow us to bound the extent of taste-based caste discrimination in the demand for health care in Uttar Pradesh (UP), India. We believe that we move the literature forward by demonstrating clearly the challenge empirical studies of discrimination face in distinguishing the predictions of taste-based discrimination from the predictions of statistical discrimination. Our framework shows that the predictions of taste-based discrimination, whether the discriminators have homophily caste preference or heterophily caste preference, are identical to a subset of the predictions of statistical discrimination. As a result, we can bound the extent of taste-based discrimination and also tighten the bound under some reasonable assumptions.

We use a simple theoretical framework to illustrate how individual preference rankings of various consumption bundles can be classified to be consistent with the preferences of taste-based discriminators or statistical discriminators. In our setting, patients from different castes decide which doctor to visit. Doctors have two observable characteristics to the patients: their experience (number of years worked as a doctor) and their caste.¹ Within this framework, we first develop a taste-based discrimination model (Becker, 1957). Our framework allows for individuals to exhibit either in-group (homophily) or out-group (heterophily) preference. Patients also have a preference for high quality (health) service, which may be positively or negatively correlated with the experience of doctors depending on the patients' past experiences or beliefs. It is indeed possible that some patients prefer low-experience doctors because they have had lower quality service with high-experience doctors

¹In the empirical analysis, we have a robustness check where we look at other characteristics of doctors such as their gender (See Section 7.1).

in the past than with low-experience doctors or because they believe that younger doctors are more qualified than older doctors. As a result, when choosing a doctor, there is a tradeoff between the doctor’s experience (high versus low) and the cost of choosing a doctor from the out-group and in-group. The framework shows that at most eight out of 24 (preference) rankings of doctors are possible under taste-based discrimination.

To contrast the preference rankings of doctors under taste-based discrimination with those under statistical discrimination, we present a model of statistical discrimination where the experience of a doctor is a noisy signal of the quality of the doctor (health service) within the same consumer preference relation framework, but without taste-based discrimination. The quality of the doctor and the noise of the signal (experience) follow a normal distribution that depends on the doctor’s caste. Each patient infers the expected quality of the doctor from the noisy signal using the available information by caste of the doctor. The choice of a doctor depends on the (perceived) caste-specific group average quality of the doctor, the caste-specific variance of the doctor’s quality, the caste-specific variance of the doctor’s experience, and the observed doctor’s experience. The model shows that all 24 rankings of doctors are possible under statistical discrimination. Eight of these rankings overlap with those under taste-based discrimination, implying that, in only 16 cases, we can differentiate the predictions of the two theories.

To bound the extent of taste-based discrimination, we conduct a field experiment in 40 locations in UP using a correspondence method that elicits 3,128 patients’ rankings of physicians of different castes and years of experience. We find that 36% of patients have rankings of doctors consistent with both *homophily* taste-based discrimination and statistical discrimination of doctors, 21% of patients have rankings consistent with both *heterophily* taste-based discrimination and statistical discrimination of doctors, and 43% of patients have rankings that are unambiguously consistent with statistical discrimination of doctors.

Our results highlight that it is difficult to distinguish the preference rankings of taste-based discriminators and statistical discriminators in the majority (57%) of cases. However, if we assume that caste preferences are *deep* such that they similarly apply to all aspects of an individual’s choices and are context invariant, we can further reduce the upper bound of taste-based discrimination with the aid of additional instruments. We develop three ways to reclassify preference rankings that are consistent with both taste-based discrimination and statistical discrimination into those unambiguously consistent with statistical discrimination.

First, we administer a survey to the same 3,128 patients after the ranking exercise, asking them about their attitudes towards different caste groups. We use the relative attitudes toward different castes to classify whether a patient’s caste preference inferred in the field

experiment is *consistent* with the patient’s caste preference revealed in the survey. For example, if a person’s ranking of doctors is consistent with heterophily taste-based discrimination in the field experiment, while this person has relatively more positive attitudes towards their own caste group in the survey, then we reclassify this person’s ranking of doctors as consistent with statistical discrimination only (rather than both theories). We show that the percentage of taste-based discriminators decreases to 23%.

Second, we select a representative subsample of 482 individuals to participate in a lab-in-the-field experiment and let them play four dictator games to devise alternative methods distinguishing taste-based and statistical discrimination. In the second method, we infer a person as of homophily (heterophily) type if the amount they give to an anonymous in-group partner is greater (less) than the amount given to an anonymous out-group partner in the lab-in-the-field experiment. We reclassify this person as a statistical discriminator if their caste preference inferred in the lab-in-the-field experiment *contradicts* their caste preference inferred from his/her rankings of doctors in the field experiment.

Third, since all patients tend to give more to individuals living below the poverty line and from a low-caste background, our third method controls for these tendencies when we infer a person’s caste preference through his/her giving behaviors. Using the second and third method to reclassify taste-based discrimination, we find that the percentage of taste-based discriminators decreases from 57% to 25% and 31%, respectively. Overall, the results suggest that the majority discriminators are likely to be statistical discriminators.

Many papers have examined discrimination using laboratory experiments, field experiments, natural experiments, and non-experimental approaches. In particular, the correspondence method has been the primary approach used in recent studies to investigate discrimination in a variety of settings, including employment (Bertrand and Mullainathan 2004; Banerjee et al., 2009; Giulietti et al., 2019), housing (Ewens et al., 2014), product markets (Gneezy et al., 2012; Doleac and Stein 2013; Zussman, 2013), financial markets (Bayer et al., 2018), education (Hanna and Linden, 2012), and along different dimensions, including race, ethnicity, gender, age, disability, sexual orientation, obesity, caste, and religion.² However, as noted by Kofi Charles and Guryan (2011) and Neumark (2018), few studies were able to empirically differentiate behaviors consistent with taste-based discrimination and statistical discrimination, and, when they do, it is implicitly done at the aggregate (group) level.

²See Altonji and Blank (1999), Kofi Charles and Guryan (2011), Lang and Lehmann (2012), and Neumark (2018), for general overviews, Anderson et al. (2006) and Lane (2016), for tests of discrimination in the laboratory, Baert (2018), for correspondence experiments, and Riach and Rich (2002), Rich (2014), and Bertrand and Duflo (2017), for field experiments.

In addition to our methodological contributions, our approach differs from past studies on discrimination in the following ways. First, we use methods to elicit (customer) discriminators’ rankings of service providers of different types in *real transactions*. The rankings elicited allow us to categorize responses that are consistent with both economic theories of discrimination and responses that are unique to statistical discrimination at the *individual* level. The technique of eliciting preference rankings was previously implemented in the laboratory setting to test theories about self-regarding and other-regarding preferences (Levati et al., 2014) and correlated beliefs (Cason et al., 2020). To the best of our knowledge, this is the first time that this technique was implemented in a field setting and employed to examine the sources of discrimination. Our approach allows us to circumvent an important shortcoming of past studies on discrimination in which the discriminator’s preference rankings over the choice set was unobserved and enables us to bound the extent of taste-based discrimination.

Second, because we observe the rankings of different individuals by different types of discriminators in the *final decision stage* of a transaction, we circumvent some of the common criticisms of correspondence studies (Guryan and Kofi Charles, 2013) where outcomes examined were often measured at a preliminary stage of a transaction, and characteristics of the decision-making discriminators were usually unobserved or limited. Our setting of caste discrimination and the use of caste-based surnames also minimize a typical concern in most correspondence studies of racial discrimination implemented in the labor and rental markets, where a fictitious applicant’s race is primarily signaled via the first name of the applicant: less-common names that may be more indicative of a person’s socio-economic background than the person’s race (Fryer and Levitt, 2004). In contrast, a caste-based surname is one of the defining features of a caste group, and the surnames that we use are common surnames that unequivocally reveal the castes of doctors.

Third, by using a survey and extending List’s (2004) incentivized lab-in-the-field experimental method to collect measures of relative attitudes of discriminators towards different groups of individuals and combining the measures with inferences drawn about preferences in our field experiment, we devise several ways to bound the extent of taste-based discrimination. Specifically, by exploiting the way people *contradict* themselves between the field experiment when health treatment matters, the self-reported survey and the lab-in-the-field experiment about interactions with people from different castes, we are able to pin down individuals who are “pure” statistical discriminators. We believe that this approach has never been implemented in the discrimination literature before and demonstrates that at least 69% to 77% of discriminators in our healthcare setting statistically discriminate.

Finally, our field experiment involves randomly contacting households in each village or

town to advertise for an upcoming free-of-charge health check service offered by a mobile clinic and asking the subjects to express their preference over four potential doctors listed on a sign-up sheet. In India, mobile medical units are a common practice in places where medical facilities are inadequate, or in areas populated by low-income households (e.g., urban slums). Thus, the main advantage of our field experiment is that it occurred in a “natural” environment since people in these areas have used such services. It is also relatively common for patients to register their interest for an upcoming service and express their preference. We therefore believe that these individuals did not know that they were taking part in a caste discrimination study and they acted the way they normally would.

This paper is also related to other past studies which have shown significant socio-economic differences between low-caste and high-caste individuals in the Indian context.³ Some of these studies specifically examine the impacts of caste-based Affirmative Action (AA) policies in addressing the problem.⁴ For example, Bertrand et al. (2010) find that, although AA policies in college admissions lead to higher earnings and greater job quality for lower-caste individuals, the income gains experienced by lower-caste individuals are smaller than income losses experienced by displaced upper-caste applicants. Similarly, Bagde et al. (2016) find that AA policies in college admissions improve educational outcomes of lower-caste students at the expense of higher-caste students. On the other hand, Frisncho and Krishna (2012) note that, under AA policies in higher education, lower-caste (Dalits) students perform poorly and do not catch up with students in other groups. Those enrolled in more selective majors through AA policies end up earning less than what they would have had they enrolled in a less selective major.

Our results have important implications for the use of caste-based AA policies. Uttar Pradesh is one of the Indian states with the largest concentration of lower-caste population, who are beneficiaries of a range of Affirmative Action (AA) policies. Our results provide an empirical justification for the statistical discrimination assumption typically made in the related research on AA. Low-caste individuals in India benefit from AA, particularly in college admissions and job placement, but AA policies may also have a negative effect by reinforcing prejudices about the ability of low-caste doctors due to their preferential treatment. Moreover, as noticed by Deshpande (2016), there is considerable debate about

³See, for examples, Bertrand et al. (2010) on educational and labor market outcomes; Banerjee and Knight (1985) and Deshpande and Newman (2007) on earnings; and, Munshi and Rosenzweig (2006) on social and economic mobility.

⁴For general overviews on the pros and cons of AA policies, see Holzer and Neumark (2000, 2006) and Arcidiacono and Lovenheim (2016). The literature examining the unintended consequences of AA policies under statistical discrimination dated back to the seminal work of Coate and Loury (1993).

whether caste is a valid indicator of disadvantages or whether AA policy in India should be defined in terms of class/income or other social markers, such as religion. Our findings that many patients statistically discriminate against doctors, particularly doctors from a low-caste background, highlight the interconnection between caste-based AA policies and statistical discrimination. It also implies that much of the advancement in the literature on race-based AA policies in the United States can be used to examine caste-based AA policies in India.

The rest of the paper unfolds as follows. In Section 2, we develop our benchmark model by differentiating taste-based discrimination (Section 2.1) and statistical discrimination (Section 2.2). In Section 3, we describe our experiment and the India context. In Section 4, we provide our empirical results, testing the two benchmark models. In Section 5, we extend our model to incorporate the possibility of a negative correlation between experience and quality, provide some evidence on this, and, then, examine the model predictions. In Section 6, we tighten the bound of taste-based discrimination by first using information from a survey and then a lab-in-the-field experiment. In Section 7, we perform different robustness checks. Finally, Section 8 concludes and offers some discussion and implications of this study.

2 The benchmark model

We outline the two major economic theories of discrimination in the context of our field experiment and present their predictions through a simple theoretical framework. In order to match our field experiment, we assume only two types of castes for both the doctors and the patients: the low and the high caste, and two different levels of (years of) experience for the doctors: low and high. We denote the caste of a *doctor* by $c = c_H, c_L$, where c_H corresponds to the high caste and c_L corresponds to the low caste, and the caste of a *patient* by $c^p = c_H^p, c_L^p$ where the superscript p refers to the patient. We denote the experience of a doctor by $e = e_H, e_L$, with $e_H > e_L$.

2.1 Taste-based discrimination

According to Becker’s (1957) theory of taste-based discrimination, prejudiced employers (or workers or consumers) dislike employing (or working with, or purchasing from) people with certain observable traits (e.g., race, gender, caste, etc.).

Here, we model taste-based discrimination as a consumer choice problem. The patient (consumer) chooses a doctor consumption bundle, \mathbf{x} , which contains both the *social closeness*

(Φ) to the doctor’s caste group relative to the patient’s own caste group and the perceived quality of health care (q) provided by the doctor, among the patient’s consumption set X of all possible doctors. We denote by $\Phi(c^p, c)$, the social closeness of a patient from caste c^p to a doctor from caste c . Furthermore, the perceived quality of health care provided by a doctor is fully characterized by the years of experience e the doctor has been practicing medicine.⁵ For now, we assume patients perceive doctors with more years of experience provide higher quality health care, i.e., $q'(e) > 0$. We will relax this assumption later in Section 5.1 and allow for the possibility that $q'(e) < 0$. A consumption bundle $\mathbf{x} \in X$ is thus represented by a vector $\mathbf{x} \in \mathbb{R}_+^2$.

We assume that patients’ preferences for doctors with various levels of social closeness and perceived health care quality satisfy five fundamental axioms of consumer choice: completeness, transitivity, continuity, strict monotonicity, and strict convexity. It follows that a patient’s preference relation between two doctors with different levels of social closeness and perceived health care quality can be represented by a real-valued utility function: $U : \mathbb{R}_+^2 \rightarrow \mathbb{R}$, $\forall \mathbf{x}^0, \mathbf{x}^1 \in \mathbb{R}_+^2$, such that $U(\mathbf{x}^0) \geq U(\mathbf{x}^1) \Leftrightarrow \mathbf{x}^0 \succeq \mathbf{x}^1$. We denote this utility function for a patient c^p by: $U(\Phi(c^p, c), q)$ and assume that it is strictly increasing in both arguments.

2.1.1 Homophily versus heterophily taste-based discrimination

We consider two possible manifestations of social closeness. The first is patients with a preference bias for own type or *homophily* (McPherson et al., 2001; Currarini et al., 2009), so that, for a patient of a given caste, there is a cost of interacting with a doctor from a different caste. This is a standard assumption that the discrimination literature typically makes (at least for the average individual). Thus, for a low-caste patient with homophily preference, the social closeness to a low-caste doctor is higher than to that of a high-caste doctor, $\Phi(c_L^p, c_L) > \Phi(c_L^p, c_H)$. Likewise, for a high-caste patient with homophily preference, the social closeness

⁵What matters to patients is likely not to be the experience of a doctor *per se*, but the quality of health care, such as the accuracy of diagnosis, the efficacy of the prescribed medicine, etc. provided by the doctor. For simplicity, we assume that the quality of health care can be fully described by the doctor’s experience in this taste-based discrimination model. In reality, patients may use experience as a noisy signal of quality to form a prediction about the quality of health care to be provided by the doctor. We can accommodate this possibility in the model by having the patient to first use the experience of the doctor to predict the quality of health care the doctor provided (with some errors). Our model predictions are robust to this possibility as long as information about the doctor’s caste is not used in the prediction. Patients may also use information about the doctor’s caste in forming this prediction if they are statistical discriminators. In order to put aside the possibility of statistical discrimination, we thus make this simplified assumption in our taste-based discrimination model.

to a low-caste doctor is lower than to that of a high-caste doctor, $\Phi(c_H^p, c_L) < \Phi(c_H^p, c_H)$.

The second type of preference for social closeness is patients with a out-group preference bias or *heterophily*. For this type of patient, there is a cost of interacting with a doctor from the same caste. We do not expect the majority of individuals to be this type, but it is possible that there are some of them. For a low-caste patient with heterophily preference, the social closeness to a low-caste doctor is lower than to that of a high-caste doctor, $\Phi(c_L^p, c_L) < \Phi(c_L^p, c_H)$. Likewise, for a high-caste patient with heterophily preference, the social closeness to a low-caste doctor is greater than to that of a high-caste doctor, $\Phi(c_H^p, c_L) > \Phi(c_H^p, c_H)$.

2.1.2 Ranking from the perspective of a homophily low-caste patient

On the basis of the axioms and assumptions specified above for taste-based discriminators, we can list the possible preference rankings of doctors for a low-caste patient c_L^p who has homophily preference, given their choice set of doctors with two levels of experience e_L and e_H and two caste backgrounds c_L and c_H .

It should be clear that under the strict monotonicity axiom, for a homophily low-caste patient who views doctor experience as an indication of better health care quality, the best possibility is a doctor $c_L e_H$, i.e., a doctor from a low-caste group c_L and with a high experience level e_H , because the social closeness and quality of this doctor are both the highest. For this patient, the worst possibility is a doctor $c_H e_L$, as the social closeness and quality of the doctor are both the lowest. For a homophily low-caste patient, there are two possible rankings of doctors that are compatible with this taste-based discrimination model:

$$c_L e_H \succ c_L e_L \succ c_H e_H \succ c_H e_L$$

$$c_L e_H \succ c_H e_H \succ c_L e_L \succ c_H e_L$$

Figure 1 illustrates these two possible rankings for a homophily low-caste patient given an arbitrary utility function $U(\Phi(c_L^p, c), q)$ that satisfies the axioms and assumptions of consumer choice specified above. Note that in the first ranking (panel A), the patient exhibits stronger preference for social closeness than for experience, while in the second ranking (panel B), the patient exhibits stronger preference for experience than for social closeness.⁶

[Insert Figure 1 here]

⁶The Online Appendix A.1.1 shows an example of an additively separable utility function (see (1)) that generates exactly these rankings for a low-caste patient.

2.1.3 Ranking from the perspective of a heterophily low-caste patient

We now provide the possible preference rankings of doctors for a heterophily low-caste patient whose preferences satisfy the axioms and assumptions specified above. For this patient, the best possibility is a doctor $c_H e_H$, i.e., a doctor from a high-caste group c_H and with a high experience level e_H , because the social closeness and quality of this doctor are both the highest. For this patient, the worst possibility is a doctor $c_L e_L$, as the social closeness and quality of this doctor are both the lowest. For a heterophily low-caste patient, there are two possible rankings of doctors that are compatible with this taste-based discrimination model:

$$c_H e_H \succ c_H e_L \succ c_L e_H \succ c_L e_L$$

$$c_H e_H \succ c_L e_H \succ c_H e_L \succ c_L e_L$$

Figure 2 illustrates these two possible rankings for a heterophily low-caste patient given an arbitrary utility function $U(\Phi(c_L^p, c), q)$ that satisfies the axioms and assumptions of consumer choice specified above. In the first ranking (panel A), the patient exhibits stronger preference for social closeness than for experience, while in the second ranking (panel B), the patient exhibits stronger preference for experience than for social closeness.

[Insert Figure 2 here]

2.1.4 Ranking from the perspective of a homophily high-caste patient

Let us provide the possible preference rankings of doctors for a homophily high-caste patient whose preferences satisfy the axioms and assumptions specified above. It should be clear that under the strict monotonicity axiom, for a homophily high-caste patient, the best possibility is a doctor $c_H e_H$, i.e., a doctor from a high caste group c_H and with a high experience level e_H , because the social closeness and quality of this doctor are both the highest. For this patient, the worst possibility is a doctor $c_L e_L$, as the social closeness and quality of this doctor are both the lowest. Here are the possible rankings for such high-caste patients:

$$c_H e_H \succ c_H e_L \succ c_L e_H \succ c_L e_L$$

$$c_H e_H \succ c_L e_H \succ c_H e_L \succ c_L e_L$$

Figure 3 illustrates these two possible rankings for a homophily high-caste patient given an arbitrary utility function $U(\Phi(c_H^p, c), q)$ that satisfies the axioms and assumptions of consumer choice specified above.⁷

⁷The Online Appendix A.1.1 shows an example of an additively separable utility function (see (??)) that generates exactly these rankings for a high-caste patient.

[Insert Figure 3 here]

2.1.5 Ranking from the perspective of a heterophily high-caste patient

We now provide the possible preference rankings for a heterophily high-caste patient. For this patient, the best possibility is a doctor c_{LeH} , i.e., a doctor from a low-caste group c_L and with a high experience level e_H , because the social closeness and quality of this doctor are both the highest. For this patient, the worst possibility is a doctor c_{HeL} , as the social closeness and quality of the doctor are both the lowest. For such high-caste patients, there are two possible rankings of doctors that are compatible with this taste-based discrimination model:

$$c_{LeH} \succ c_{LeL} \succ c_{HeH} \succ c_{HeL}$$

$$c_{LeH} \succ c_{HeH} \succ c_{LeL} \succ c_{HeL}$$

Figure 4 illustrates these two possible rankings for a heterophily high-caste patient given an arbitrary utility function $U(\Phi(c_H^p, c), q)$ that satisfies the axioms and assumptions of consumer choice specified above.

[Insert Figure 4 here]

Overall, in the taste-based discrimination case, there are 4 possible rankings compatible with preference relations that satisfy the five axioms of preference relation and assumptions about either homophily or heterophily (caste) preference and positive relation between quality and experience of a doctor.

2.2 Statistical discrimination

Phelps (1972) and Arrow (1973) pioneered statistical discrimination theory. The theory posits that, in the absence of direct information about quality, a decision maker would use group averages to make inferences. For instance, labor market discrimination may exist because employers do not know with certainty workers' productivity and, therefore, may base their employment decisions on the workers' visible features, such as group identity or race, as long as these features are correlated with the unobserved productivity. This type of discrimination can result in self-fulfilling behavior from the disadvantaged groups. For example, Verdier and Zenou (2004) show that, if all agents, including blacks themselves,

believe with no reason that blacks are more criminal than whites, blacks can become more criminal than whites because, based on wrong beliefs, employers pay them less, which forces them to reside far away from job centres, which leads blacks to rationally commit more crime than whites.⁸

As in the case of taste-based discrimination, we assume that a statistically discriminating patient's preference relations satisfy five fundamental axioms of consumer choice: completeness, transitivity, continuity, strict monotonicity, and strict convexity. This statistically discriminating patient in our experiment, however, does not have any preference for social closeness on the basis of caste. She has only a preference for the quality of health care provided. Because the actual quality of health care, q , to be delivered by a doctor is unobserved to the patient before the transaction takes place, she uses the information about the doctor's caste, c , and experience, e , to form a prediction about this quality, $\mathbb{E}(q | e, c)$. It is important to note that what matters to this patient is not the experience of a doctor *per se* but the quality of health care or treatment provided by the doctor. Her consumption bundle, \mathbf{x} , contains only the expected quality of health care, $\mathbb{E}(q | e, c)$. The patient's preference relation between two doctors is *now* represented by a real-valued utility function: $U : \mathbb{R}_+ \rightarrow \mathbb{R}, \forall \mathbf{x}^0, \mathbf{x}^1 \in \mathbb{R}_+$, such that $U(\mathbf{x}^0) \geq U(\mathbf{x}^1) \Leftrightarrow \mathbf{x}^0 \succeq \mathbf{x}^1$.

Based on Phelps (1972) and Aigner and Cain (1977), we develop a model of statistical discrimination for our case. The experience e of a doctor from caste group c *now* provides a signal of the doctor's quality q with an error (noise) ε so that:

$$e = q + \varepsilon$$

where $\varepsilon \sim N(0, \sigma_{\varepsilon, c}^2)$ and $q \sim N(\beta_c, \sigma_{q, c}^2)$. It is assumed that $Cov(q, \varepsilon) = 0$. Thus: $\mathbb{E}(e_c) = \beta_c$ and $Var(e_c) = \sigma_{q, c}^2 + \sigma_{\varepsilon, c}^2$. Each patient infers the expected value of the doctor quality q from the noisy signal e (experience) using the available information, including the caste of the doctor c . In order to make his/her doctor choice, each patient forms $\mathbb{E}(q | e, c)$. Since q and e are jointly normally distributed, for each caste of doctor $c = c_L, c_H$, we have (DeGroot, 2004):

$$\hat{q}_c := \mathbb{E}(q | e, c) = (1 - \gamma_c) \beta_c + \gamma_c e_c \tag{1}$$

where $0 < \gamma_c < 1$ is given by:

$$\gamma_c = \frac{\sigma_{q, c}^2}{\sigma_{q, c}^2 + \sigma_{\varepsilon, c}^2} = \frac{Cov(q_c, e_c)}{Var(e_c)} \tag{2}$$

⁸For a substantive survey on the theory of statistical discrimination, see Fang and Moro (2011).

where $Cov(q_c, e_c) > 0$, (i.e., experience is a signal of quality). In other words, for a given caste of doctor, c , a doctor with higher experience is perceived to be providing a higher quality health service. We will relax the assumption that $Cov(q_c, e_c) > 0$ later and allow for the possibility that $Cov(q_c, e_c) < 0$.

Equation (2) says that $\hat{q}_c := \mathbb{E}(q | e, c)$, the conditional distribution of q given e and c , follows a normal distribution with mean equal to a weighted average of the signal e_c and the unconditional group mean β_c . If the signal e_c is very noisy, i.e., the variance of ε ($\sigma_{\varepsilon, c}^2$) is very high, the expected conditional value of doctor's quality is close to β_c , the population average, regardless of the signal's value. In other words, when experience is not informative of quality, the patient uses the average quality of health care provided by the doctor's caste group to make inferences about a particular doctor's quality. On the other hand, if the signal is very precise, i.e., $\sigma_{\varepsilon, c}^2$ close to zero, then the signal e_c provides an accurate estimate of the doctor's quality. In some sense, γ_c can be interpreted as the "reliability" of the signal since the higher is γ_c , the less noisy and thus the more precise is the signal e_c .

The choice of a doctor from a patient of caste c^p will depend on these different aspects of the model, in particular, on γ_c , the "reliability" of the signal, as well as the average caste c doctor's experience, $\mathbb{E}(e_c) = \beta_c$, and the signal e_c .

Different cases may arise. For example, assume that the unconditional distribution of doctor qualities are the same between the two castes, i.e., $\beta_{c_H} = \beta_{c_L}$ and $\sigma_{q, c_H}^2 = \sigma_{q, c_L}^2$ but the signals patients receive are differently informative, i.e., $\sigma_{\varepsilon, c_L}^2 > \sigma_{\varepsilon, c_H}^2$. This means that $\gamma_{c_H} > \gamma_{c_L}$ so that the signal about a doctor's experience is noisier and less precise for the lower caste c_L doctor than for the higher caste c_H doctor. In that case, doctors from a lower caste with high signals (high experience) are less preferred to same-signal doctors from the higher caste, and the opposite occurs to doctors with low signals. This noisier signal assumption is typically made for minority individuals in studies of racial discrimination in the United States (e.g., Aigner and Cain (1977)) to explain why minority individuals with strong test performance may be discriminated against in the labor market, on average.

2.2.1 Rankings from the perspective of any patient

We now examine the patient's preference rankings of doctors. Contrary to the taste-based discrimination, we do not need to differentiate a patient from a low caste background and a patient from a high caste background since caste preference is assumed away for a statistical discriminator. The only difference that may matter is the fact that patients may hold different beliefs about different types of doctors. We are agnostic about how the differences in their beliefs may arise. One can imagine that everyone starts with a common prior about

the quality of doctor from various caste groups, but the idiosyncratic experiences with different types of doctors over patients' lifetimes lead to different posterior beliefs. In other words, their beliefs are shaped by the draws of doctors (from different caste groups and with different years of experience) they have encountered and these draws are unlikely to be independently and identically distributed.⁹ For now, we assume that $Cov(q_c, e_c) > 0$ to allow comparisons with the predictions of taste-based discrimination presented above. We will relax this assumption in Section 5.1 for both taste-based and statistical discrimination.

What kind of ranking can we have for a patient who behaves according to this statistical discrimination model? First, we can have the same rankings as in the taste-based discrimination case, e.g.,

$$c_{LeH} \succ c_{LeL} \succ c_{HeH} \succ c_{HeL}$$

$$c_{LeH} \succ c_{HeH} \succ c_{LeL} \succ c_{HeL}$$

Indeed, for a low-caste or high-caste patient, $c_{LeH} \succ c_{LeL}$ and $c_{HeH} \succ c_{HeL}$ are always true since, for two doctors of the same caste, a high-experience doctor is always preferred to a low-experience doctor given that $0 < \gamma_c < 1$. What about $c_{LeL} \succ c_{HeH}$? This preference relation is true if

$$\beta_{c_H} - \beta_{c_L} < \gamma_{c_H} (\beta_{c_H} - e_H) - \gamma_{c_L} (\beta_{c_L} - e_L)$$

This is clearly possible under statistical discrimination. For example, if $\beta_{c_H} = \beta_{c_L} = \beta$ (the expected experience of a doctor is the same independent of caste), then it suffices that $\gamma_{c_H} < \gamma_{c_L}$ (either the covariance $Cov(q, e)$ is lower or the variance $Var(e)$ is higher for high-caste doctors). The other ranking given by

$$c_{LeH} \succ c_{HeH} \succ c_{LeL} \succ c_{HeL}$$

is also possible. Indeed, for $c_{HeH} \succ c_{LeL}$ to be true, it has to be that:

$$\beta_{c_H} - \beta_{c_L} > \gamma_{c_H} (\beta_{c_H} - e_H) - \gamma_{c_L} (\beta_{c_L} - e_L)$$

Again, this is possible under statistical discrimination.

⁹Bohren et al. (2019) examine whether such beliefs get updated as new information arrives in the context of gender discrimination in online evaluations of user-generated content. They find that without prior evaluations, women face significant discrimination, but the direction of discrimination reverses following a sequence of positive evaluations. Ewens et al. (2014) examine racial discrimination in the US rental apartment market and assume that the draws are correlated within neighborhoods in which landlords are leasing apartments.

In fact, under statistical discrimination, it is easily verified that there are exactly six possible rankings with two castes and two experience levels that are compatible with (1), the assumption that $Cov(q_c, e_c) > 0$, and the five axioms of consumer choice. All the rankings that have $c_{LeL} \succ c_{LeH}$ or $c_{HeL} \succ c_{HeH}$ are not possible because signals are informative and $Cov(q_c, e_c) > 0$. These six rankings are:

$$c_{HeH} \succ c_{HeL} \succ c_{LeH} \succ c_{LeL}$$

$$c_{HeH} \succ c_{LeH} \succ c_{HeL} \succ c_{LeL}$$

$$c_{LeH} \succ c_{HeH} \succ c_{LeL} \succ c_{HeL}$$

$$c_{LeH} \succ c_{LeL} \succ c_{HeH} \succ c_{HeL}$$

$$c_{HeH} \succ c_{LeH} \succ c_{LeL} \succ c_{HeL}$$

$$c_{LeH} \succ c_{HeH} \succ c_{HeL} \succ c_{LeL}$$

Figure 5 illustrates these six rankings. Panels (A)-(B) show rankings identical to those in Figure 1 and Figure 3, panels (C)-(D) show rankings identical to those in Figure 2 and Figure 4, and panels (E)-(F) show the last two rankings that are consistent with only statistical discrimination.

[Insert Figure 5 here]

In our field experiment, when patients report any of the first four preference rankings, we are unable to distinguish taste-based discriminators from statistical discriminators. These patients may be taste-based discriminating and they may be statistically discriminating. In contrast, we can certainly identify patients as statistical discriminators when they report any of the last two preference rankings. As a starting point, we will first focus on estimating the share of patients whose preference rankings are those in panels (E)-(F) to identify the minimum share of statistical discriminators. Later, we will use additional instruments and the assumption that caste preference is context independent to further identify patients with preference rankings in panels (A) to (D) as statistical discriminators.

3 Context and experimental design

In this section, we first provide some background on the caste system in India and the policies that have been in place to overcome discrimination against low-caste individuals. Then, we explain the way we implemented our correspondence study.

3.1 Caste discrimination and affirmative action policies in India

The caste system in India played an important role in ancient Hindu tradition. The term *caste* originated from the Iberian word *Casta*, which means “lineage” or “breed.” Most Indians use the terms “Varna” and “Jat” when referring to caste. The caste system divides Hindus into four main categories (Varna)– Brahmins, Kshatriyas, Vaishyas, and Shudras. At the top of the hierarchy are the Brahmins, who were priests, teachers and intellectuals. The next category is the Kshatriyas, who were rulers and aristocrats of the society. The third category encompasses traders, landlords, farmers, and businessmen. The bottom category is the Shudras, who were peasants and working class of the society. Below these castes are the outcasts who are untouchable to these four castes and who call themselves Dalit. These untouchables worked in degrading jobs, such as cleaning, sewage, etc.

The first three castes had social and economic rights, which the Shudras and the untouchables did not have, and were classified as high caste. The lower classes were listed in three categories- (1) Scheduled Castes (SCs) who were untouchables; (2) Scheduled Tribes (STs)- who did not accept the caste system and preferred to reside in the forests and mountains; and, (3) Other Backward Classes (OBCs), which include Shudras, untouchables who converted from Hinduism to other religions, nomads and tribes who made a living from criminal acts.

For centuries, caste dictated almost every aspect of Hindu religious and social life. Rural communities were long divided on the basis of caste – the upper and lower castes almost always lived in segregated colonies.¹⁰ Brahmins did not share water wells with them, neither did they accept food nor drink and married only within one’s caste. Traditionally, the system bestowed many privileges on the upper castes while sanctioning repression of the lower castes by privileged groups. In recent decades, the influence of caste has somewhat declined, especially in cities where different castes live side-by-side and inter-caste marriages are becoming more common. Despite the changes though, caste identities remain strong, and surnames are almost always indications to which caste a person belongs. There is also evidence suggesting that the lowest-caste groups continue to face stigmatization, exclusion

¹⁰Although Islam does not recognize any castes, Muslim communities in India apply a comparable caste system of social stratification, and they differ widely in power, privilege, and wealth. Thus, the low-class Muslims in India have faced similar discrimination as low-caste Hindus. The upper-class Muslims dominated government jobs and parliamentary representation. As a result, there have been campaigns to include the Muslim untouchables and lower castes among the groups eligible for affirmative action programs in India under SC and STs provision act. There have also been cases, for example, in the Bihar state of India, reported in which the higher-caste Muslims have opposed the burials of lower-caste Muslims in the same graveyard. In UP, Muslims are divided into 68 castes and sub-castes: 35 of them are OBCs.

and rejection (Shah et al., 2006; Navsarjan, 2010).¹¹

After independence of India, discriminating a person based on his or her caste was legally forbidden. Affirmative action (AA) policies (known as the “reservation” policy in India) were launched in 1950 to promote equal opportunity to the SCs and STs in areas of employment, education, and politics (Deshpande, 2012). The Ministry of Education, in 1954, suggested a 20% quota (“reservation”) for SCs and STs in educational institutions. In 1982, 15% and 7.5% of vacancies were specified to be reserved for SC and ST candidates, respectively, in public sector jobs and admission into higher public educational organizations, including medical schools. In addition, in the late 1980s, a commission of inquiry (known as the “Mondal Commission”), recommended a 27% quota reserved for OBCs.¹² Candidates from SCs, STs, and OBCs have to take entrance examinations for educational institutions, but they compete only among themselves to fill the allocated number of reserved seats, which are not available to candidates from other backgrounds. The admission requirement is also lower for these lower-caste groups. For example, for admission to the undergraduate level in a public medical college, a candidate must pass with minimum of 50% marks. However, for candidates belonging to SC/ST/OBC, the threshold is 40% instead of 50%.

3.2 The field experiment

We conducted a field experiment to test for the presence and sources of caste discrimination in the demand for health care in the Kanpur Nagar district of Uttar Pradesh (UP), India. UP is the most populous state in India with a population of about 225 million. UP has the largest concentration of lower-caste people in India. Caste-based issues and policies have historically dominated the state’s politics. The Kanpur Nagar district has a total population of around 4.6 million people as per the 2011 Census, with 1.6 million people living in rural areas and 3 million people living in urban area (Population Census, 2011). The sex ratio is 862 females per 1000 males. Figure B.1 in the Online Appendix B shows the location of the Kanpur Nagar district in the state of UP.

¹¹Nambissan (2010) notes excessive gap in access to quality education leading to inequalities between SC and others. Thorat and Attewell (2007) find in a correspondence study significant differences in job call-back rates between Hindu upper caste and others (Dalit and Muslims). Siddique (2011) also finds similar results, with Dalit women getting the lowest call-back rates. Shah et al. (2006) document untouchability in rural India using a large survey carried out over 565 villages across 11 states during 2001-2002.

¹²In 1992, the Supreme Court of India put a cap on reservation and ruled that reservations should not exceed 50%. The exact percentages of reservation vary from state to state. In 2017, the new state government in UP declared that caste-based reservations in private medical and dental colleges will cease to exist. However, the quota for lower-caste groups remained at 49% (SC-21%; ST-1% ; and OBC-27%).

Similar to Section 3.1, our experiment considers different castes for both patients and doctors: high-caste individuals are those who belong to the general-category (GC) caste while low-caste persons are those who belong to either a Scheduled Caste (SC), a Scheduled Tribe (ST), or an Other Backward Caste (OBC). The field experiment took place in 40 areas across the Kanpur Nagar district between August and October of 2017. Figure B.2 in the Online Appendix B shows the locations where the experiment was conducted. The selected locations have demographic characteristics that are representative of the overall demographic characteristics of the state of UP. A total of 3,128 individuals participated in the field experiment. Table 1 below shows that the characteristics of our sampled individuals are on average statistically similar to the demographic and social economic characteristics of individuals in Uttar Pradesh.

We implemented the field experiment in four stages. In the first stage, subjects registered interests and expressed preference for different types of doctors presented to them. In the second stage, subjects answered a short survey questionnaire. In the third stage, subjects were assigned to doctors and appointments. In the fourth stage, subjects received services.

In the first stage, we randomly approached households in each locality to advertise for an upcoming, free-of-charge health check service offered by a mobile clinic.¹³ Due to safety and ethical concerns, individuals with potential urgent and life-threatening diseases or injuries were advised to seek immediate medical attention at the local hospital, instead of waiting for the upcoming health check.

At the point of registration, we requested subjects to express their preference over four potential doctors listed on a sign-up sheet. The sign-up sheet showed a two-by-two matrix containing the information for four different doctors: (i) a doctor with a high-caste surname and a high number of years of experience (c_{HeH}); (ii) a doctor with a low-caste surname and a high number of years of experience (c_{LeH}); (iii) a doctor with a high-caste surname and a low number of years of experience (c_{HeL}); and (iv) a doctor with a low-caste surname and a low number of years of experience (c_{LeL}).¹⁴ The high-caste surname that appears on the sign-up sheet belongs to the general-category (GC) caste. The low-caste surname that appears on the sign-up sheet is either an SC or ST or OBC surname but never both. Similarly, the high number of years of experience is either 12 years or 8 years but never both. The low number of years of experience is always 4 years. We do not disclose the first name

¹³In India, mobile medical units have been introduced into service to provide primary medical care to people living in remote areas in India where medical facilities are non-existent or inadequate. The mobile units typically offer low-cost services from doctors and paramedics, and also medicine.

¹⁴The sign-up sheet also indicated that, in case the subject was not assigned to any of the listed doctors, an alternative doctor would be provided.

of the doctor but only the initial, and we randomize the order in which each type of doctor appears in the matrix.

We instructed subjects to rank these doctors from the most desired (rank 1) to the least desired (rank 4), without the possibility of an equal rank.¹⁵ We explained to the subjects that they had the highest chance of getting their rank-one doctor, the second highest chance of getting their rank-two doctor, the third highest chance of getting their rank-three doctor, and the lowest chance of getting their rank-four doctor.¹⁶

Once we elicited subjects' rankings of the four doctors, we invited them to fill out a short survey that asked questions about their demographic and socio-economic information, such as their own caste, poverty status, education level, and so on. The short survey also includes questions about their past experience related to health services, their attitudes toward individuals of different castes, their risk attitudes, etc. By surveying them after the elicitation exercise, we minimized any potential priming effect. The correspondence study effectively concluded by the end of stage two. Observe that, in our experiment, patients are able to make accurate inferences about the distribution of the quality of doctors from different castes because most of them have experienced doctors from different castes in the past.

In stage three, we informed the subject about the doctor they were assigned to and the location and time of their upcoming health-check appointment. This stage typically occurred on the day after registration. In stage four, the mobile clinic arrived in the village to deliver service. The mobile clinic delivered the service within one week of registration.

Table 1 provides summary statistics of the 3,128 participants in the field experiment. The respondent's caste composition is as follows: 836 GC, 739 SC, 12 ST, and 1541 OBCs, which means that roughly 27 percent of participants are from a high-caste (GC) background and the rest from a low-caste background. The mean age of participants is 38. 80% of the participants are Hindu and 51% of the participants are male. 2,049 (65.5%) participants reside in a rural area. Roughly 34% of participants live below the poverty line and roughly 11% of participants have at least some college education. Low-caste participants are more likely to live in urban areas (36% as opposed to 31%), live below the poverty line (37% as opposed to 31%), and have not attended college before (91% as opposed to 83%). Thus, low-caste participants are more likely to come from a low, socio-economic background. We

¹⁵We deal with the issue that patients may express indifference between doctors in a robustness check in Section 7.3.

¹⁶The high-caste surnames used were: Bajpai, Dixit, Mishra, Pandey. The low-caste surnames used were: Katiyar, Pal, Rajput, Yadav, Kanaujiya, Kureel, Sonkar, and Valmiki.

also see in Table 1 that the observable characteristics of our 3,128 individuals are similar to that of the population in UP where the experiment was conducted.

[Insert Table 1 here]

4 First results

4.1 Evidence of caste discrimination

We present whether on average there is any evidence of caste discrimination first by pooling the responses of all patients and ignoring the preference rankings at the individual patient level. The purpose here is not to bound the share of taste-based discriminators and the share of statistical discriminators, but to examine whether caste discrimination is present at the aggregate level.

Figure 6 presents the average ranks for the four doctors, pooling the responses of all patients. On average, high-caste, high-experience (HH) doctors are ranked highest (mean of the rank = 1.77), followed by low-caste, high-experience (LH) doctors (mean = 1.85), high-caste, low-experience (HL) doctors (mean = 3.11), and low-caste, low-experience (LL) doctors (mean = 3.27). The differences in average ranks are all statistically different at the 5% level, with the exception of high-caste, high-experience (HH) doctors and low-caste, high-experience (LH) doctors where the difference in average ranks is statistically different at the 10% level.

For two doctors from the *same caste* but with different years of experience, the doctor with the *highest number of years of experience* is better ranked. For two doctors from different castes but with the same years of experience, the *high-caste doctor* is better ranked than the low-caste doctor, especially for low-experienced doctors. Thus, Figure 6 shows that patients do care about doctors' experience and clearly prefer doctors who have the highest number of years of experience. This figure also shows that low-caste doctors are on average being discriminated against. Indeed, if there were no caste discrimination, for the same experience level, there should not be any difference between high- and low-caste doctors.¹⁷

[Insert Figure 6 here]

Figure 7 reports the average rank for the four different types of doctors by the caste of patient. In panel (A), we see that, for high-caste patients, on average, experience matters rel-

¹⁷The significant differences also mean that by not offering patients the possibility to rank doctors equally is not a major concern. Otherwise, the differences would not be statistically significant.

atively more than caste (social closeness) while they exhibit in-group preference (homophily). High-caste patients prefer a high-caste doctor to a low-caste doctor if the two have the same years of experience, and they also prefer a high-experience doctor to a low-experience doctor if the two are from the same caste. These differences are statistically significant at the 5% level. However, high-caste patients are, on average, willing to trade caste for experience. They prefer a low-caste doctor with high experience (LH in the figure) than a high-caste doctor with low experience (HL). Similarly, in panel (B), for low-caste patients, we also see that the experience of the doctor matters relatively more than caste (social closeness) while they exhibit in-group preference (homophily). They prefer a low-caste doctor to a high-caste doctor if the two have the same years of experience. However, for low-caste patients, the gap in terms of ranking between low- and high-caste doctors for each experience level is much smaller than for high-caste patients.

[Insert Figure 7 here]

Overall, there is evidence of discrimination against low-caste physicians, especially for those who have low experience, but, at this stage, it is unclear whether the primary source of discrimination is taste-based discrimination or statistical discrimination. This is what we will investigate next.

4.2 Rankings consistent with each theory of discrimination when experience is positively correlated with quality

In the benchmark model (Section 2), we show that, under taste-based discrimination and homophily preference, there are four possibilities of ranking of doctors: two from low-caste patients and two from high-caste patients. Likewise, under taste-based discrimination and heterophily preference, there are also four possible rankings of doctors: two from low-caste patients and two from high-caste patients. Under statistical discrimination, we show that six different rankings of doctors are possible and they are independent of the caste of the doctors. Four of these six rankings are identical to the four rankings under taste-based discrimination. We can only distinguish whether patients are clearly statistical discriminators when they rank doctors as follows:

$$c_{HeH} \succ c_{LeH} \succ c_{LeL} \succ c_{HeL} \tag{3}$$

$$c_{LeH} \succ c_{HeH} \succ c_{HeL} \succ c_{LeL} \tag{4}$$

The first ranking (3) violates the strict monotonicity axiom under taste-based discrimination because a patient with such a preference ranking have both $c_{HeH} \succ c_{LeH}$ and $c_{LeL} \succ c_{HeL}$. If this patient is a high-caste (low-caste) individual, this first ranking means that at the high level of experience, he/she exhibits homophily (heterophily) preference, while at the low level of experience, he/she exhibits heterophily (homophily) preference. Similarly, the second ranking (4) also violates the strict monotonicity axiom under taste-based discrimination because a patient with such a ranking have both $c_{LeH} \succ c_{HeH}$ and $c_{HeL} \succ c_{LeL}$. If this patient is a low-caste (high-caste) individual, this second ranking means that at the high level of experience, he/she exhibits homophily (heterophily) preference, while at the low of experience, he/she exhibits heterophily (homophily) preference. These two rankings (3) and (4) can, however, arise under statistical discrimination depending on the beliefs people hold of high- and low-caste doctors. For example, at the same experience level, a low-caste patient can choose $c_{HeH} \succ c_{LeH}$ if $\beta_H > \beta_L$ and/or $\sigma_{\epsilon,H}^2 < \sigma_{\epsilon,L}^2$ (noisier signals for low-caste doctors).

We now examine the distribution of the various rankings in our experiments. In Figure 8a, we look at the distribution of rankings by high-caste patients while, in Figure 8b, we focus on that by low-caste patients. In panel (A) of both figures, we see that, in our experiments, some patients rank doctors in ways that are consistent with both taste-based and statistical discrimination while others are only consistent with statistical discrimination (by ranking doctors as in (3) and (4)). More importantly, in panel (B) of both figures, we see that some patients do not behave according to predictions of the taste-based or statistical discrimination models given the assumptions specified above.

[Insert Figures 8a and 8b here]

In Table 2, we quantify these types of rankings by caste of patients. We see in column (1) that, on average, 31% of low-caste patients have rankings of doctors consistent with both homophily taste-based discrimination and statistical discrimination and 21% of them have rankings consistent with both heterophily taste-based discrimination and statistical discrimination. Thus, 52% of low-caste patients have rankings of doctors consistent with both taste-based discrimination and statistical discrimination. Column (1) also shows that 29% of low-caste patients have rankings of doctor that are only consistent with statistical discrimination while 19% of them have rankings of doctor that are consistent with neither theories. Column (2) shows that distributions of different theory-consistent type rankings of doctors for high-caste patients. Roughly 39% of high-caste patients have rankings of doctors consistent with both taste-based discrimination and statistical discrimination, 22% of them

have rankings of doctors only consistent with statistical discrimination, and 24% of them have rankings of doctors consistent with neither theories.

[Insert Table 2 here]

Column (3) in Table 2 offers a similar exercise but does not distinguish patients by caste. We find that 33% of patients report preference rankings consistent with both homophily taste-based discrimination and statistical discrimination, while 18% of patients report preference rankings consistent with both heterophily taste-based discrimination and statistical discrimination. In sum, 53% of patients report preference rankings consistent with both taste-based discrimination and statistical discrimination. On the other hand, 27% of patients report preference rankings of doctors uniquely consistent with statistical discrimination and 20% of patients report preference rankings of doctors consistent with neither theories.

Overall, when we allow taste-based discriminatory patients to exhibit either homophily caste preference or heterophily caste preference, but assume that they prefer doctors with more years of experience, the maximum share of taste-based discriminators is roughly half of the sample. It is important to note that this figure is likely to be the upper bound as these patients can also be statistically discriminating doctors given that that preference rankings consistent with taste-based discrimination are identical to those consistent with statistical discrimination. On the other hand, the estimates reveal that at least 27% of patients are statistical discriminators. Lastly, a sizable fraction of patients (20%) do not seem to behave according to either theory. One possibility is that they do not discriminate at all. Another one is that they do not necessarily prefer doctors with more years of experience. We investigate the former in a robustness check (Section 7.4) while we study the latter in the next sections because we have evidence of discrimination in Figures 6 and 7.

5 Experience may be negatively correlated with quality

The 20% of patients whose rankings of doctors that are consistent with neither the taste-based model nor statistical discrimination model presented in Section 2 above may actually prefer less-experienced doctors over more-experienced doctors. To encompass the rankings of doctors by these 20% of patients, we will need to relax the assumption that perceived quality increases with years of experience of doctor in the benchmark model. We first provide some evidence that, indeed, some patients may prefer less-experienced doctors.

It may be possible that some patients prefer doctors with fewer years of experience in India. A possible reason is that because age is correlated with experience, and some patients may believe that younger doctors are more effective in treating them as younger doctors are perceived to have received more up-to-date training than older doctors and provide better quality service.¹⁸ Another possible reason is that some people may have had lower-quality service with high-experience doctors in the past than with low-experience doctors and thus may believe that $q'(e) < 0$.

We can evaluate if less-experienced doctors are on average more preferred for the 20% of patients whose rankings of doctors are consistent with neither taste-based nor statistical discrimination. Among these patients, we will compare their ranking when they can choose between two doctors whose experience gap is four years (four versus eight years) and when this gap is eight years (four versus 12 years). If younger doctors with lower experience are preferred to older doctors with more experience, then we would expect to see more cases for the latter than the former.

Figure 9 shows that the share of patients whose rankings of doctors that are consistent with neither taste-based nor statistical discrimination increases when patients have to choose between doctors with four years and 12 years of experience (right panel) and between four years and eight years of experience (left panel). In other words, when the gap in experience is greater (eight years), there are more patients belonging to the category “neither” than when the difference is only four years. Thus, it appears reasonable to relax the assumption that experience is positively correlated with quality.

[Insert Figure 9 here]

5.1 Extending the model

We now extend our model to encompass those rankings in which doctors with fewer years of experience may be preferred over those with more years of experience.

5.1.1 Taste-based discrimination

We now assume that there are two-types of patients in each caste $c^p = c_L^p, c_H^p$: those for which $q'(e) > 0$ (as before) and those for which $q'(e) < 0$. As discussed above, some people may prefer younger doctors than older doctors.

¹⁸Indeed, discussions with many participants who ranked less-experienced doctors higher within their own caste also indicate that these individuals generally believe younger doctors are better trained and equipped with better know-how, and they are more likely to prescribe more efficacious medicines.

The preference relations of a low-caste patient c_L^p and a high-caste patients c_H^p are still the same as in Section 2.1, but for some patients, $q'(e) > 0$, while for other patients, $q'(e) < 0$. Instead of two, there are now four possible rankings for each caste of patients that are compatible with the five axioms of preference relation and assumptions about homophily preference. These eight possible rankings that are consistent with taste-based discrimination are provided in the Online Appendix A.2.1.

5.1.2 Statistical discrimination

Assume the same statistical discrimination model as in Section 2.2. Now, assume that both $Cov(q_c, e_c) > 0$ (as before) and $Cov(q_c, e_c) < 0$ are possible. As above, some people may have had lower-quality service with high-experience doctors in the past than with low-experience doctors, for doctors from caste group c . The experience may then lead to the belief that $Cov(q_c, e_c) < 0$. In that case, it is easily verified that, contrary to Section 2.2, there will not only be six possible rankings but 24 rankings, which are listed in the Online Appendix A.2.2. Therefore, there will be 16 (and not two as above) rankings that are compatible only with statistical discrimination. Our focus in the next section is to identify the share of patients with these 16 preference rankings that are consistent with only statistical discrimination. It is important to note that for patients who reported the remaining eight preference rankings, we are unable to ascertain whether they taste-based or statistically discriminate.

5.2 Refining empirical results

We now implement the same exercise as in Figures 8a and 8b but with our new model, which offers more ranking possibilities (eight instead of four for rankings compatible with both taste-based and statistical discrimination and 24 instead of six for rankings compatible with statistical discrimination). We report the results in Table 3.

Column (1) in Table 3 shows that for low-caste patients, 33% of them have preference rankings of doctors consistent with both homophily taste-based discrimination and statistical discrimination, 23% of them have preference rankings of doctors consistent with both heterophily taste-based discrimination and statistical discrimination, and a little over 43% of them have preference rankings of doctors consistent only with statistical discrimination. Column (2) in Table 3 shows that for high-caste patients, 44% of them have preference rankings of doctors consistent with both homophily taste-based discrimination and statistical discrimination, 15% of them have preference rankings of doctors consistent with both heterophily taste-based discrimination and statistical discrimination, and a little over 41%

of them have preference rankings of doctors consistent only with statistical discrimination. Overall, low-caste patients are slightly more likely to have preference rankings consistent with only statistical discrimination, while high-caste patients are more likely to preference rankings consistent with both homophily taste-based discrimination and statistical discrimination.

[Insert Table 3 here]

Finally, Column (3) in Table 3 provides a more general picture of preference rankings consistent with different theories of discrimination. We see that 36% (instead of 33% in Table 2) of patients have preference rankings consistent with both homophily taste-based discrimination and statistical discrimination, 21% (instead of 18% in Table 2) of patients have preference rankings consistent with both heterophily taste-based discrimination and statistical discrimination, and 43% (instead of 27% in Table 2) of patients have preference rankings consistent with only statistical discrimination. Thus, once we allow for patients to prefer less-experienced doctors, the share of taste-based discriminators is at most 57%. It also means that a sizable of individuals must believe or have preferences such that experience is inversely related to quality.

6 Tightening the bound of taste-based discrimination

We can tighten the upper bound of taste-based discrimination if we assume that caste preferences are *deep* in the sense that they similarly permeate all aspects of an individual’s choices. Given this assumption, caste preferences are context invariant. We can then further separate patients whose rankings are consistent with both types of discrimination in the previous section into those that are consistent with only statistical discrimination. The first approach relies on survey instruments, while the second relies on a lab-in-the-field experiment.

By exploiting the way people *contradict* themselves between the field experiment when health treatment matters, and the self-reported survey and the lab-in-the-field experiment about interactions with people from different castes, we will be able to determine individuals who are “pure” statistical discriminators. In both approaches, we first identify a patient’s caste preference revealed in the survey or lab-in-the-field experiment. We then classify whether this revealed caste preference contradicts the patient’s caste preference inferred from his/her ranking of doctors in the field experiment. If there is a contradiction, we reclassify his/her preference ranking of doctors as consistent only with statistical discrimination.

For example, consider a *high-caste* patient who has given the following ranking of doctors in the field experiment: $c_{HeH} \succ c_{LeH} \succ c_{HeL} \succ c_{LeL}$. According to our theory, this person can be either a homophilous taste-based discriminator ($c_{HeH} \succ c_{LeH}$ and $c_{HeL} \succ c_{LeL}$) or a statistical discriminator ($c_{HeH} \succ c_{HeL}$ and $c_{LeH} \succ c_{LeL}$). Assume that, in the survey, this person reveals that he has more positive attitudes about low-caste individuals or, in the lab-in-the-field experiment (dictator games), he gives more money to a low-caste person. We will then code or reclassify him as a “pure” statistical discriminator because his caste ranking of doctors in the field, which shows a clear preference for high-caste doctors, contradicts his “revealed” caste preference in the survey or the lab-in-the-field experiment where he prefers low-caste persons. Indeed, this high-caste patient cannot taste-based discriminate against low-caste doctors because he does not have a “distaste” for low-caste individuals.

6.1 Survey in the field

We use information that we collected through a survey administered to the 3,128 patients after the ranking exercise to identify each patient’s general attitudes about different castes.

In addition to the demographic information reported in Table 1, we asked the patients in our field experiment whether they “strongly disagreed,” “disagreed,” “neither disagreed nor agreed,” “agreed,” or “strongly agreed” with a set of statements about different caste groups. Four of these attitude questions are useful for us to potentially identify the relative taste each individual has for high-caste and low-caste persons. These four questions are as follows: (i) “It really upsets me if anyone says anything negative about people from Backward Caste”; (ii) “I have very positive attitudes towards people from Backward Caste”; (iii) “It really upsets me if anyone says anything negative about people from General Caste”; (iv) “I have very positive attitudes towards people from General Caste”. We code “strongly disagree” as 1 point, “disagree” as 2 points, “neither disagree nor agree” as 3 points, “agree” as 4 points, and “strongly agree” as 5 points. We then compute the total points for the first two questions (i) and (ii) (this score is denoted by $S_{c_L}^p$), which measures a person’s positive attitudes towards low-caste individuals, and the total points for the last two questions, (iii) and (iv), which measures the person’s positive attitudes towards high-caste individuals (this score is denoted by $S_{c_H}^p$).

If a person has relatively positive attitudes toward his/her own caste in the survey, then the person exhibits in-group (homophily) caste preference in general. If his/her ranking of doctors in the field experiment is one of the four consistent with heterophily taste-based discrimination, then we will instead classify his/her preference ranking of doctors as consistent with statistical discrimination. Similarly, if a person has relatively negative attitudes

toward his/her own caste in the survey, then the person exhibits out-group caste preference in general. If his/her ranking of doctors in the field experiment is one of the four consistent with homophily taste-based discrimination, then we will instead classify his/her preference ranking of doctors as consistent with statistical discrimination. For example, if a high-caste person has $S_{c_H}^p > S_{c_L}^p$, while her ranking of doctors is: $c_{LeH} \succ c_{LeL} \succ c_{HeH} \succ c_{HeL}$, then she cannot taste-based discriminate against a low-caste doctor in the field experiment under the assumption that caste preference is context invariant.

[Insert Figure 10 here]

Figure 10 shows the share of patients whose caste preference revealed in the survey is consistent with their caste preference inferred from their preference rankings of doctors in the field experiment. Only a small fraction of patients (roughly 5.5%) with preference rankings of doctors that are consistent with heterophily taste-based discrimination also exhibit heterophily preference in the survey. Although the fraction of patients who exhibit preferences consistent with homophily taste-based discrimination in both the field experiment and survey are much higher (roughly 33% for low-caste patients and 40% for high-caste patients), the majority of patients' caste preferences according to the rankings of doctors in the field experiment actually contradict their caste preferences revealed in the survey. Thus, if we reclassify patients' preference rankings of doctors that are consistent with both taste-based discrimination and statistical discrimination by checking whether their revealed caste preferences in the survey are consistent with their inferred caste preferences in the field experiment, we will reduce the upper bound of taste-based discrimination by almost half.

6.2 Lab-in-the-field experiment

In late October 2017, we invited a random subset of the initial field-experimental subjects in 30 randomly selected villages to participate in a lab-in-the-field experiment. The purpose of the lab-in-the-field experiment was to allow separate identification of taste-based discrimination and statistical discrimination for the sets of rankings that are consistent with the predictions of both theories. The main advantage of using the lab-in-the-field experiment over the survey method is that caste preferences are revealed under incentivization. Similar to the survey method, we examine whether the revealed caste preferences in the lab-in-the-field experiment are consistent with the caste preferences inferred from the preference rankings of doctors in the field experiment. In total, 482 subjects participated in the lab-in-the-field experiment.

The lab-in-the-field experiment was conducted as follows. Each subject participated in four dictator games. In each dictator game, each subject, who had an endowment of 100 Rupees, decided how much he/she wanted to keep from this endowment (a number between 0 and 100 (inclusive) Rupees), given that what is not kept went to a randomly drawn individual from a particular group of subjects. The four games corresponded to four different groups of subjects: high caste, low caste, above poverty line, and below poverty line. If the subject is a low-caste (high-caste) individual, we reminded the subject that the low-caste partner was from the same low-caste group. The anonymous partner was randomly drawn from our field experiment and the allocation was later given to them.

At the beginning of each game, an envelope with the group identity of an anonymous partner written on the envelope was drawn from a set of four envelopes. The subject was then given the group identity of the anonymous partner and the envelope with 100 Rupees ($10 \times \text{Rs}10$ notes). The experimenter then instructed the subjects to go to a quiet corner to allocate whatever amount they wished for themselves and put the remaining money in the envelope they wanted to give to the anonymous partner. They were also informed that, once they finished the task, they would drop the envelope in a bag full of similar-looking envelopes that the experimenter placed in a different corner.¹⁹ By letting them drop each of the envelopes in a bag full of similar-looking envelopes away from the scrutiny of the experimenter, we ensured minimal experimenter demand effect.

The third and fourth columns in Table 1 display the characteristics of these 482 subjects and show that they are statistically similar to the original 3,128 subjects who participated in the initial field experiment. More importantly, for the lab-in-the-field sample of 482 individuals, we find the same results obtained in Table 3 for the whole sample of 3,128 individuals (see the Online Appendix C for the replication results). Thus, these 482 subjects who participated in the lab-in-the-field experiment behave, on average, exactly as the 3,128 subjects who participated in the field experiment. In particular, 57% of them have preference rankings of doctors consistent with the predictions of both the taste-based and statistically discrimination models while 43% of them have preference rankings of doctors consistent with only the statistical discrimination model.

Figure 11 displays the mean amounts of giving in our lab-in-the-field experiment. We note a lot of variation in the giving behavior of individuals. In particular, both low-caste individuals and high-caste individuals tend to give more to low-caste individuals and individuals living below the poverty line than to high-caste individuals and individuals living above the

¹⁹In the inside of each envelope, each subject's unique id is written, so the amount can be linked to their responses in the field experiment.

poverty line. Thus, it seems that high-caste individuals tend to exhibit heterophily preference in their giving behavior, whereas both high-caste individuals and low-caste individuals exhibit preference to help those who are financially less-privileged.

[Insert Figure 11 here]

We first use List's (2004) method to classify whether a patient's caste preference in the field experiment is consistent with the patient's caste preference in the lab-in-the-field experiment. If a low-caste (high-caste) person has preference ranking of doctors consistent with homophily taste-based discrimination in the field experiment but does not give more to a low-caste (high-caste) person than to a high-caste (low-caste) person in the lab-in-the-field experiment, then we reclassify this person as statistical discriminator in the field experiment. Similarly, if a low-caste (high-caste) person has preference ranking of doctors consistent with heterophily taste-based discrimination in the field experiment but does not give more to a high-caste (low-caste) person than to a low-caste (high-caste) person in the lab-in-the-field experiment, then we also reclassify this person as statistical discriminator in the field experiment. Among other individuals whose caste preferences inferred in the field experiment do not contradict their revealed caste preferences in their giving behaviors, we keep the same classification.

[Insert Figure 12 here]

Figure 12 shows the share of patients whose caste preference revealed in their giving behaviors is consistent with their caste preference inferred from their preference rankings of doctors in the field experiment. Panel (A) shows that less than 3% of low-caste patients with preference rankings of doctors that are consistent with heterophily taste-based discrimination also exhibit heterophily preference in their giving behavior, whereas panel (B) shows that roughly 19% of high-caste patients with preference rankings of doctors that are consistent with heterophily taste-based discrimination also exhibit heterophily preference in their giving behavior. On the other hand, 38% of low-caste patients with preference rankings of doctors that are consistent with homophily taste-based discrimination also exhibit homophily preference in their giving behavior (panel A). This figure is 22% for high-caste patients. Thus, if we reclassify patients' preference rankings of doctors that are consistent with both taste-based discrimination and statistical discrimination by checking whether their revealed caste preferences in their giving behaviors are consistent with their inferred caste preferences in the field experiment, we will reduce the maximum share of taste-based discriminators by more than half.

We have seen in Figure 11 that both high-caste and low-caste subjects tend to give more to individuals from a low-caste background and to individuals living below the poverty line. Since low-caste individuals are more likely to live below the poverty line,²⁰ it is plausible that the tendency for all individuals to give more to low-caste individuals reflects preferences to help people in need of financial assistance.

In order to have a more accurate classification of the caste preferences revealed in giving behavior, we control for the tendency of individuals to give more to the poor. We refine List's (2004) method and estimate the following equation by caste of patient and area to obtain the residuals $\widehat{\varepsilon}_i^p$:

$$G_{cH,i}^p - G_{cL,i}^p = \alpha_0 + \alpha_1 G_{APL,i}^p + \alpha_2 G_{BPL,i}^p + \beta' X_i^p + \varepsilon_i^p$$

where $G_{cH,i}^p$ and $G_{cL,i}^p$ are the amounts given to the high- and low-caste patient i , $G_{APL,i}^p$ and $G_{BPL,i}^p$ are the amounts given to *APL* (above the poverty line) and *BPL* (below the poverty line) individuals, and X_i^p is a set of characteristics of patient i , which include gender, religion, poverty status, and education.

We infer a person's caste preference in the lab-in-the-field experiment using the residuals $\widehat{\varepsilon}_i^p$. If the residual is below zero, i.e., $\widehat{\varepsilon}_i^p < 0$, then the patient exhibits a preference for low caste in giving behavior. This is because the negative residual informs us that this person gives relatively more to a low-caste person than a high-caste person even after considering the person's tendency to give more to the poor (who are more likely to be low-caste). The excess giving is consistent with this patient having a preference for low caste. If the residual is greater than zero, i.e., $\widehat{\varepsilon}_i^p > 0$, then the patient exhibits a preference for high caste in giving behavior.

Figure 13 shows the share of patients whose caste preference revealed in their giving behaviors (based on $\widehat{\varepsilon}_i^p$) is consistent with their caste preference inferred from their preference rankings of doctors in the field experiment. Panel (A) shows that around 20% of low-caste patients with preference rankings of doctors that are consistent with heterophily taste-based discrimination also exhibit heterophily preference in their giving behavior, whereas panel (B) shows that roughly 14% of high-caste patients with preference rankings of doctors that are consistent with heterophily taste-based discrimination also exhibit heterophily preference in their giving behavior. On the other hand, 28% of low-caste patients with preference rankings of doctors that are consistent with homophily taste-based discrimination also exhibit homophily preference in their giving behavior (panel A). This figure is 49% for high-caste pa-

²⁰In our full sample, low-caste individuals are 33 percent more likely to live below the poverty line than high-caste individuals.

tients. If we reclassify patients' preference rankings of doctors that are consistent with both taste-based discrimination and statistical discrimination by checking whether their caste preferences inferred from their giving behaviors are consistent with their caste preferences inferred from their rankings of doctors, we will reduce the maximum share of taste-based discriminators by approximately 44%.

[Insert Figure 13 here]

6.3 Results after reclassification

After using the three methods to reclassify preference rankings of doctors consistent with both taste-based discrimination and statistical discrimination into preference rankings of doctors only consistent with statistical discrimination, we present the results in Table 4. In panel A, we present the results using the survey method of reclassification. In panel B, we present the results using the List's (2004) method of reclassification. In panel C, we present the results using the refinement of List's (2004) method of reclassification. For comparison, we also reproduce the results before reclassification in panel D. Column (1) presents the distributions for low-caste patients, column (2) presents the distributions for high-caste patients, and column (3) presents the distributions for all patients.

[Insert Table 4 here]

The maximum share of taste-based discriminators falls considerably for both low-caste and high-caste patients using the survey method of reclassification. For low-caste patients, it decreases from 57% (column (1) in panel D) to 22% (column (1) in panel A) while, for high-caste patients, it decreases from 59% (column (2) in panel D) to 27% (column (2) in panel A). When we combine patients of all castes, we see, in column (3), independently of their caste, the maximum share of taste-based discriminators decreases from 57% (panel D) to 23% (panel A). In comparison, the share of patients who are unambiguously statistical discriminators increases from 43% (column (3) in panel D) to 77% (column (3) in panel A).

Panel B shows that the upper bound of taste-based discrimination decreases to 24% and 26%, respectively, for low-caste patients (column (1)) and high-caste patients (column (2)) using List's (2004) method for reclassification. When we combine patients of all castes, we see that independently of their caste, the maximum share of taste-based discriminators falls to 25% in column (3) in panel B. In comparison, the share of patients who are unambiguously statistical discriminators increases from 43% (column (3) in panel D) to 75% (column (3)

in panel B). The reclassification using List’s (2004) method gives similar results to the reclassification using the survey method.

Panel C shows the results using the refinement of List’s (2004) method for reclassification. Columns (1) and (2) show that the maximum share of taste-based discriminators decreases to 28% and 40% for low-caste patients and high-caste patients, respectively. When we combine all patients, we see that the upper bound of taste-based discrimination decreases from 57% (in panel D) to 31% in column (3) in panel C. This figure is a little larger than the 23% and 25% using the survey method and List’s (2004) method for reclassification.

6.4 Summary of results

We now summarize how the shares of patients whose rankings of doctors are consistent with the two theories of discrimination change as we alter the way we classify their rankings according to the various theoretical predictions and whether their inferred caste preferences are compatible across settings.

When we do not allow the experience of doctors to be negatively correlated with their quality of service, 53% of patients exhibit preferences that are consistent with both taste-based and statistical discrimination, 27% of patients exhibit preferences only consistent with statistical discrimination, and 20% of patients exhibit preferences that are consistent with neither theories.

When we allow the quality of a doctor’s service to be negatively correlated with their experience, the upper bound of taste-based discrimination increases to 57%, while the share of patients who are unambiguously statistical discriminators increases to 43%.

When we assume that caste preferences are deep and context invariant and use caste preferences that patients reveal in attitudinal questions in the survey to redefine taste-based discrimination, the upper bound of taste-based discrimination decreases to 23%.

When we assume that caste preferences are deep and context invariant and use caste preferences that patients reveal in their giving behaviors in the lab-in-the-field experiment to redefine taste-based discrimination according to List’s (2004) method, the upper bound of taste-based discrimination decreases to 25%.

Finally, when we use patients’ giving behaviors in the lab-in-the-field experiment and control for their characteristics to redefine taste-based discrimination, the upper bound of taste-based discrimination decreases to 31%.

Thus, using our novel methodology and the assumption that caste preferences are invariant, we find the upper bound of taste-based discrimination is 23% to 31%. The results

imply that the majority of patients statistically discriminate physicians on the basis of caste in Uttar Pradesh, India.

6.5 Characteristics of the discriminators

In Table 5, we examine whether the mean characteristics of the various types of discriminators differ by caste. The definitions of “pure” statistical discriminators are based on the definition after reclassifying rankings consistent with both theories into only statistical discrimination using the survey information about relative positive attitudes towards different castes. There are some differences in the mean characteristics of the two types of discriminators. For example, individuals with preference rankings of doctors consistent with homophily taste-based discrimination and statistical discrimination are more likely to be Hindu, female and living below the poverty line than individuals with preference rankings of doctors consistent with heterophily taste-based discrimination and statistical discrimination. On the other hand, individuals with preference rankings of doctors uniquely consistent with statistical discrimination are more likely to be low-caste, younger, Hindu, male, and living below the poverty line than those with preference rankings of doctors consistent with both homophily taste-based discrimination and statistical discrimination.

[Insert Table 5 here]

7 Robustness checks

7.1 Preferences for attributes other than caste and experience

In the taste-based discrimination model, we assume that a patient has only preferences for the social closeness of a doctor in terms of caste, Φ , and the quality of health care, $q(e)$, but nothing else. In reality, patients are likely to have preferences for other attributes of a doctor. A good example is the *gender* of a doctor. Now imagine that, in our experiment, patients are shown only two of the three attributes in their consumption bundle \mathbf{x} . Given that they also have preferences for the gender of a doctor, it is plausible to think that they may use the doctor’s experience to infer the doctor’s gender because female doctors are increasingly more represented in the medical profession in India (Bhadra, 2011). This possibility is similar to the Heckman’s (1998) critique about using experiments to detect taste-based discrimination. Note that, to put aside the possibility of caste-based statistical discrimination, we still assume that these patients do not use the doctor’s caste to help

make inferences. In this case, differences in the predicted gender of a doctor across patients will influence how they rank the four doctors. The possible rankings under taste-based discrimination for the case when patients try to infer the unobserved attribute from an observed attribute in $\mathbf{x} \in \mathbb{R}_+^3$ may thus include more than the eight possible rankings we have highlighted above for the case when $\mathbf{x} \in \mathbb{R}_+^2$.

If the share of (uniquely) statistical discriminators does not vary significantly when additional correlated attributes are taken into consideration, then our results are unlikely to be biased due to taste-based discriminators using observable attributes of a doctor to infer other unobservable attributes of the doctor for which they have preferences.

We thus examine if the findings for male and female patients differ between the case when all the four doctors are females and the case when all the four doctors are males. The results are reported in Table 6. Column (1) reports the results for male patients and male doctors, column (2) reports the results for male patients and female doctors, column (3) reports the results for female patients and male doctors, and column (4) reports the results for female patients and female doctors. The share of discriminators who have preference rankings consistent with only statistical discrimination is similar regardless of whether they are presented with female or male doctors. Therefore, our results are robust to the possibility that taste-based discriminators use a doctor’s experience to make inferences about other unobserved attributes of the doctor.²¹

[Insert Table 6 here]

7.2 Patients may strategically manipulate the rankings of doctors

It is plausible that patients may strategically manipulate the rankings of doctors as in the matching literature, such as for the choice of schools.²²

We believe that such an issue is not as relevant in our specific context. Our subjects were not making decisions in the setting with which the matching literature is typically concerned. First, our subjects were given a short amount of time to choose from a set of doctors that they never heard or visited before (doctors with fictitious names). The information given about these doctors was also very limited (surnames, experience, and gender). Second,

²¹In the Online Appendix D, instead of the gender of the doctor, we consider his or her age, an unobserved attribute that is also correlated with experience as younger doctors are on average less experienced. We show that our findings are similar when the high-experience doctors have 12 years of experience and when they have 8 years of experience.

²²For overviews of the matching literature, see Roth and Sotomayor (1990) and Sönmez and Ünver (2011).

our subjects were making decisions for a one-off experience that was expected to last no more than 15 minutes. Third, subjects were not informed about the exact probability of each doctor being chosen. These features contrast the situations of school choice that the matching literature studies, where parents have rich information about the schools available, the number of slots available relative to the number of applicants, have substantial amount of time to make decisions, and an understanding as to where their child will eventually end up attending the school for many years to come.

However, even if it is very unlikely, we investigate the sensitivity of our results to the possibility that patients strategically manipulate the top-two ranked doctors by putting their most preferred doctors as the second most-preferred doctors. For that, we swap the order of the two top-ranked doctors among patients who show rankings only consistent with statistical discrimination.

In column (1) in Table 7, we report the results based on the three methods of reclassifying taste-based discrimination. Quite naturally, the maximum share of taste-based discriminators increases and is now between 37% and 50%. The conclusion that majority of patients are unambiguously statistical discriminators remains unchanged.

[Insert Table 7 here]

7.3 Patients may not care much about the lower-ranked doctors

It is also plausible that some patients may only care about their most-preferred choices (the first-two doctors that they rank) and do not care much about their less-preferred choices (the last two doctors that they rank). In other words, they may be *indifferent* between lower-ranked doctors and, as a result, may *randomly* rank these less-preferred doctors. Because the ranking of the last two doctors affects our inference of whether the person's ranking is consistent with statistical discrimination only or with both taste-based and statistical discrimination, we need to verify how these labels are affected when we change the ranking of the last two doctors. For that, we swap the two bottom-ranked doctors for rankings only consistent with statistical discrimination and turn them into rankings consistent with both theories to assess the sensitivity of our results to this type of randomization.

Column (2) in Table 7 reports the results based on the three methods of reclassifying taste-based discrimination. After we swap the last two ranked doctors, the upper bound of taste-based discrimination varies between 37% and 50%. These results give us confidence that, at least half of the patients are unambiguously statistical discriminators.

7.4 Accounting for non-discriminators

Given the evidence of discrimination in Figures 6 and 7, in order to bound the extent of taste-based discrimination, we have assumed that all patients were discriminating. To assess the sensitivity of our findings to the assumption that all patients discriminate, we now consider two alternative approaches. First, we assume that the 20% of patients who may prefer doctors with fewer years of experience (i.e., those with $q'(e) > 0$ or the “neither” group in Table 2) are non-discriminators. Second, we perform some numerical simulations where we randomly choose the share of non-discriminators and check how the other patients discriminate against doctors.

7.4.1 Non-discriminating patients prefer doctors with fewer years of experience

We assume that the 20% of patients who behave according to neither theories in Table 2 are now non-discriminators. We implement the same analysis as above using the three methods of reclassification (the survey method, List’s method, and refinement of List’s method) to reclassify taste-based discriminators as statistical discriminators but keeping these 20% of individuals as non-discriminators instead of considering them as discriminators with preferences such that $q'(e) < 0$. The results are displayed in column (3) in Table 7. We see that among discriminators, the upper bound of taste-based discrimination is in the range of 27% and 36%, which is not too different those reported above.

7.4.2 Simulating the share of non-discriminators

We now perform the last robustness check by running simulations where we assume that a fraction of individuals in our field experiment do not discriminate doctors on the basis of caste and then implement the same analysis as above using the three methods of reclassification (the survey method, List’s method, and refinement of List’s method) to reclassify taste-based discriminators as statistical discriminators. Specifically, we select a random subset of individuals according to the assumed share of discriminators in each round of the simulation and perform 1,000 rounds of simulation for each assumed share of discriminators. The results are displayed in Table 8. The first column, the share of individuals who are not discriminators is assumed to be 5%, then 25% (column (2)) and then 50% (column (3)).

Whether we consider 50% or 95% discriminators, The upper bound of taste-based discrimination stays between 23% and 32%. Thus, our conclusion that the majority of patients are statistical discriminators is robust to allowing a fraction of patients who are not discriminators.

[Insert Table 8 here]

8 Conclusion

This paper highlights the challenge in separating the predictions of taste-based discrimination from the predictions of statistical discrimination and devises a method to bound the extent of taste-based discrimination. Although the predictions of the two main discrimination theories are often identical, it is important to distinguish the two sources of discrimination and understand the scope of statistical discrimination in explaining the extent to which minority, historically disadvantaged, or under-represented groups endure discrimination. By conducting a field experiment in Uttar Pradesh, India, which elicits patients' rankings of physicians of different castes and years of experience, we show that as much as 57% of caste-based discriminatory behaviors of patients are consistent with taste-based discrimination.

If we assume that caste preferences are deep in the sense that they similarly permeate all aspects of an individual's choices, we can narrow the estimated upper bound of taste-based discrimination with the help of additional instruments. In particular, we measure patients' attitudes towards different caste groups collected from survey questions and an incentivized lab-in-the-field experiment. If the revealed preferences of patients from a low or high-caste contradict themselves between the ranking of doctors in the field experiment and the survey and/or the lab-in-the-field experiment, we are able to further determine the persons who are "pure" statistical discriminators among those whose discriminatory choices in the field experiment are consistent with both types of discrimination. This novel methodology allows us to reduce the estimated upper bound of taste-based discriminators from 57% to 23–31%.

The findings imply that, irrespective of caste, at least 69% to 77% of patients statistically discriminate against doctors, especially low-caste doctors. This is a lower bound since, for the other category, we are not able to distinguish taste-based and statistical discriminators. Thus, the majority of patients statistically discriminate against doctors on the basis of caste in India. The findings have important implications for the use of affirmative action (AA) policies. On the one hand, the finding that patients statistically discriminate against doctors on the basis of caste provides justification for the use of caste-based AA policies to address discrimination. On the other hand, given that the majority of patients are statistical discriminators, our findings highlight that policy makers need to be cautious about how AA policies are implemented (Coate and Loury, 1993). For example, since AA policies in college admissions benefit low-caste students to gain entry into selective majors and occupations,

these policies may reinforce the negative perception that low-caste doctors are less qualified and thus backfire since individuals may statistically discriminate even more low-caste doctors on the basis that they are less qualified than high-caste doctors. As a result, there are two countervailing effects of AA policies: it increases the investment in education of low-caste individuals but may reinforce the negative stereotype people have against low-caste doctors. These issues are complex, and we do not know if the large fraction of statistical discriminators in our field experiment are a reaction to the AA policies implemented in India or just reflect the individuals' beliefs in terms of low-caste doctors.

More generally, our methodology can be applied in many other settings to understand the primary sources of discrimination along different dimensions, such as race, ethnicity, gender, religion, age, etc. Given the recent major events around the world, such as the Black Lives Matter movement and the Covid-19 related racism, identifying the extent of taste-based discrimination can be a first step towards implementing appropriate policy responses to address the underlying problems.

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Figure 1: Low-caste homophily patients' preferences for and rankings of doctors with different levels of caste closeness and quality of health care

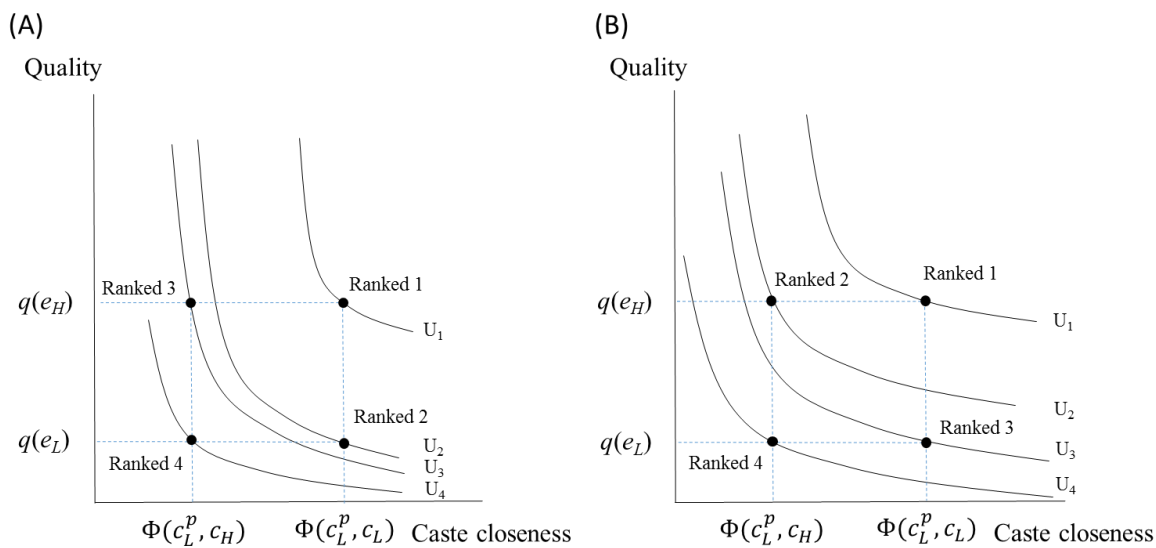


Figure 2: Low-caste heterophily patients' preferences for and rankings of doctors with different levels of caste closeness and quality of health care

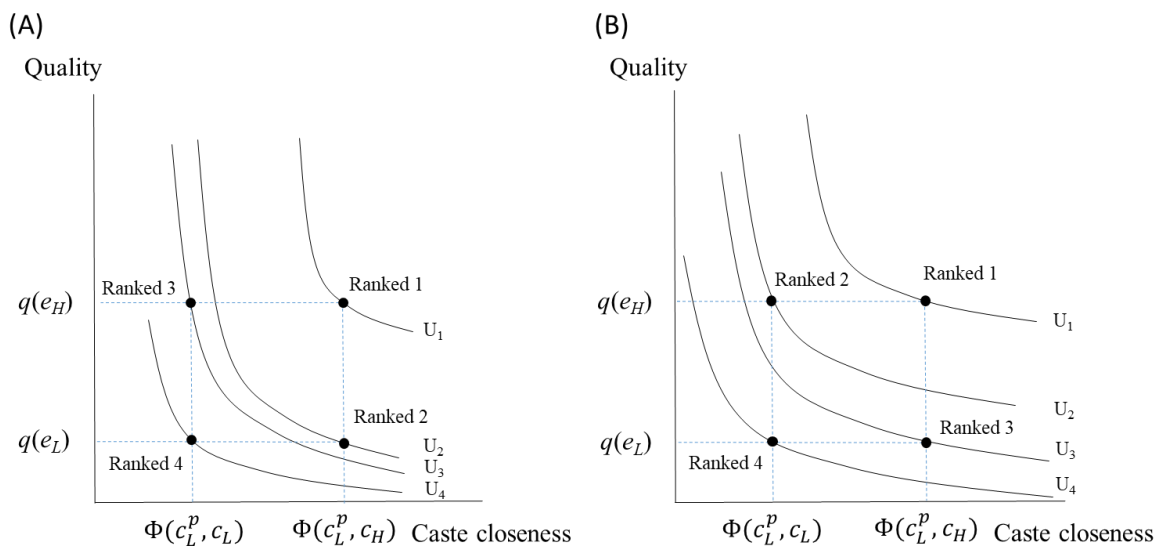


Figure 3: High-caste homophily patients' preferences for and rankings of doctors with different levels of caste closeness and quality of health care

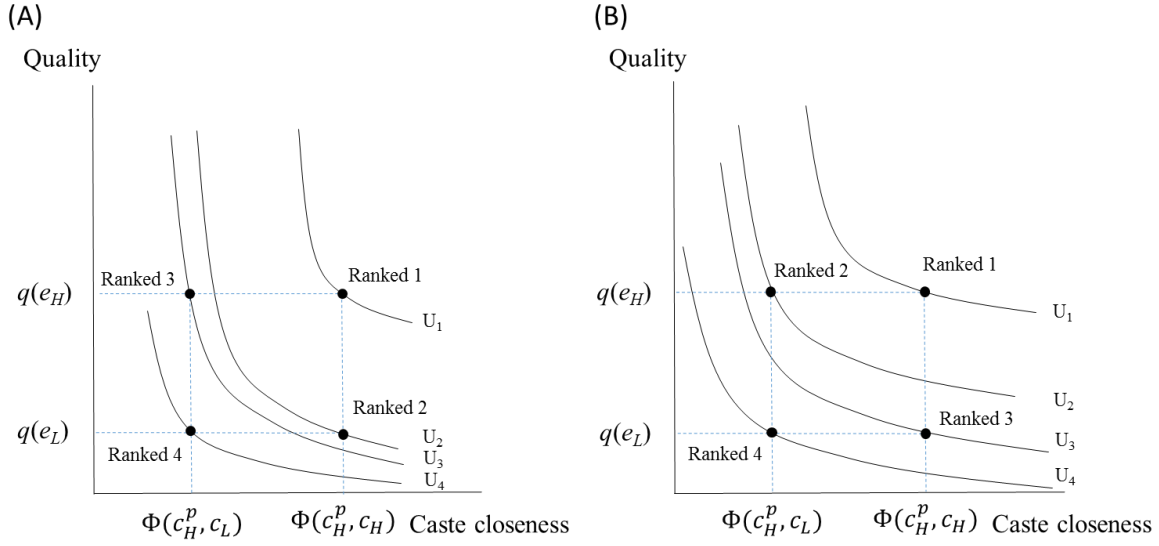


Figure 4: High-caste heterophily patients' preferences for and rankings of doctors with different levels of caste closeness and quality of health care

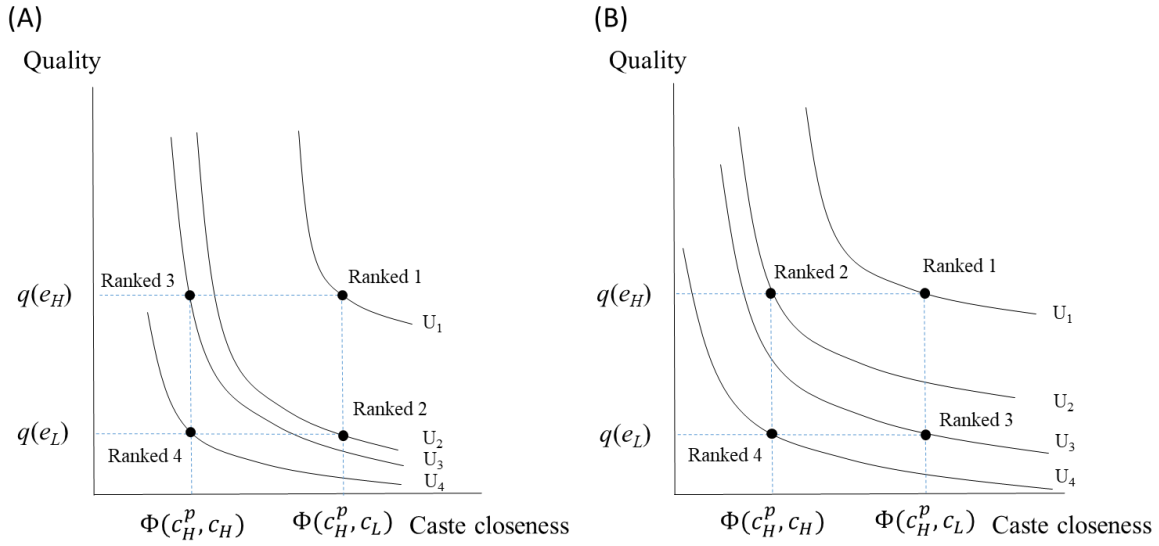


Figure 5: Rankings of doctors with different levels of caste closeness and expected quality of health care when patients statistically discriminate

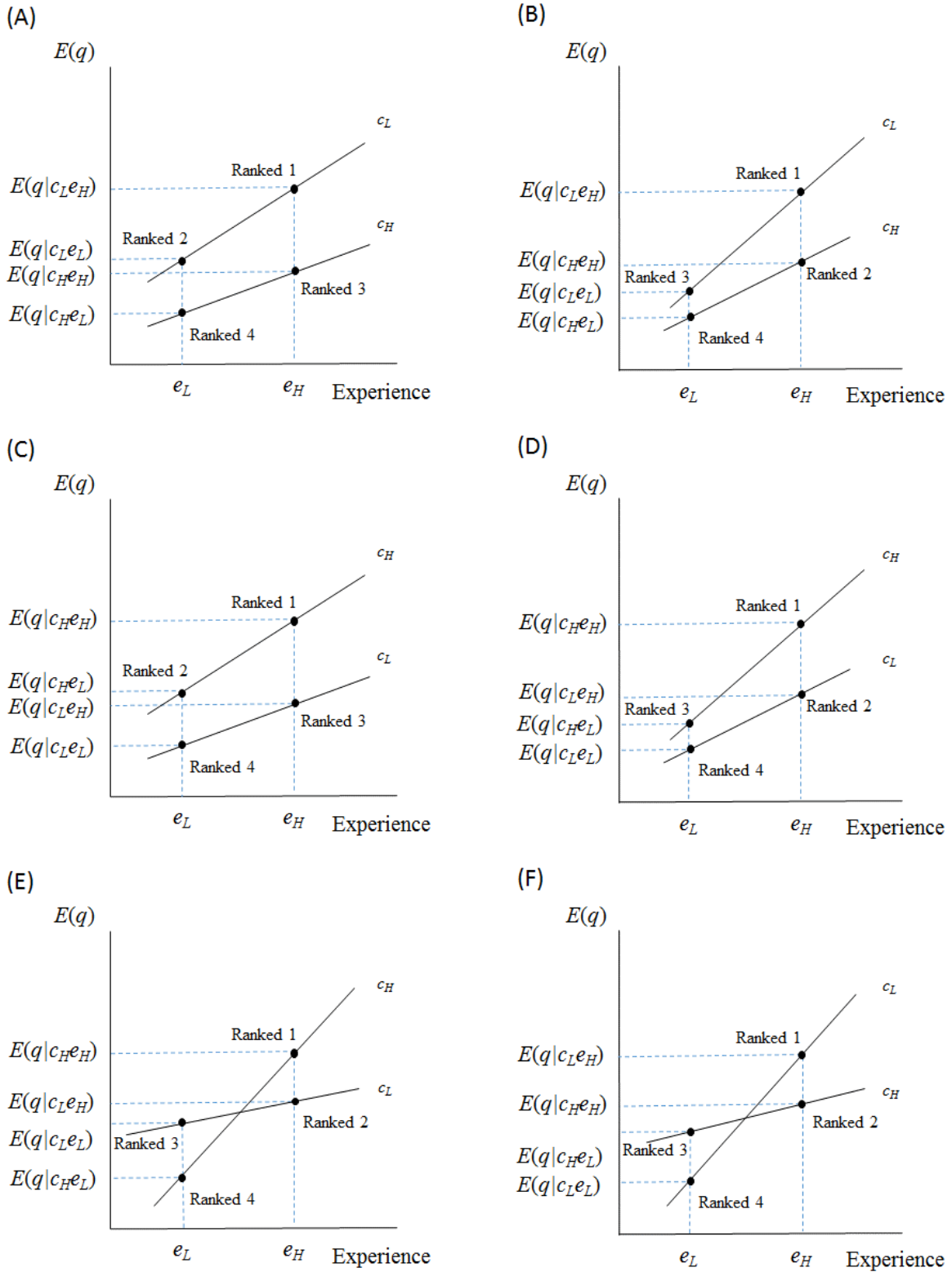
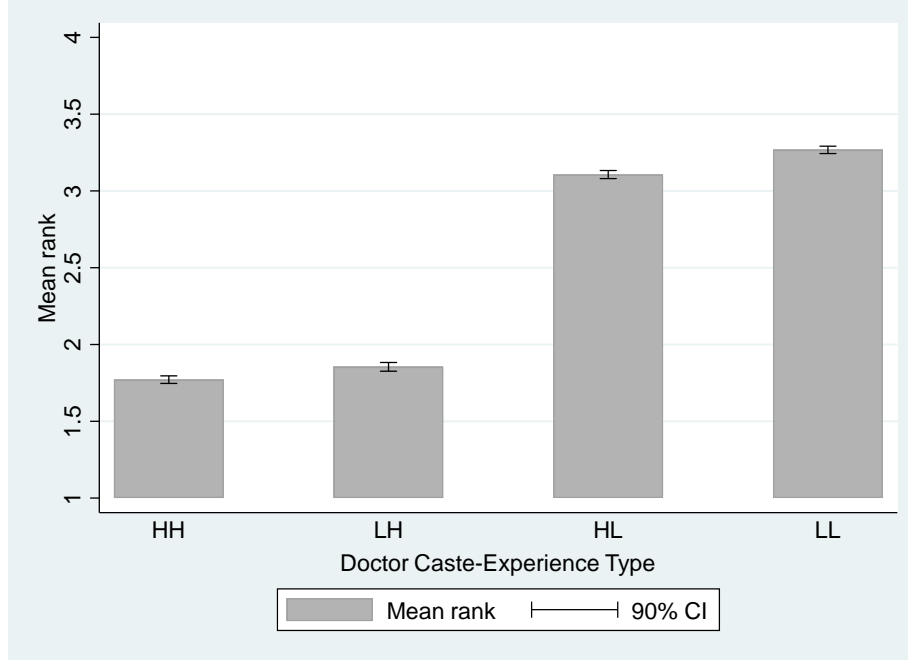
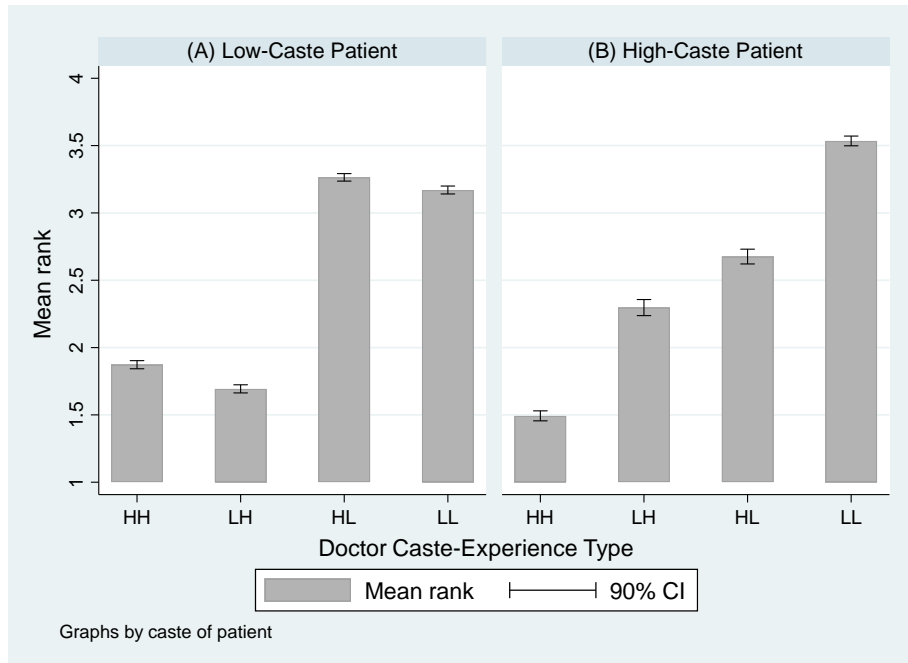


Figure 6: Mean rank by doctor type – Pooling patients of all caste groups



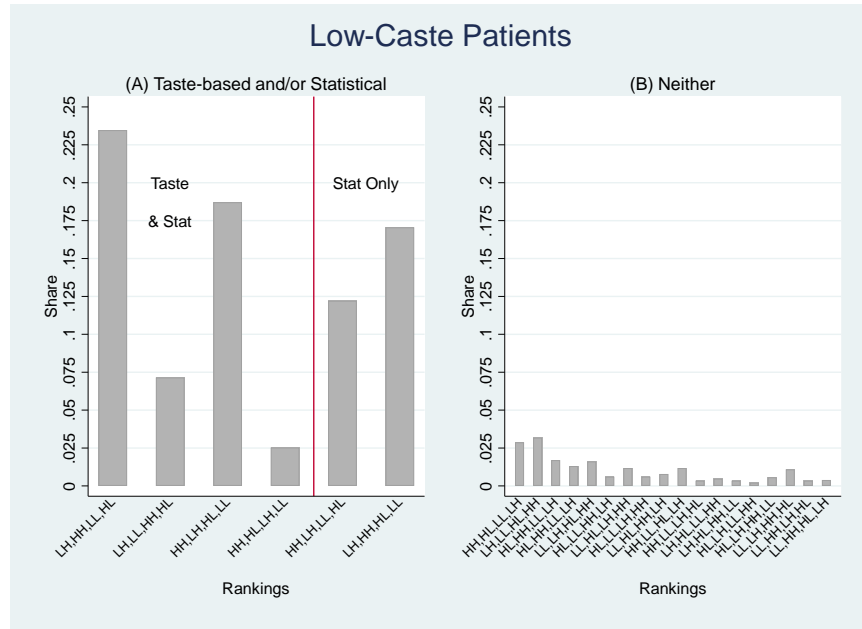
Notes: Higher mean rank means less preferred. Doctor caste-type is denoted by caste and experience. HH = high caste and high experience; LH = low caste and high experience; HL = high caste and low experience; and LL = low caste and low experience. Standard errors clustered at the patient level.

Figure 7: Mean rank by doctor type and caste of patients



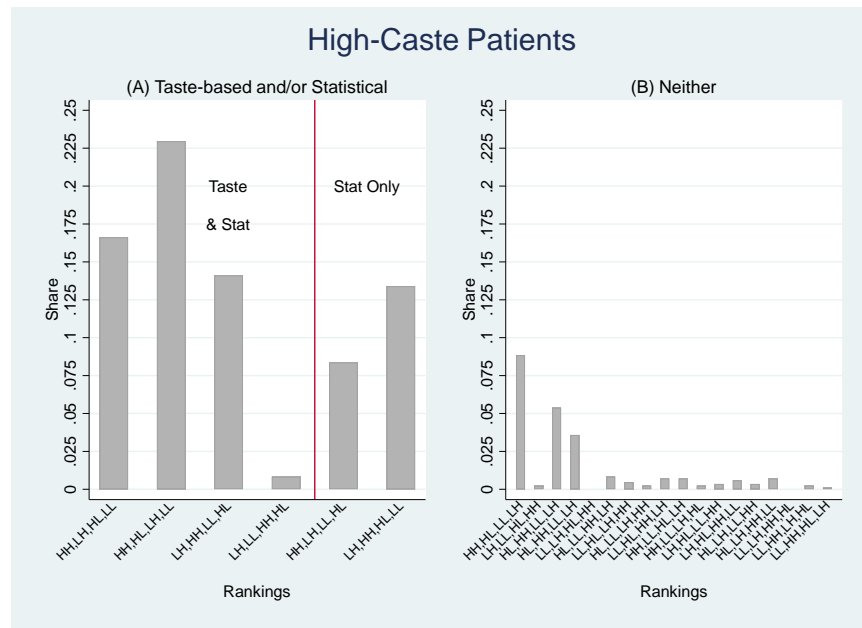
Notes: Higher mean rank means less preferred. Doctor caste-type is denoted by caste and experience. HH = high caste and high experience; LH = low caste and high experience; HL = high caste and low experience; and LL = low caste and low experience. Standard errors clustered at the patient level.

Figure 8a: Distribution of rankings for low-caste patients, assuming experience is positively correlated with quality



Notes: HH = high caste and high experience; LH = low caste and high experience; HL = high caste and low experience; and LL = low caste and low experience. For example, the ranking order “HH,LH,HL,LL” means that high-caste high-experience doctor is the most preferred, low-caste high-experience doctor is the second most preferred, and so on.

Figure 8b: Distribution of rankings for high-caste patients, assuming experience is positively correlated with quality



Notes: HH = high caste and high experience; LH = low caste and high experience; HL = high caste and low experience; and LL = low caste and low experience. For example, the ranking order “HH,LH,HL,LL” means that high-caste high-experience doctor is the most preferred, low-caste high-experience doctor is the second most preferred, and so on.

Figure 9: Distribution of preference rankings consistent with different theories by 8-vs-4 years and 12-vs-4 years of experience, assuming experience is positively correlated with quality

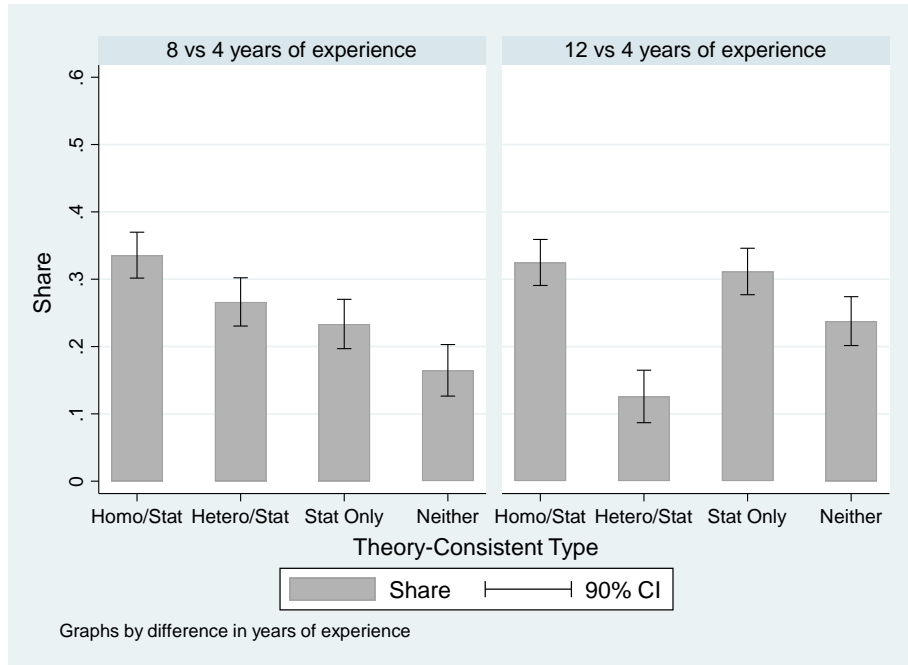


Figure 10: Distribution of patients whose caste preferences for doctors are consistent with their caste preferences revealed in survey

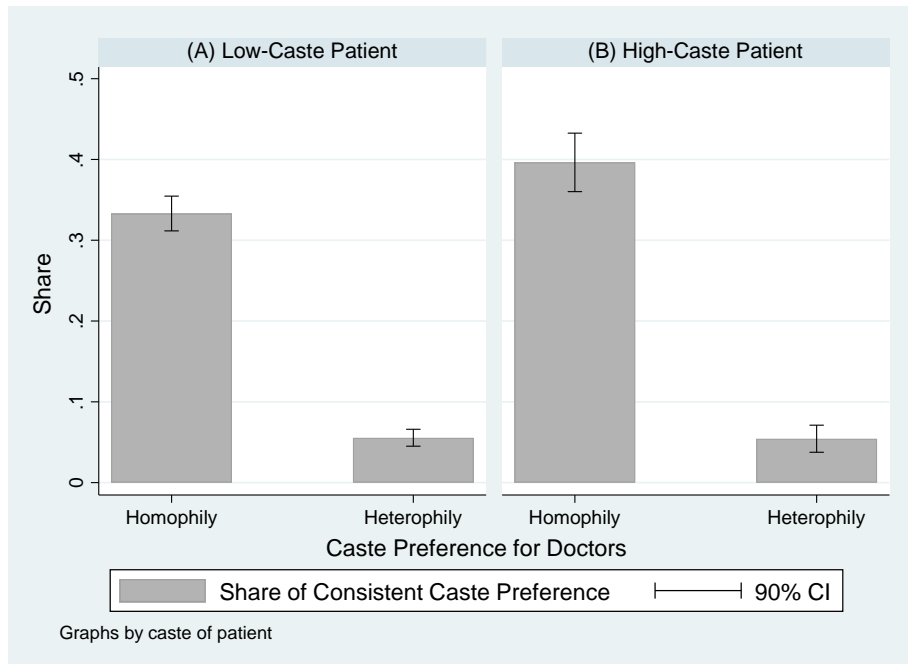


Figure 11: Mean Amount Given to Different Groups by Caste of Patient

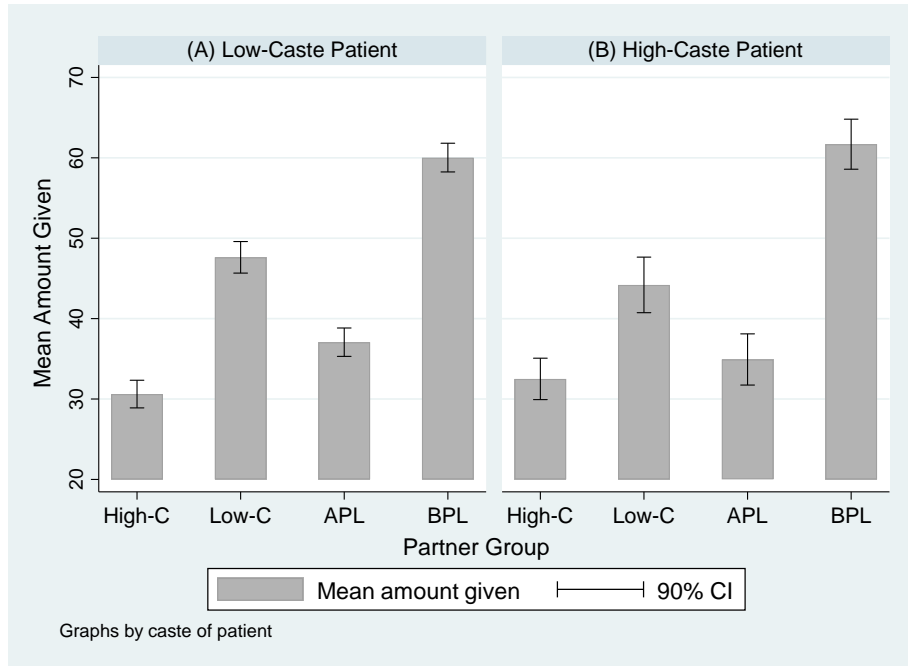


Figure 12: Distribution of patients whose caste preferences for doctors are consistent with their caste preferences in giving based on List's (2004) method

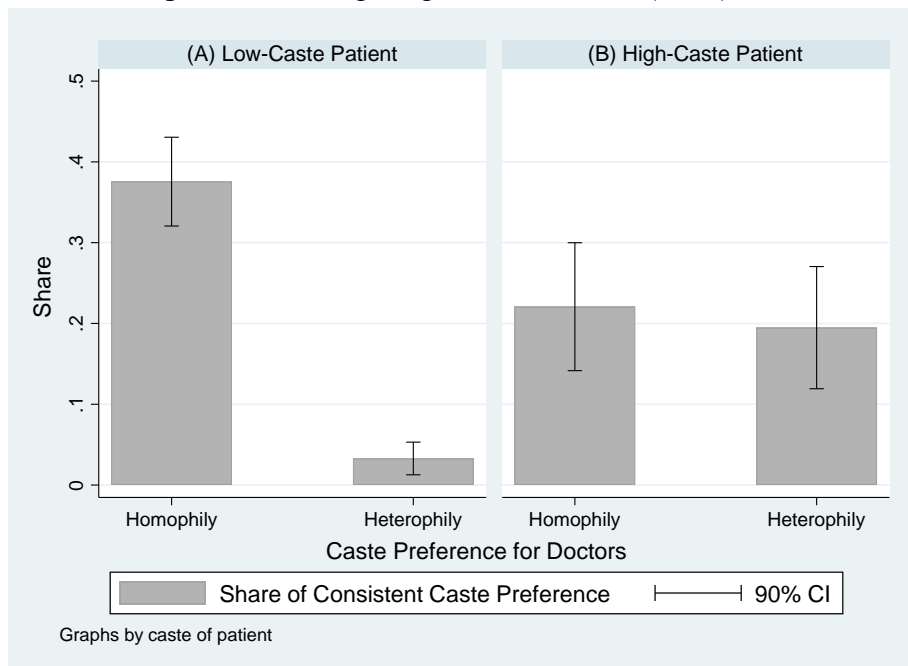


Figure 13: Distribution of patients whose caste preferences for doctors are consistent with their caste preferences in giving based on refinement of List's (2004) method

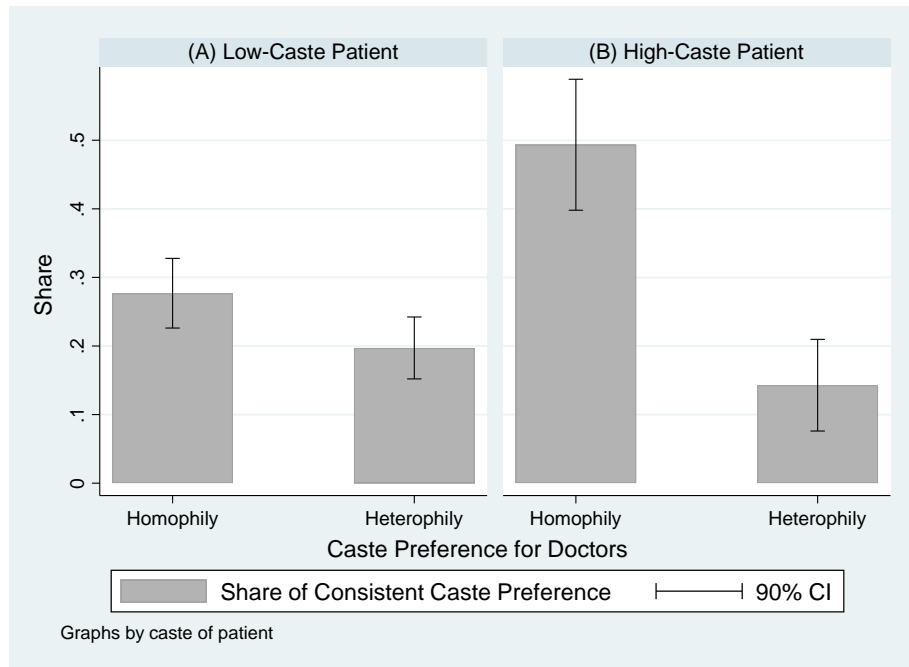


Table 1: Descriptive statistics

	Field Sample (n = 3,128)		Lab-in-the-field Sample (n = 482)		Uttar Pradesh
<i>Patient characteristics</i>	Mean	SD	Mean	SD	Mean
High caste – General category (GC)	0.27	0.44	0.26	0.44	0.27
Low caste –					
Other Backward Classes (OBC)	0.49	0.50	0.50	0.50	0.52
Scheduled Castes (SC)	0.24	0.42	0.24	0.43	0.19
Scheduled Tribes (ST)	0.00	0.06	0.01	0.08	0.01
Age	37.8	14.3	38.5	15.0	38.0
Hindu (or not)	0.80	0.40	0.76	0.43	0.80
Urban resident (or not)	0.34	0.48	0.33	0.47	0.34
Male (or not)	0.51	0.50	0.53	0.50	0.51
At least college educated (or not)	0.11	0.32	0.09	0.28	0.08
Below poverty line (or not)	0.34	0.47	0.34	0.47	0.29
High caste – General category (GC)					
Age	38.5	15.0	38.7	15.6	
Hindu (or not)	0.81	0.39	0.75	0.43	
Urban resident (or not)	0.31	0.46	0.37	0.49	
Male (or not)	0.49	0.50	0.58	0.50	
At least completed high school (or not)	0.17	0.38	0.12	0.33	
Below poverty line (or not)	0.25	0.43	0.30	0.46	
Low caste – OBC/SC/ST					
Age	37.6	14.0	38.5	14.8	
Hindu (or not)	0.79	0.40	0.77	0.42	
Urban resident (or not)	0.36	0.48	0.32	0.47	
Male (or not)	0.51	0.50	0.51	0.50	
At least completed high school (or not)	0.09	0.29	0.16	0.37	
Below poverty line (or not)	0.37	0.48	0.35	0.48	

Notes: The bottom two panels report statistics for high-caste patients and low-caste patients separately. All statistics for Uttar Pradesh were sourced from NSS 68th Round, 2011-12, except the below poverty line figure came from World Bank (2016).

Table 2: Distribution of preference rankings consistent with different theories by caste of patient, assuming experience signals better quality

	(1) Low-caste Patients	(2) High-caste Patients	(3) All Patients
Homophily taste-based or statistical discrimination	0.306 (0.010)	0.396 (0.017)	0.330 (0.008)
Heterophily taste-based or statistical discrimination	0.212 (0.009)	0.150 (0.012)	0.196 (0.007)
Uniquely statistical discrimination	0.293 (0.010)	0.218 (0.014)	0.273 (0.008)
Neither	0.188 (0.008)	0.237 (0.015)	0.201 (0.007)

Notes: Taste-based discrimination is indistinguishable from statistical discrimination. We assume that high experience signals better quality of healthcare service when classifying with which theory a particular ranking is consistent. Standard errors reported in parentheses.

Table 3: Distribution of preference rankings consistent with different theories by caste of patient, when experience can be positively or negatively correlated with quality

	(1) Low-caste Patients	(2) High-caste Patients	(3) All Patients
Homophily taste-based or statistical discrimination	0.334 (0.010)	0.440 (0.017)	0.363 (0.009)
Heterophily taste-based or statistical discrimination	0.232 (0.009)	0.154 (0.013)	0.211 (0.007)
Uniquely statistical discrimination	0.434 (0.010)	0.406 (0.017)	0.426 (0.009)

Notes: Taste-based discrimination is indistinguishable from statistical discrimination. High experience may signal better or worse quality of healthcare service when classifying with which theory a particular ranking is consistent. Standard errors reported in parentheses.

Table 4: Distribution of preference rankings consistent with different theories by caste of patient after reclassification of taste-based discrimination, when experience can be positively or negatively correlated with quality

	(1) Low-caste Patients	(2) High-caste Patients	(3) All Patients
A. Survey method of reclassification			
Homophily taste-based or statistical discrimination	0.188 (0.008)	0.236 (0.015)	0.201 (0.007)
Heterophily taste-based or statistical discrimination	0.031 (0.004)	0.032 (0.006)	0.032 (0.003)
Uniquely statistical discrimination	0.780 (0.009)	0.732 (0.015)	0.767 (0.008)
B. List's (2004) method of reclassification			
Homophily taste-based or statistical discrimination	0.223 (0.022)	0.137 (0.031)	0.201 (0.018)
Heterophily taste-based or statistical discrimination	0.020 (0.007)	0.121 (0.029)	0.046 (0.010)
Uniquely statistical discrimination	0.757 (0.023)	0.742 (0.039)	0.753 (0.020)
C. Refinement of List's (2004) method of reclassification			
Homophily taste-based or statistical discrimination	0.165 (0.020)	0.306 (0.042)	0.201 (0.018)
Heterophily taste-based or statistical discrimination	0.117 (0.017)	0.089 (0.026)	0.110 (0.014)
Uniquely statistical discrimination	0.718 (0.024)	0.605 (0.044)	0.689 (0.021)
D. Before reclassification			
Homophily taste-based or statistical discrimination	0.334 (0.010)	0.440 (0.017)	0.363 (0.009)
Heterophily taste-based or statistical discrimination	0.232 (0.009)	0.154 (0.013)	0.211 (0.007)
Uniquely statistical discrimination	0.434 (0.010)	0.406 (0.017)	0.426 (0.009)

Notes: Taste-based discrimination is indistinguishable from statistical discrimination. High experience may signal better or worse quality of healthcare service when classifying with which theory a particular ranking is consistent. Standard errors reported in parentheses.

Table 5: Mean characteristics of different types of discriminators

	(1) Homophily or statistical	(2) Heterophily or statistical	(3) Uniquely statistical	(4) Difference (1) - (2)	(5) Difference (1) - (3)	(6) Difference (2) - (3)
High caste	0.313 [0.464]	0.273 [0.448]	0.255 [0.436]	0.040 (0.048)	0.058*** (0.021)	0.018 (0.046)
Age	38.995 [13.933]	38.030 [14.708]	37.490 [14.311]	0.965 (1.574)	1.505** (0.627)	0.540 (1.500)
Hindu	0.857 [0.350]	0.737 [0.442]	0.786 [0.410]	0.120** (0.046)	0.071*** (0.016)	-0.048 (0.045)
Urban	0.355 [0.479]	0.384 [0.489]	0.341 [0.474]	-0.029 (0.053)	0.014 (0.021)	0.043 (0.050)
Male	0.467 [0.499]	0.566 [0.498]	0.515 [0.500]	-0.098* (0.054)	-0.048** (0.022)	0.050 (0.051)
College	0.117 [0.322]	0.121 [0.328]	0.113 [0.317]	-0.004 (0.035)	0.004 (0.014)	0.008 (0.033)
BPL	0.372 [0.484]	0.283 [0.453]	0.335 [0.472]	0.089* (0.049)	0.037* (0.022)	-0.052 (0.046)

Notes: Types of discriminators defined after reclassification using survey information about relative attitudes towards different castes. Standard deviations reported in brackets and standard errors reported in parentheses. ***p<0.01; ** p<0.05; p<0.10.

Table 6: Robustness of results to genders of patients and doctors

	(1)	(2)	(3)	(4)
	Male	Male	Female	Female
	Patients	Patients	Patients	Patients
	Male	Female	Male	Female
	Doctors	Doctors	Doctors	Doctors
A. Survey method				
Homophily taste-based or statistical discrimination	0.184	0.186	0.213	0.222
	(0.014)	(0.014)	(0.015)	(0.015)
Heterophily taste-based or statistical discrimination	0.041	0.030	0.023	0.033
	(0.007)	(0.006)	(0.005)	(0.006)
Uniquely statistical discrimination	0.775	0.784	0.764	0.745
	(0.015)	(0.015)	(0.015)	(0.016)
B. List's (2004) method				
Homophily taste-based or statistical discrimination	0.154	0.229	0.215	0.215
	(0.031)	(0.039)	(0.040)	(0.037)
Heterophily taste-based or statistical discrimination	0.096	0.042	0.028	0.008
	(0.025)	(0.019)	(0.016)	(0.008)
Uniquely statistical discrimination	0.750	0.729	0.757	0.777
	(0.037)	(0.041)	(0.042)	(0.038)
C. Refinement of List's (2004) method				
Homophily taste-based or statistical discrimination	0.169	0.237	0.224	0.182
	(0.032)	(0.039)	(0.041)	(0.035)
Heterophily taste-based or statistical discrimination	0.140	0.093	0.075	0.124
	(0.030)	(0.027)	(0.026)	(0.030)
Uniquely statistical discrimination	0.691	0.669	0.701	0.694
	(0.040)	(0.043)	(0.044)	(0.042)

Notes: Taste-based discrimination is indistinguishable from statistical discrimination. High experience may signal better or worse quality of healthcare service when classifying with which theory a particular ranking is consistent. Standard errors reported in parentheses.

Table 7: Robustness of results to changing the order of the two top-ranked doctors and the two bottom-ranked doctors among rankings only consistent with statistical discrimination

	(1)	(2)	(3)
	Swap two top-ranked	Swap two bottom-ranked	Ignore the “neither”-type
A. Survey method			
Homophily taste-based or statistical discrimination	0.304 (0.016)	0.324 (0.008)	0.231 (0.008)
Heterophily taste-based or statistical discrimination	0.067 (0.009)	0.050 (0.004)	0.038 (0.004)
Uniquely statistical discrimination	0.628 (0.017)	0.626 (0.009)	0.731 (0.009)
B. List’s (2004) method			
Homophily taste-based or statistical discrimination	0.290 (0.021)	0.293 (0.021)	0.222 (0.021)
Heterophily taste-based or statistical discrimination	0.075 (0.012)	0.089 (0.013)	0.051 (0.011)
Uniquely statistical discrimination	0.635 (0.022)	0.618 (0.022)	0.727 (0.023)
C. Refinement of List’s (2004) method			
Homophily taste-based or statistical discrimination	0.293 (0.021)	0.301 (0.021)	0.230 (0.021)
Heterophily taste-based or statistical discrimination	0.205 (0.018)	0.195 (0.018)	0.125 (0.004)
Uniquely statistical discrimination	0.502 (0.023)	0.504 (0.023)	0.645 (0.009)

Notes: Taste-based discrimination is indistinguishable from statistical discrimination. High experience may signal better or worse quality of healthcare service when classifying with which theory a particular ranking is consistent. Standard errors reported in parentheses.

Table 8: The share of different types of discriminators

	Assume 95% discriminators	Assume 75% discriminators	Assume 50% discriminators
A. Survey method			
Homophily taste-based or statistical discrimination	0.201 [0.002]	0.201 [0.004]	0.201 [0.007]
Heterophily taste-based or statistical discrimination	0.032 [0.001]	0.032 [0.002]	0.032 [0.003]
Uniquely statistical discrimination	0.767 [0.002]	0.767 [0.005]	0.767 [0.008]
B. List's (2004) method			
Homophily taste-based or statistical discrimination	0.201 [0.004]	0.201 [0.011]	0.201 [0.018]
Heterophily taste-based or statistical discrimination	0.046 [0.002]	0.046 [0.005]	0.046 [0.009]
Uniquely statistical discrimination	0.753 [0.005]	0.754 [0.011]	0.753 [0.019]
C. Refinement of List's (2004) method			
Homophily taste-based or statistical discrimination	0.203 [0.004]	0.204 [0.011]	0.205 [0.019]
Heterophily taste-based or statistical discrimination	0.109 [0.004]	0.110 [0.008]	0.110 [0.015]
Uniquely statistical discrimination	0.688 [0.005]	0.686 [0.013]	0.686 [0.021]

Notes: Mean share is computed on the basis of 1000 repetitions of simulation. Standard deviation of the share of rankings reported in the bracket.

Online Appendix

A Rankings of doctors

A.1 Rankings of doctors when experience is positively correlated with quality

A.1.1 Homophily taste-based discrimination

We present a simple additively separable utility function for patients of caste $c = c_L, c_H$ to summarize the four possible rankings under taste-based discrimination when experience is assumed to be positively correlated with quality. We note that these rankings are true for any utility function that satisfies the five axioms of consumer choice specified in Section 2.1

The utility function for a low-caste patient c_L^p choosing a doctor of caste $c = c_L, c_H$ is given by:

$$U(\Phi(c_L^p, c), q) = q(e) - \mathbf{1}_{\theta_H} \quad (\text{A.1})$$

where $q'(e) > 0$ (higher experience doctors provide better-quality health service) and $\mathbf{1}_{\theta_H} = \theta_H > 0$ if the doctor is from a high-caste and zero otherwise. The indicator $\mathbf{1}_{\theta_H}$ indicates whether there is any distance between the doctor's caste group and the patient's caste group.

The possible rankings for a low-caste patient compatible with (A.1) are:

$$c_L e_H \succ c_L e_L \succ c_H e_H \succ c_H e_L$$

$$c_L e_H \succ c_H e_H \succ c_L e_L \succ c_H e_L$$

In the first ranking, we need to give the condition for which $c_L e_L \succ c_H e_H$ (the other inequalities are always true by definition since $e_H > e_L$). The condition is:

$$\theta_H > q(e_H) - q(e_L) \quad (\text{A.2})$$

For the second ranking, we need to give condition for which $c_H e_H \succ c_L e_L$ (the other inequalities are always true by definition since $e_H > e_L$). The condition is:

$$\theta_H < q(e_H) - q(e_L) \quad (\text{A.3})$$

The utility function for a high-caste patient c_H^p choosing a doctor of caste $c = c_L, c_H$ is given by:

$$U(\Phi(c_H^p, c), q) = q(e) - \mathbf{1}_{\theta_L} \quad (\text{A.4})$$

where $\mathbf{1}_{\theta_L} = \theta_L > 0$ if the doctor is from a low-caste and zero otherwise.

The possible rankings for a high-caste patient compatible with (A.4) are:

$$c_H e_H \succ c_H e_L \succ c_L e_H \succ c_L e_L$$

$$c_H e_H \succ c_L e_H \succ c_H e_L \succ c_L e_L$$

In the first ranking, we need to give the condition for which $c_H e_L \succ c_L e_H$ (the other inequalities are always true by definition since $e_H > e_L$). The condition is:

$$\theta_L > q(e_H) - q(e_L) \quad (\text{A.5})$$

For the second ranking, we need to give the condition for which $c_L e_H \succ c_H e_L$ (the other inequalities are always true by definition since $e_H > e_L$). The condition is:

$$\theta_L < q(e_H) - q(e_L) \quad (\text{A.6})$$

To summarize, with taste-based discrimination assuming that $q'(e) > 0$, there are 4 possible rankings. The possible rankings for a *low-caste patient* compatible with (A.1) are:

$$c_L e_H \succ c_L e_L \succ c_H e_H \succ c_H e_L$$

$$c_L e_H \succ c_H e_H \succ c_L e_L \succ c_H e_L$$

The possible rankings for a *high-caste patient* compatible with (A.4):

$$c_H e_H \succ c_H e_L \succ c_L e_H \succ c_L e_L$$

$$c_H e_H \succ c_L e_H \succ c_H e_L \succ c_L e_L$$

A.1.2 Heterophily taste-based discrimination

The utility function for a low-caste patient c_L^p choosing a doctor of caste $c = c_L, c_H$ is given by:

$$U(\Phi(c_L^p, c), q) = q(e) - \mathbf{1}_{\theta_L} \quad (\text{A.7})$$

where $q'(e) > 0$ (higher experience doctors provide better-quality health service) and $\mathbf{1}_{\theta_L} = \theta_L > 0$ if the doctor is from a low-caste and zero otherwise. The indicator $\mathbf{1}_{\theta_L}$ indicates whether there is any distance between the doctor's caste group and the patient's caste group.

The possible rankings for a low-caste patient compatible with (A.7) are:

$$c_{HeH} \succ c_{HeL} \succ c_{LeH} \succ c_{LeL}$$

$$c_{HeH} \succ c_{LeH} \succ c_{HeL} \succ c_{LeL}$$

The utility function for a high-caste patient c_H^p choosing a doctor of caste $c = c_L, c_H$ is given by:

$$U(\Phi(c_H^p, c), q) = q(e) - \mathbf{1}_{\theta_H} \quad (\text{A.8})$$

where $\mathbf{1}_{\theta_H} = \theta_H > 0$ if the doctor is from a high-caste and zero otherwise. The possible rankings for a low-caste patient compatible with (A.8) are:

$$c_{LeH} \succ c_{LeL} \succ c_{HeH} \succ c_{HeL}$$

$$c_{LeH} \succ c_{HeH} \succ c_{LeL} \succ c_{HeL}$$

A.1.3 Statistical discrimination

Assume that $Cov(q_c, e_c) > 0$. With statistical discrimination, there are 6 possible rankings and it does not depend on the caste of the patient. These 6 rankings compatible with (1) in Section 2.2 are given by:

$$c_{HeH} \succ c_{HeL} \succ c_{LeH} \succ c_{LeL}$$

$$c_{HeH} \succ c_{LeH} \succ c_{HeL} \succ c_{LeL}$$

$$c_{HeH} \succ c_{LeH} \succ c_{LeL} \succ c_{HeL}$$

$$c_{LeH} \succ c_{HeH} \succ c_{HeL} \succ c_{LeL}$$

$$c_{LeH} \succ c_{HeH} \succ c_{LeL} \succ c_{HeL}$$

$$c_{LeH} \succ c_{LeL} \succ c_{HeH} \succ c_{HeL}$$

A.2 Rankings of doctors when experience can be positively or negatively correlated with quality

A.2.1 Homophily taste-based discrimination

In that case, there are 8 possible rankings. (i) Consider *low-caste patients* with preferences given by (A.1). If experience is *positively* correlated with quality, i.e. $q'(e) > 0$, then we have:

$$c_{LeH} \succ c_{LeL} \succ c_{HeH} \succ c_{HeL}$$

$$c_{LeH} \succ c_{HeH} \succ c_{LeL} \succ c_{HeL}$$

(ii) Consider *low-caste patients* with preferences given by (A.1). If experience is *negatively* correlated with quality, i.e. $q'(e) < 0$, then we have:

$$c_{LeL} \succ c_{LeH} \succ c_{HeL} \succ c_{HeH}$$

$$c_{LeL} \succ c_{HeL} \succ c_{LeH} \succ c_{HeH}$$

(iii) Consider *high-caste patients* with preferences given by (A.4). If experience is *positively* correlated with quality, i.e. $q'(e) > 0$, then we have:

$$c_{HeH} \succ c_{HeL} \succ c_{LeH} \succ c_{LeL}$$

$$c_{HeH} \succ c_{LeH} \succ c_{HeL} \succ c_{LeL}$$

(iv) Consider *high-caste patients* with preferences given by (A.4). If experience is *negatively* correlated with quality, i.e. $q'(e) < 0$, then we have:

$$c_{HeL} \succ c_{LeL} \succ c_{HeH} \succ c_{LeH}$$

$$c_{HeL} \succ c_{HeH} \succ c_{LeL} \succ c_{LeH}$$

A.2.2 Heterophily taste-based discrimination

In that case, there are 8 possible rankings. (i) Consider *low-caste patients* with preferences given by (A.7). If experience is *positively* correlated with quality, i.e. $q'(e) > 0$, then we have:

$$c_{HeH} \succ c_{HeL} \succ c_{LeH} \succ c_{LeL}$$

$$c_{HeH} \succ c_{LeH} \succ c_{HeL} \succ c_{LeL}$$

(ii) Consider *low-caste patients* with preferences given by (A.7). If experience is *negatively* correlated with quality, i.e. $q'(e) < 0$, then we have:

$$c_{HeL} \succ c_{LeL} \succ c_{HeH} \succ c_{LeH}$$

$$c_{HeL} \succ c_{HeH} \succ c_{LeL} \succ c_{LeH}$$

(iii) Consider *high-caste patients* with preferences given by (A.8). If experience is *positively* correlated with quality, i.e. $q'(e) > 0$, then we have:

$$c_{LeH} \succ c_{LeL} \succ c_{HeH} \succ c_{HeL}$$

$$c_{LeH} \succ c_{HeH} \succ c_{LeL} \succ c_{HeL}$$

(iv) Consider *high-caste patients* with preferences given by (A.8). If experience is *negatively* correlated with quality, i.e. $q'(e) < 0$, then we have:

$$c_{LeL} \succ c_{LeH} \succ c_{HeL} \succ c_{HeH}$$

$$c_{LeL} \succ c_{HeL} \succ c_{LeH} \succ c_{HeH}$$

A.2.3 Statistical discrimination

Assume that both $Cov(q_c, e_c) > 0$ and $Cov(q_c, e_c) < 0$ are possible for a doctor of caste $c = c_L, c_H$. All of the patients statistically discriminate using (1) in Section 2.2. Then, in that case, all rankings are possible and there are therefore 24 possible rankings, which are given by:

(i) When doctors c_{HeH} are ranked first:

$$c_{HeH} \succ c_{HeL} \succ c_{LeH} \succ c_{LeL}$$

$$c_{HeH} \succ c_{HeL} \succ c_{LeL} \succ c_{LeH}$$

$$c_{HeH} \succ c_{LeH} \succ c_{HeL} \succ c_{LeL}$$

$$c_{HeH} \succ c_{LeH} \succ c_{LeL} \succ c_{HeL}$$

$$c_{HeH} \succ c_{LeL} \succ c_{HeL} \succ c_{LeH}$$

$$c_{HeH} \succ c_{LeL} \succ c_{LeH} \succ c_{HeL}$$

(ii) When doctors c_{HeL} are ranked first:

$$c_{HeL} \succ c_{HeH} \succ c_{LeH} \succ c_{LeL}$$

$$c_{HeL} \succ c_{HeH} \succ c_{LeL} \succ c_{LeH}$$

$$c_{HeL} \succ c_{LeH} \succ c_{HeH} \succ c_{LeL}$$

$$c_{HeL} \succ c_{LeH} \succ c_{LeL} \succ c_{HeH}$$

$$c_{HeL} \succ c_{LeL} \succ c_{HeH} \succ c_{LeH}$$

$$c_{HeL} \succ c_{LeL} \succ c_{LeH} \succ c_{HeH}$$

(iii) When doctors c_{LeH} are ranked first:

$$c_{LeH} \succ c_{HeH} \succ c_{HeL} \succ c_{LeL}$$

$$c_{LeH} \succ c_{HeH} \succ c_{LeL} \succ c_{HeL}$$

$$c_{LeH} \succ c_{HeL} \succ c_{HeH} \succ c_{LeL}$$

$$c_{LeH} \succ c_{HeL} \succ c_{LeL} \succ c_{HeH}$$

$$c_{LeH} \succ c_{LeL} \succ c_{HeH} \succ c_{HeL}$$

$$c_{LeH} \succ c_{LeL} \succ c_{HeL} \succ c_{HeH}$$

(iv) When doctors c_{LeL} are ranked first:

$$c_{LeL} \succ c_{HeH} \succ c_{HeL} \succ c_{LeH}$$

$$c_{LeL} \succ c_{HeH} \succ c_{LeH} \succ c_{HeL}$$

$$c_{LeL} \succ c_{HeL} \succ c_{HeH} \succ c_{LeH}$$

$$c_{LeL} \succ c_{HeL} \succ c_{LeH} \succ c_{HeH}$$

$$c_{LeL} \succ c_{LeH} \succ c_{HeH} \succ c_{HeL}$$

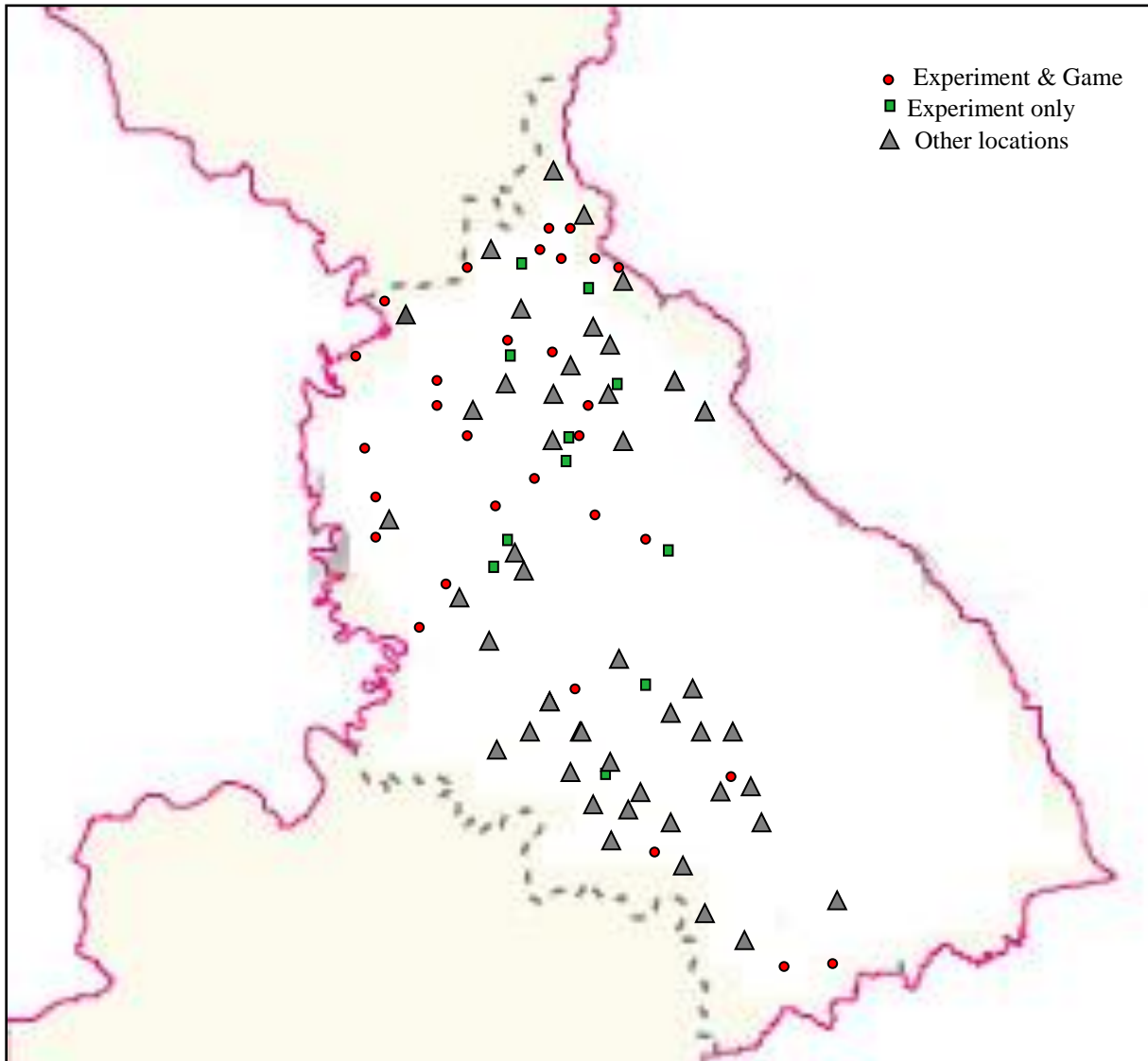
$$c_{LeL} \succ c_{LeH} \succ c_{HeL} \succ c_{HeH}$$

B Maps

Figure B.1 shows the location of Kanpur Nagar district in the state of UP while Figure B.2 displays all the locations where the experiment was conducted in Kanpur Nagar district. The areas covered in our study include Ratanpur, Lodhar, Kursauli, Maksudabad, Tikra, Singhpur, Hora, Paigupur, Pachor, Mandhana, Kukradev, Tikkanpurwa, Bairy, Mharajpur, Loharkheda, Pargahi, Guraha, Sandeela, Shadipur, Naurangabad, Baikunthpur, Sakshupurwa, Iswariganj, Hradaypur, Parapratappur, Chandula and Pokharpurwa and urban areas, namely, Naramau, Karsaitpur, Madarpur, Indra Nagar, Kalyanpur Khud, Devi Shai Nagar, Sahab Nagar, Jai Prakash Nagar, Loharanbhatta, Fazalganj, Barasirohi, Mirjapur and Maswanpur.

Figure B.1: Location of Kanpur Nagar, Uttar Pradesh on the Map of India

Figure B.2: Locations where the field experiments were conducted



C Replication of the experiment using the 482 lab-in-the-field participants

Table C.1 replicates the results obtained in Table 3 for the 482 lab-in-the-field participants. We see that the results are similar.

D Preference for unobserved doctor's age

In Section 7.1, we examine whether our results are robust to the consideration of gender, which is correlated with experience. We here consider whether our results are also robust to the consideration of age, an unobserved attribute that is also correlated with experience (as younger doctors are on average less experienced). For example, a doctor with 12 years of experience is likely to be older than a doctor with 8 years of experience. If the share of (uniquely) statistical discriminators does not vary significantly when patients are presented with doctors with four years and 12 years of experience and when they are presented with doctors with four years and eight years of experience, then our results are unlikely to be biased from taste-based discriminators using experience of a doctor to make inferences about the doctor's age. In panel A in Table D.1, we report the results for the three different methods of reclassification used in this paper when patients have to choose between doctors with four years and eight years of experience. In panel B in Table D.1, we report the results when patients have to choose between doctors with four years and 12 years of experience. The table shows similar shares of patients with preference rankings consistent with statistical discrimination only. Therefore, our findings are robust to potential preferences for other attributes that are correlated with experience.