DISCUSSION PAPER SERIES

DP14535

MARKET COMPETITION AND DISCRIMINATION

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DEVELOPMENT ECONOMICS

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This Discussion Paper is issued under the auspices of the Centre's research programmes:

- Development Economics

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JEL Classification: C93, J15, J43, Q13

Keywords: discrimination, market competition, Ethnicity, Bangladesh

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Market Competition and Discrimination[*]

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March 20, 2020

Abstract

Becker (1957) famously postulated that taste-based discrimination should disappear in the long run if the market operates competitively. This study provides evidence in support of this idea by carrying out a field experiment in the context of the rice market in Bangladesh. We recruit professional rice buyers (middlemen) to act as judges in a rice competition by providing their quality rating and willingness to pay (WTP) for rice samples that we randomly associate with farmers bearing ethnic majority or minority names. First, we find that there is no ethnic difference in buyers' evaluation of rice quality. Second, we find that local buyers, who have local monopsony power, discriminate against ethnic minority farmers by expressing a lower WTP for their rice (2.7% less) relative to that of ethnic majority farmers. Third, we find that wholesale buyers, who face fierce competition in the marketplace, do not discriminate against ethnic minority farmers in terms of their WTP for rice. In terms of mechanisms, we show through a second lab-in-the-field experiment and survey information that local and wholesale buyers do not have different tastes for discrimination. This suggests that market competition can eliminate the discrimination of wholesale buyers.

Keywords: Discrimination, market competition, ethnicity, rice market, Bangladesh, field experiments.

JEL Classification: C93, J15, J43, J71, Q13, Z13

1 Introduction

Understanding and measuring discrimination is crucial to explaining why some groups perform better than others and to help guide policies aimed at redressing injustices inflicted on vulnerable minority groups in the society. Economics has identified two main types of discrimination: individuals from the majority group can either taste-discriminate if they dislike people from some categories of the population (Becker, 1957) or statistically discriminate when, under imperfect information, they form expectations based on limited signals that correlate with some observable characteristics (Phelps, 1972; Arrow, 1973). According to Becker (1957), in a market context, taste-based discrimination should disappear in the long run if competition is unfettered.[1] Despite the intuitive appeal of Becker's argument, identifying the causal impact of competition on discrimination and showing that the mechanism linking competition and group differences in economic outcomes (e.g., prices or wages) is consistent with a taste-based explanation is notoriously difficult with observational data. Thus, empirical evidence for Becker's claim has been very scant and has focused almost entirely on discrimination occurring in the labor market.

In this study, we leverage a field experiment in a natural setting involving regular market participants combined with a lab-in-the-field experiment and survey information to shed new empirical light on Becker's claim. Specifically, the aim of the paper is (i) to document the existence of taste-based price discrimination against ethnic minority rice farmers in Bangladesh; and (ii) taking advantage of the fact that the professional buyers (middlemen) in the agricultural markets we study face different competitive pressures, to investigate, whether, indeed, market competition can moderate the impact of prejudice.

Our setting has features that makes it very suitable to address the questions at hand. We study rice markets in Bangladesh that involve, on one side, experienced professional buyers (middlemen), and, on the other side, rice farmers who belong to an ethnic majority or an ethnic minority group. There are two types of buyers —both belonging to the ethnic majority group—that differ in the degree of monopsony power they experience in the segment of the market in which they operate. On the one hand, *wholesale* buyers operate in shops in city markets with many competitors located very close to each other (same street) and many farmers who are seeking to sell their rice and who face negligible search costs if they would like to look for an alternative buyer.

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[1]Becker made this argument in reference to the labor market in which discriminatory employers might discriminate against minority employees, but a similar argument can be applied to a product market—such as the one we study in this paper—in which a buyer might discriminate against minority sellers.

Thus, the market of wholesale buyers approximates a perfectly competitive market. On the other hand, *local buyers* buy rice directly from farmers/sellers at their doorstep. While there is a large number of this type of buyer in the region, from the perspective of farmers/sellers, the timing and frequency of their arrival is uncertain, so they face high search costs of waiting for another buyer if the negotiation with a buyer fails. This means that these local buyers face much less competitive pressure when bargaining with rice sellers than wholesale buyers, allowing them to exercise local monopsony power.[2]

We develop a simple theoretical model to formalize how competition will lead wholesale buyers to be willing to pay the same price for rice, independently of the ethnicity of the farmer selling it, even though they might have a distaste for transactions with ethnic minority farmers. On the other hand, prejudiced local buyers will quote a lower price to ethnic minority sellers (the seller's reservation price minus the buyer's cost of buying from a minority seller) than to majority sellers (the price will be the sellers' reservation price).

We test this theoretical prediction in a field experiment. To elicit buyers' willingness to pay (WTP) for rice in a natural way, we organized a rice competition among rural rice farmers. In the competition, the winner—who received a large financial award (30% of a farmer's monthly income)—was determined on the basis of the quality of their rice and the potential price at which the rice would be sold to buyers. To evaluate this, we recruited ethnic majority professional rice buyers (i.e., middlemen) to evaluate the physical quality of the rice and report how much they would be willing to pay for a kilogram of it. These two assessment outcomes determined the winner of the rice competition. To test for the presence of ethnic discrimination, we randomly assigned ethnic majority and minority sounding names to each rice sample to reveal the farmer's putative ethnic identity to buyers. By doing so, we break any systematic relationship that the ethnicity of farmers might have with the quality of rice they produce. Thus, any association between ethnicity and buyers' assessment outcomes could be attributed to discrimination. Importantly, having these two assessment outcomes (quality and WTP) allows us to distinguish between the two types of discrimination: taste-based or statistical. Note also that in our setting, a name is sufficient to signal to buyers the ethnic identity of the farmers because, in Bangladesh, ethnic minorities either have tribe or clan patronyms, whereas ethnic majority Bengalis are mostly Muslims with names that are very different from that of ethnic minorities.[3]

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[2]The evidence we collected from surveys we carried out with participants in this market confirm that the two types of buyer have different local monopsony power.

[3]Note that unlike correspondence studies where a fictitious applicant's race is primarily signaled via the first name of the applicant (e.g., Bertrand & Mullainathan (2004)), which may be more indicative

We found no ethnic differences in buyers' assessment of rice quality, which suggests that these buyers do not statistically discriminate on the basis of ethnic identity. That is, their judgment of rice quality is not influenced by possible stereotypes associated with the skills or ability of ethnic minority farmers. However, we found evidence of discrimination against ethnic minority farmers in terms of WTP that differs across buyers' type. In particular, we found that ethnic majority local buyers who have local monopsony power were willing to pay 2.7% less for rice associated with ethnic minority sounding names than what they are willing to pay for rice produced by farmers with ethnic majority sounding names. However, this was not true for wholesale buyers who operate in a competitive environment. They displayed the same willingness to pay for rice whether it was from an ethnic minority or a majority farmer. We also found that, on average, the prices quoted by wholesale buyers operating in a perfect competition market were higher than those of local buyers who have local monopsony power. The evidence of ethnic differences in WTP and not in quality is consistent with taste-based discrimination and not statistical discrimination at work in our setting.

To understand the mechanism behind our main result, we then carried out a second (lab-in-a-field) experiment drawing on the same population of rice buyers as in the first rice competition field experiment. We wanted to check whether the difference in WTP across buyers' type was due to the distinct competitive forces they face and not to underlying differences in taste for discrimination, which could arise because, for instance, they reside in different parts of the same district (wholesale buyers live in the city, whereas local buyers reside in nearby villages). In this second experiment, rice buyers played another-other allocation game in which they were anonymously matched with two farmers (one from the ethnic minority group and the other one from the ethnic majority group) from the same district. The task of this game was to divide an endowment between the two farmers without being able to keep any money for one's self. We found that both local and wholesale buyers allocated roughly 40% of their endowment to ethnic minority recipients and roughly 60% to ethnic majority recipients. In other words, we did not find any statistical difference in terms of discriminatory preferences between local buyers and wholesale buyers. We then conducted a survey among buyers about their attitudes toward ethnic minorities. The results confirmed that both local and wholesale buyers exhibit the same statistically indistinguishable negative views against ethnic minorities.

If we take our evidence as a whole, we find that both local and wholesale buyers have

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of a person's socio-economic background than the person's race (Fryer & Levitt, 2004), in the context that we study, surnames are uniquely associated with a particular ethnic group, and the surnames that we use are common surnames that unequivocally reveal ethnicity.

a distaste for the minority ethnic group, while there is no difference in terms of distaste between the two types of buyers. When we elicited their willingness to pay for rice, local buyers, who have local monopsony power, quoted a lower price to the minority group than the majority one, whereas wholesale buyers, who face fierce competition, quoted the same price to both groups. This suggests that the taste-based discrimination that these buyers have against the ethnic minority group—the existence of which is supported by our second experiment— can be eliminated if competition is strong enough.

Our study contributes to a large literature in economics and the social sciences more broadly aimed at uncovering the nature, roots, and consequences of ethnic and racial discrimination.[4] This body of literature has documented the existence of discrimination in various markets, contexts, and countries. Our paper is most closely connected to a subset of this literature that is concerned with race/ethnic discrimination in product/consumer markets using field experiments. This previous research has shown that discrimination is present in various marketplaces including the market for used sportscards (List, 2004), used cars (Zussman, 2013), online markets (Nunley, Owens & Howard, 2011; Doleac & Stein, 2013; Ayres, Banaji & Jolls, 2015), housing markets (Ewens, Tomlin & Wang, 2014; Edelman, Luca & Svirsky, 2017), and health markets (Islam, Pakrashi, Wang & Zenou, 2018). Discriminatory behavior has been shown to exist both among sellers and buyers and the evidence as to its nature, that is, whether it is taste-based or statistical, is mixed. We contribute to this literature by providing evidence of ethnic discrimination occurring among professional buyers in an agricultural market in the context of a developing country, which, to the best of our knowledge, has not previously been investigated.

Our paper also contributes to a small strand of the discrimination literature that has looked at the impact of market competition on discrimination. This literature has focused on the labor market (wage and employment differences), covering either the gender dimension (Ashenfelter & Hannan, 1986; Black & Strahan, 2001; Hellerstein, Neumark & Troske, 2002; Black & Brainerd, 2004), or the racial dimension (Peoples & Talley, 2001; Levine, Levkov & Rubinstein, 2008; Hirata & Soares, 2016). An exception is the study by Li, Lang & Leong (2017), which analyzes the sex market in Singapore, finding that price discrimination in this market persists despite competition.

To the best of our knowledge, this is the first paper that tests the impact of competition on price discrimination in an agricultural product market using a field experiment in a natural setting with regular participants. What is unique in our study is that we

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[4]For general overviews see Altonji & Blank (1999), Charles & Guryan (2011), Lang & Lehmann (2012), and Neumark (2018). Anderson, Fryer & Holt (2006) and Lane (2016) survey studies of discrimination in the laboratory, and Riach & Rich (2002) and Bertrand & Duflo (2017) survey studies of discrimination that use field experiments.

are able to compare the price setting of some agents (buyers) facing perfect competition with the price determination of other agents with the same taste for discrimination but who have local monopsony power. In this respect, we provide clean causal evidence that, indeed, competition eliminates discrimination.

The rest of the paper unfolds as follows. In the next section, we provide some background of ethnic minorities and the rice market in Bangladesh. In Section 3, we develop a simple taste-based discrimination model of buyers-sellers showing how the degree of competition affects discrimination. We explain our experimental design in Section 4. Our main results are given in Section 5. In Section 6, we explain our second field experiment and describe our results. Finally, Section 7 concludes. In the Appendix, we provide additional tables and figures (Appendix A), experimental session materials and pictures (Appendix B), and surveys (Appendix C).

2 Background

In this section, we provide some background on the ethnic minority group (Santals) and the operation of rice markets in Bangladesh.

2.1 The Santals

In Bangladesh, there are 45 different ethnic minority groups that primarily depend on agriculture for their livelihood. These ethnic minorities are different in terms of race and culture, speak a different language, and follow customs and religion that are distinct from those of the ethnic majority (Bengali) population (Roy, 2012). Ethnic minorities in Bangladesh are severely discriminated against in terms of access to healthcare, education, employment, etc. over generations (Shariff, 2008; Roy, 2012; D'Costa, 2014). They have a long history of being stigmatized, marginalized, and discriminated against by the ethnic majority, leading them to develop an aversion for interethnic competition (Siddique & Vlassopoulos, 2020). It is telling of their plight that they are usually referred to as *jangli*—a derogatory term to describe them as barbaric, uncivilized, or sub-human (Debnath, 2010).

The Northwestern region (i.e., in Rajshahi and Rangpur divisions) where our study took place, is home to the second-largest ethnic minority community, the Santal. They live mostly in remote villages, which are not easily accessible and, hence, remain outside the range of basic services (Ali, 1998; Cavallaro & Rahman, 2009). Like other ethnic minorities in Bangladesh, Santals also face various issues such as poor economic conditions, lack of attention and educational opportunities, language and cultural alienation, poor

employment opportunities, political injustice, and so on, in their daily lives (Samad, 2006; Sarker & Davey, 2009). Santals are also the largest Scheduled (lower caste) Tribe in India, numbering around seven million, and face similar treatment by the ethnic majority in India (Shariff, 2008; Office of the Registrar General & Census Commissioner India, 2017). Santals are predominately landless farmers and primarily depend on either day-labor work or share-cropping (Shariff, 2007; Debnath, 2010). They, along with other ethnic minority farmers, have experienced loss of their agricultural lands to ethnic majority land grabbers (Roy, 2012; Samad, 2006). They also have limited access to information and market prices; hence, they mostly rely on third parties to market their goods (Samad, 2006; Saunderson, 2006; Sarker & Davey, 2009; AIPP, 2010). It is widely believed that middlemen usually take advantage of ethnic minority farmers by buying their goods at a lower price than that generally offered to ethnic majority farmers (Saunderson, 2006; AIPP, 2010).

2.2   The Rice market in Bangladesh

Bangladesh is dependent on the agricultural sector, as 41 percent of its total labor force depends on it for livelihood, while 75 percent of cultivated crops is rice (Bangladesh Bureau of Statistics, 2017). Middlemen play an important role in the distribution of rice produced by small farmers in rural Bangladesh.[5] There are different types of middlemen (intermediaries) that operate between the rice farmer and the final consumer. In our study, we focus on two types: (i) local buyers, known as *foriya*, who operate in villages and buy directly from rice farmers by visiting them at home and sell to local village shops or city wholesalers; and (ii) city wholesalers or wholesale buyers who operate in storehouses in city marketplaces that are commonly known as *arot* (and the wholesaler is known as *arotdar*) who buy from farmers and foriyas and sell wholesale to retailers. *Foriyas* do not operate in storehouses in village marketplaces, so farmers cannot visit their storehouses to sell rice. In contrast, *arotdars* operate in large storehouses in the city, hence have a fixed location, and are always located in streets with many other *arots*. Such streets in city marketplaces are locally known as *chal-potti*, which literally translates to "rice-market."

One key difference between the two types of middlemen that is crucial for this study is the degree of monopsony power that they possess. On one hand, *arotdars* (*wholesale buyers*) operate in markets with many competitors in very close proximity (same street) and many farmers who are seeking to sell their rice do not face important search costs if

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[5]The rice marketing channels in Bangladesh are described in Rahman, Takeda & Mohiuddin (2006) and Reardon, Minten, Chen & Adriano (2013).

they wish to look for an alternative buyer. Thus, this market approximates a perfectly competitive market. On the other hand, *foriyas* (*local buyers*) buy rice directly from farmers at their doorstep. While there is a large number of this type of buyers in the region, from the perspective of farmers the timing and frequency of their arrival is uncertain, so they face search costs. This means that local buyers face less competitive pressure when bargaining with rice sellers than wholesalers. Pictures of a typical rice market in Bangladesh, where *wholesale buyers* operate, are provided in the Appendix (Figure B1 in Appendix B).

Support for the fact that the two types of rice buyers operate under different competitive pressures is lent by answers to a survey we carried out among rice buyers and farmers in the Rajshahi Division of Bangladesh where the study took place.[6] Table 1 Panel A summarizes, by buyer type (local buyer versus wholesale buyer), the answers to some key questions in this survey that are relevant here. Focusing on the first five entries of the table, compared to local buyers, wholesale buyers report facing *more competition* in buying rice, more pressure to offer *higher prices*, and more fear of losing a seller to other buyers. They also report that they are more likely to lose sellers to other buyers and that this concern influences the price that they quote. Furthermore, farmers also confirm that they have more alternatives when transacting with wholesalers than with local buyers. Our survey of rice farmers (Panel B of Table 1) indicates that, when asked to indicate on a scale from 0 to 1 (where 1 corresponds to very easy) how easy it is for them to find alternative buyers, they report that they find it easier to find an alternative wholesale buyer than an alternative local (0.53 vs 0.28).

This evidence suggests that *local buyers*, who have local monopsony power, may be able to indulge their discriminatory tastes by price discriminating on the basis of the farmer's ethnicity, whereas *wholesale buyers*, who are constrained by competition, are less likely to do so. The next section formalizes this concept in a model, which generates the predictions that we will test in our field experiment.

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[6]Details about the survey are provided in Appendix C and details about the sample of buyers and farmers can be found in Section 6.1.

Table 1: Survey of Rice Market Buyers and Sellers

| | Panel A: Rice Buyers | | | | |
	Pooled (*Std. Dev.*)	**Local** (*Std. Dev.*)	**Wholesale** (*Std. Dev.*)	**MW-test** *p*-values	**t-test/CS-test*** *p*-values
Fear of losing a seller to other buyers	2.99 (2.63)	2.41 (2.45)	3.97 (2.68)	0.009	0.011
Competition in rice buying	3.26 (2.69)	2.22 (2.20)	5.03 (2.54)	0.000	0.000
Competition forces to offer higher price*	0.30 (0.46)	0.18 (0.39)	0.50 (0.51)	0.002	0.002
Frequency of losing sellers to other buyers	0.27 (0.23)	0.22 (0.20)	0.34 (0.27)	0.042	0.034
Concern of losing sellers influence price quoting	0.28 (0.30)	0.17 (0.24)	0.46 (0.31)	0.000	0.000
Buyers quote price first*	0.68 (0.47)	0.69 (0.47)	0.67 (0.48)	0.856	0.855
Minority farmers haggles most*	0.28 (0.45)	0.22 (0.42)	0.40 (0.50)	0.078	0.076
Easy to buy from minority*	0.43 (0.50)	0.39 (0.49)	0.50 (0.51)	0.347	0.344
Sample Size	81	51	30	-	-

| | Panel B: Rice Sellers/Farmers | | | | |
	Pooled (*Std. Dev.*)	**Majority** (*Std. Dev.*)	**Minority** (*Std. Dev.*)	**MW-test** *p*-values	**t-test** *p*-values
Ease of Finding Alternative Local	0.28 (0.30)	0.20 (0.26)	0.36 (0.31)	0.047	0.052
Ease of Finding Alternative Wholesale	0.53 (0.32)	0.55 (0.35)	0.51 (0.29)	0.578	0.694
Sample Size	54	28	26	-	-

Note: The survey data reported above were collected during the second experiment described in section 6.1. 'Fear of losing a seller to other buyers' and 'Competition in rice buying' were answered on scale from 0-10 where 10 corresponds to extreme fear and extreme competition, respectively; 'Frequency of losing sellers to other buyers' was answered on a 4-point scale, where 1 corresponds to 'very often,' 0.67 corresponds to 'often,' 0.33 corresponds to 'not that often,' and 0 corresponds to 'not at all'; 'Concern of losing sellers influence price quoting' was answered on a 4-point scale, where 1 corresponds to 'very,' 0.67 corresponds to 'somewhat,' 0.33 corresponds to 'little,' and 0 corresponds to 'not at all'; 'Competition forces to offer higher price' is a dummy that equals 1 if yes and 0 if no; 'Buyers quote price first' is a dummy that equals 1 if buyers quote price first and 0 otherwise; 'Minority farmers haggles most' is a dummy that equals 1 if minority haggles most and 0 otherwise; 'Easy to buy from minority' is a dummy that equals 1 if it is easier to buy rice from minorities and 0 if from majorities; Ease of Finding Alternative Local/Wholesale states how easy it is for farmers to find alternative Local/wholesale buyers while selling rice (between 0 and 1, where 1 corresponds to very easy). The MW-test is a two-sided Mann-Whitney U test; the t-test is a two-sample t-test with unequal variances; the CS-test is a Pearson's Chi-Squared test (uses CS-test if *).

3 Theory

Let us give a theoretical explanation of why wholesale buyers, who face fierce competition, cannot discriminate against ethnic minority rice sellers whereas local buyers, who nearly have a local monopsony, can discriminate against the Santal minority group.

Consider a simple model of taste-based discrimination. According to Becker (1957), prejudiced consumers (here buyers) dislike purchasing from sellers with some observable traits (e.g., ethnicity, gender, caste, etc.). Using taste-based discrimination, let us now

study the purchase of a good from buyers (middlemen) who are all from the majority group (Muslim Bengali; referred to as group M). We consider a buyer-seller relationship in which a buyer from the majority group would like to buy a product (rice in the data) from a seller who is either from the *majority* group or a seller from the *minority* group (Santal people who speak *Santali* and practice the Santal religion; referred to as group m).

Indeed, consider a market composed of sellers of types m and M and buyers from the majority group. Assume that some buyers dislike buying from sellers of type m and pay an extra cost of $c > 0$ while others do not. In Figure 2 in Section 6 below; we empirically show that, indeed, some buyers do have a distaste for buying from a minority seller while others do not.

Each discriminatory buyer (referred to as a buyer of type $t = d$) with a taste for discrimination $c > 0$ has a reservation price or willingness to pay (WTP) for a rice of quality q equal to $v^d(q) = v(q) - c$. This is the *maximum price* a type$-d$ buyer is willing to pay for a rice of quality q. Each non-discriminatory buyer (referred to as a buyer of type $t = nd$) with *no* taste for discrimination ($c = 0$) has a reservation price or WTP for a rice of quality q equal to $v^{nd}(q) = v(q)$. This is the *maximum price* he is willing to pay for rice of quality q. This implies that $v^{nd}(q) > v^d(q)$ for the same q. Buyers of any type always prefer to buy the product (rice) than not buying it but do not want to pay more than their reservation price.

All buyers know exactly the quality of the rice q but, as seen above, have different reservation prices (or WTP) due to different tastes for discrimination. For simplicity, we assume that there are only two types of buyers: type d ($c > 0$) and type nd ($c = 0$), in the market.[7]

All sellers (independently of their ethnicity) have a reservation price for a rice of quality q, which is equal to $p(q)$. This is the *minimum price* below which they do not want to sell their rice.

We want to model the buyer's decision. As we have seen above, in the data, the buyer is actually an intermediary and will buy the product (rice) and then will sell it in the market. A crucial determinant of the price setting is the market competition. We will first consider perfect competition (*wholesale buyers*) and then monopsony (*local buyers*).

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[7]It is easy to generalize the analysis to buyers with different degrees of discrimination c.

3.1 Taste-based discrimination: The competition case (wholesale buyers)

There are n buyers, among whom $n^d \geq 2$ are buyers of type d and $n^{nd} \geq 2$ are buyers of type nd. We also assume that there is no (transportation or search) cost for a seller to buy from any buyer (Figure B1).

We only consider the game between buyers. In this model, all n buyers simultaneously declare their WTP for the good (rice) of quality q sold by the sellers and we solve the Nash Equilibrium of this game. The strategy of a buyer of type $t = d, nd$ is to buy a rice of quality q at a price (WTP), which can take any value between 0 and $v^t(q)$.

Result 1: *In the city with $n^d \geq 2$ wholesale buyers of type "d" and $n^{nd} \geq 2$ wholesale buyers of type "nd" and no cost for the sellers to find different buyers, there is a unique Nash Equilibrium such that no buyer discriminates against minority sellers, i.e., all buyers have a willingness to pay for a rice of quality q equal to $v^{nd}(q) = v(q)$. Therefore, for a given rice quality, buyers' willingness to pay for a rice sample is the same if it is sold by a minority or a majority seller.*

The proof of this result is the standard undercutting argument of the Bertrand competition. We only need to have two buyers of type nd to get the result. Indeed, a buyer of type nd would like to propose a price of $v^d(q) + \epsilon$ as it is higher than $v^d(q)$ (the discriminatory price). With one buyer of type d, this will be the equilibrium as it is the maximum price that a type $-d$ is willing to pay. However, with two buyers of type nd, the other non-discriminatory buyer will propose a price slightly higher than $v^d(q) + \epsilon$, and buy the goods. But the initial buyer will increase his price because he is always better off by buying the goods. And so forth. They will stop at exactly $v^{nd}(q) = v(q)$ for a rice of quality q as nobody is willing to pay more.

So, the crucial element in order to obtain this result is that there exist at least two buyers who do not discriminate against minority groups, or, more specifically, have no distaste against buying from the minority group. In our empirical exercises, we show in Figure 2 in Section 6 below that, indeed, some buyers do not discriminate against minority groups as they treat minority and majority groups equally.

3.2 Taste-based discrimination: The monopsony case (local buyers)

Consider the same game but now there is a monopsonist (the local buyer) in a market where the sellers could be of two types: $e = m$ and $e = M$. We assume that a buyer makes a take-it-or-leave-it offer and that the cost of waiting for the next buyer is too high for the seller.

In that case, any buyer will always be willing to pay the lowest possible price, which is the seller's reservation price $p(q)$. However, a buyer of type d, because of his distaste, will have a WTP equal to $p(q) - c$ while a buyer of type nd will have a WTP equal to $p(q)$. In principle, it is possible that sellers may refuse to sell their rice of quality q at price $p(q) - c$ because it is below their reservation price. However, as described in Section 2, majority buyers do exploit the fact that Santal sellers are vulnerable and can accept lower prices. Also, in our experiment, we only ask for the buyers' willingness to pay so it is possible that sellers may not accept the offer of $p(q) - c$ from the discriminatory buyers.

Result 2: *In rural areas, local buyers from the majority group do discriminate against ethnic minority farmers. Thus, for a given rice quality, buyers' willingness to pay is lower for a rice sample sold by a minority seller than by a seller from the majority group.*

3.3 Discussion

In our experiment, we provide each buyer with a rice of a certain quality and ask him his willingness to pay for this product, given that each product is associated with a seller's name that clearly identifies him as being of either ethnicity m or ethnicity M. We implement this experiment in two different areas: a rural area and an urban area (the city) where buyers are either local (rural areas) and thus have monopsony power or wholesale (city) and face fierce competition.

According to our model, if the buyer is in a rural area, he knows that he faces little competition and thus has monopsony power. So when he decides his willingness to pay for a product, he will always pay a lower price to a seller of ethnicity m compared to a seller of ethnicity M (Result 2). On the contrary, if a buyer resides in the city, he knows that there is fierce competition between different buyers and, according to our model, he will not pay a different price to sellers from different ethnicities (Result 1). Another consequence of our model is the following:

Result 3: *On average, local buyers have a lower willingness to pay for rice than whole-sale buyers.*

Let us now test these three results.

4 The rice competition field experiment

We carried out our main field experiment in April 2018 in the Rajshahi district located in the Northwestern part of Bangladesh, which has several advantages for our purposes.[8] Indeed, Rajshahi is home to the Santal ethnic minorities, which is one of the largest ethnic minority communities in Bangladesh who mostly work in the agricultural sector (Ali, 1998; Ahmed, 2010). The Santal ethnic group has very distinct first and last names, which makes the association of a name to an ethnicity automatic and natural for the local population. We recruited ethnic majority (Bengali) rice buyers to assess rice quality for 30 different rice samples that we previously collected from 30 different farmer households. We randomly assigned ethnic majority and minority sounding names to each rice sample to implicitly reveal the farmer's ethnic identity to the assessing buyers.

In what follows, we break down the description of the design of the study into four parts: rice competition, rice evaluation, randomizing ethnic identities, and experimental procedure.

4.1 The rice competition

First, to make the rice evaluation meaningful and consequential for the buyers, we organized a rice competition in which the farmer who produced the "best" recently cultivated rice would win a 2,000 Taka (or USD 25) cash prize.[9] The average daily income of farmers in the Northwestern part is around 225 Taka, thus, the prize money was about 30 percent of their monthly income. We recruited 30 farmer contestants to the rice competition (15 from the ethnic majority and 15 from the ethnic minority groups) from different villages.[10] Characteristics of these farmer contestants are provided in Table A1 in Appendix A.[11] Participants to the competition had to submit 500 grams of

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[8]We carried out the study with the support of the NGO *Ashrai*, which works on ethnic minority issues in Bangladesh. See: <http://ashrai.org.bd/>

[9]Similar competitions where farmers compete with other farmers in different games are typically organized during the Eid festivals and are widely televised and known around the country (they are called *Krishoker Eid Ananda or Farmers' Eid Celebration.*). For instance, *Channel i*, Bangladesh's first digital TV channel, organizes competitions with farmers twice a year.

[10]For the competition, we collected rice samples by randomly visiting farmer households. After entering each farmer household, we asked if the male head of the household was a farmer, asked their ethnicity, and then asked to speak to the head (if the door was attended by someone else). Then, we invited him to take part in the rice competition and mentioned the cash prize. We also informed him about the assessment process, which would be carried out by rice buyers from different (and not their own) villages and the city.

[11]Farmers from this region use traditional farming methods for land preparation, sowing seeds, harvesting, drying, storing, and husking prior to selling it to buyers (Bäckman, Islam & Sumelius, 2011; Shelley, Takahashi-Nosaka, Kano-Nakata, Haque & Inukai, 2016). For instance, plowing is either done by the farmer or with the help of bulls and buffaloes, sowing and harvesting is carried out by hand

their most recently produced husked rice. In total, farmers submitted nine different rice varieties. See Table B1 in Appendix B for the list of rice varieties and their market prices. After the rice evaluation program, a research assistant visited participant households to reveal the outcome of the competition and hand in the prize money to the winner. We provided no feedback about the achieved score and price to any contestants other than the winner and the winner's identity was never revealed to non-winners.

4.2 The rice evaluation program

To attract both type of buyers for the rice evaluation program, we advertised it in six randomly selected marketplaces in the main city of Rajshahi (to target wholesale buyers) and nine randomly selected marketplaces of the surrounding villages (to target local buyers)—all within the same district.[12] Local buyers were invited to visit a central location (e.g., a primary school, an NGO office, or a resting place within marketplaces) at a given time to take part in the rice evaluation program. See Appendix B for the different ads we used for recruitment. All local buyers who showed up on time at the central location participated in our rice evaluation program (nine sessions in total). On the other hand, wholesale buyers were approached for rice evaluation individually at their storehouses.[13]

Of the 112 rice buyers that participated in the evaluation, 81 are local buyers from nine villages and 31 of them are wholesale buyers operating in the city of Rajshahi. The sample of local and wholesale buyers is unbalanced because local buyers, who operate in many villages, are more populous compared to the wholesale buyers, who are only located in marketplaces of the main city. As each buyer evaluated 30 rice samples in total, with a sample size of 112 buyers, we have 3,360 observations in total.

All buyers were informed that the evaluation program is part of a rice competition among farmers and that their assessment would determine the winner, who would be awarded a 2,000 Taka cash prize. This was important because it ensured that buyers'

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using tools like sickles and knives, and husking to remove husks from the paddy grain to produce edible rice grains is also done at home using traditional methods (Zaman, Mishima, Hisano & Gergely, 2001). Therefore, the skills and ability of farmers are directly reflected in the rice they cultivate.

[12]The participating villages lie within a 15km radius from the main city. A map of the Rajshahi District with highlighted locations of participating rice buyers and sellers is provided in Figure B3 in Appendix B.

[13]We took a different approach in terms of advertising and locations for rice evaluation for wholesale buyers because wholesalers operate large storehouses and have comparatively busier schedules than local buyers; hence, it was difficult for them to attend a group session at a given time to evaluate rice samples for our experiment. Therefore, 12 wholesale buyers evaluated rice in three small sessions that always took place at one of their storehouses and the remaining 19 wholesale buyers evaluated rice samples in their own storehouses, individually.

assessment had a real impact on the well-being of farmers, the same way their day-to-day assessments affect farmers' earnings when they buy rice in the actual market. They were also informed that both quality score and willingness to pay would be given equal weight while determining the winner. Buyers were offered a participation fee (200 Taka or USD 2.50) and a chance to earn more by evaluating 30 different rice samples (5 Taka for evaluating each rice sample).

Participants rated the rice quality on a scale from 0 to 10 (in whole numbers), with 10 being the highest quality, and then stated how much they were willing to pay for one kilogram of that particular rice (which could be any amount).[14] We also obtained blind assessments from three additional rice buyers (one wholesale and two local buyers), which allows us to control for the "actual" quality of rice in the regression analysis below.

Note that, even if we elicited the buyers' willingness to pay (WTP) hypothetically, in the sense that the buyers would not buy the rice they evaluated, their evaluation, both in terms of quality and WTP, had an impact on the winner of the competition. So, buyers did take seriously their evaluation. Moreover, it is quite natural to assume that these buyers draw on their personal experience when expressing their WTP. Note, finally, these two types of buyers have experience from only one of the two markets, that is, wholesalers of the competitive market and local buyers of the door-to-door type. As a result, it seems reasonable to assume that each type of buyer expresses his WTP with respect to his own experience of the market he usually operates in.

4.3 Randomizing farmers' names

We attached 30 small rice samples collected from the 30 farmer contestants on a large hardboard (rice board) using transparent packets so that buyers could easily examine the rice (see Figure B2 in Appendix B for a picture of a rice board). We then randomly assigned ethnic majority and minority sounding names of farmers to each rice sample, so that ethnicity is uncorrelated with rice quality. We told buyers that the name attached to each rice sample was that of the farmer who produced that particular rice and was a participant in the rice competition. Specifically, next to each rice ID on a rice board, we randomly attached either a Bengali (ethnic majority) or a Santal (ethnic minority) sounding name. In this way, each assessor would examine the rice samples in the same order, but each participant would see a different draw of names associated with each sample.

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[14]According to the International Food Policy Research Institute (IFPRI), the physical quality of rice is evaluated based on its physical appearance that depends on its shape, color, chalkiness, proportion of dead rice in a batch, and so on, and is different from chemical quality (Ayeduvor, 2018).

In Bangladesh, ethnic minorities have either tribe or clan patronyms, which are surnames that are named after their tribes or septs. Santals have 12 clans or septs (Risley, 1891), so a male Santal's name could be Horen Tudu (if from the *Tudu* clan), Horen Hasda (if from the *Hasdak* clan), Horen Kisku (if from the *Kisku* clan), and so on. Similarly, ethnic majority Bengalis are mostly Muslims with names either starting with "Muhammad" or ending with "Rahman", "Ahmed" or "Islam". We used widely common Bengali and Santal sounding names. For Santal sounding names, we sought help from Risley (1891) and Ali (1998). We provide the list of names in Table B2 in Appendix B.

4.4 Experimental procedure

We gave buyers unique ID cards, which they would use on each evaluation sheet to assure them that their identity would be kept anonymous. We also gave them a rice board with 30 attached rice samples (in transparent plastic bags) and a separate paper (an evaluation sheet), to write down rice IDs, assigned farmers' names, quality scores, and willingness to pay (always in this order).[15] This had two advantages: first, we knew in which order buyers assessed rice samples; second, writing down farmer's name ensured that buyers had read the full name. After completion, buyers were asked to fill out a short survey in which we collected a range of individual information from them on their demographics, business experiences, shop locations, level of intercultural competence, and so on. Each assessment session took around 60 minutes.[16]

We will now test our three main theoretical results described in Section 3.

5 Results of the rice competition field experiment

5.1 Descriptive Statistics

We begin by presenting the main descriptive statistics of the rice buyers in Table 2, for the whole sample, and separately by buyer type (local and wholesalers). The table also presents two sample Mann-Whitney U test (MW-test hereinafter) results that compare the various buyer characteristics across the two types of buyers.

The average buyer of either type is 40 years old and has 15 years of experience in his current occupation. Most of the buyers work for themselves, are married, and have children. When we disaggregate the sample by buyer type, we observe some het-

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[15]An example of the evaluation sheet is provided in Table B3 in Appendix B.

[16]In group sessions, buyers were asked to sit around a table that could fit 4-6 people. Group sessions were attended by 8.5 buyers on average.

erogeneity in terms of demographics and the amount of rice bought every year. For instance, wholesalers are significantly more educated, earn a higher income, and buy more rice. On the other hand, local buyers are more familiar with the Santali culture, as measured by what we refer to as the level of intercultural competence (Fantini, 2010), and are more likely to have business interactions with ethnic minority farmers.[17] In the regression analysis, we control for these buyer characteristics and also carry out an heterogeneity analysis along the characteristics where differences are found across the two types of buyers.

We next turn to the main outcomes obtained through the rice evaluation program. The first thing to note is that overall, wholesale buyers quote higher average prices than local buyers (wholesale 39.4 vs local 36.9; t-test: p-value= 0.000), despite the fact that local buyers assign higher average quality (local 6.9 vs wholesale 6.2; t-test p-value= 0.000).

In Table 3, we present summary statistics of rice quality scores and willingness to pay (WTP) by ethnicity of the farmer. Out of a score of 10, both Bengali and Santal farmers received an almost identical average quality score (t-test: p-value is 0.708). Looking at the quality assessment separately for each type of buyer, we see that both local and wholesale buyers do not display any ethnic biases in their assessment of the quality of rice (t-test: p-value is 0.8 and 0.748 for local and wholesale buyers, respectively).[18]

Moving to differences in terms of WTP, buyers overall are willing to pay on average 0.65 Taka more (a 1.7% premium) to Bengali farmers (t-test: p-value= 0.004). When we break down WTP by buyer type, we find that this difference is driven by local buyers who are willing to pay 1.01 Taka more to Bengali farmers than they would pay to Santal farmers (a 2.8% premium) and this difference is statistically significant (t-test: p-value= 0.000). On the other hand, wholesale buyers do not discriminate against Santal farmers in terms of willingness to pay. Instead, we see that they are willing to pay slightly more to Santal farmers than they would pay to Bengali farmers, although this difference is not statistically significant at conventional levels.[19]

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[17]We asked four simple questions about the Santali culture, e.g., we asked what language is spoken by Santals, what their main religious festival is called, etc. For each correct answer, we assigned 0.25 points so that 0 would mean having no knowledge and 1 would mean having excellent knowledge. These questions are simplified versions of Fantini's intercultural competence assessment questions that only focus on the "awareness dimensions" of individuals. Please see the survey in Appendix C for all four questions.

[18]In Table 3 we show t-tests only, as the number of observations is large. We also carry out an MW-test for robustness and the results are similar throughout.

[19]We have sufficient statistical power in the subsample of wholesale buyers to detect a similar ethnic gap in WTP as in the subsample of local buyers. Specifically, with 930 observations and 80% power, the

Table 2: Rice Buyer Characteristics

Buyer Characteristics	Pooled (*Std. Dev.*)	Local (*Std. Dev.*)	Wholesaler (*Std. Dev.*)	MW-test *p*-values	t-test *p*-values
Age	40.04 (12.71)	40.69 (13.44)	38.35 (10.57)	0.492	0.337
Education	7.85 (3.89)	7.36 (3.94)	9.13 (3.50)	0.025	0.024
Income	14,080 (7,424)	12,361 (6,786)	18,571 (7,233)	0.000	0.000
Land	22.59 (43.21)	19.30 (30.42)	31.19 (65.84)	0.486	0.340
% Married	0.90 (0.30)	0.90 (0.30)	0.90 (0.30)	0.975	0.975
Children	1.88 (1.34)	1.84 (1.32)	2.00 (1.41)	0.561	0.587
Years in Current Profession	15.45 (10.42)	15.23 (11.09)	16.00 (8.59)	0.353	0.699
% Own Business	0.88 (0.32)	0.88 (0.33)	0.90 (0.30)	0.695	0.684
Years Living in Current Location	32.60 (15.47)	33.19 (16.77)	31.06 (11.49)	0.656	0.448
Rice Quantity	6,185 (25,658)	2,586 (3,192)	15,589 (47,774)	0.001	0.140
IC Competence	0.48 (0.32)	0.56 (0.30)	0.28 (0.31)	0.001	0.000
% Business Interaction	0.29 (0.45)	0.35 (0.48)	0.13 (0.34)	0.024	0.009
% Muslim	0.78 (0.42)	0.80 (0.40)	0.71 (0.46)	0.294	0.329
Sample Size	112	81	31	-	-

Note: Age and Education are in years; Income is monthly (in Bangladeshi Taka); Land Possession is the amount of land owned in 'katha', where 1 katha = 720 square feet; % Married is the proportion of buyers who are married; Children is the number of children one has; Years in Current Profession is the number of years a buyer is in his current profession; % Own Business is the proportion of buyers who also own their rice buying business; Years Living in Current Location is the number of years one is living in their current place of residence; Rice Quantity is the amount of rice (in kilograms) one buys every month for business purpose; IC Competence is the inter-cultural competence score regarding the Santal culture; % Business Interaction is a dummy variable that equals 1 if buyers have at least some interactions with ethnic minority farmers and 0 if they never interact; % Muslim is a dummy that equals to 1 if a buyer is a Muslim and 0 if Hindu; MW-test is a two-sided Mann-Whitney U test; The t-test is a two-sample test with unequal variances.

Figure 1 shows the distribution of WTP for rice associated with the two ethnic groups by buyer type and provides further illustration of the ethnic difference for local buyers and the lack for wholesalers. In fact, a Kolmogorov-Smirnov test suggests that

minimum detectable ethnic gap in WTP among wholesale buyers is 0.993 Taka or 2.6%.

Table 3: WTP and Quality Score Given to Randomized Farmer Names

	Pooled			Local Buyers			Wholesale Buyers		
	Santal (*Std. Dev.*)	**Bengali** (*Std. Dev.*)	**t-test** ***p*-values**	**Santal** (*Std. Dev.*)	**Bengali** (*Std. Dev.*)	**t-test** ***p*-values**	**Santal** (*Std. Dev.*)	**Bengali** (*Std. Dev.*)	**t-test** ***p*-values**
Quality Score	6.67	6.69	0.708	6.86	6.88	0.800	6.17	6.21	0.748
	(1.75)	(1.74)		(1.77)	(1.74)		(1.61)	(1.66)	
WTP	37.29	37.94	0.004	36.43	37.44	0.000	39.53	39.25	0.426
	(6.47)	(6.56)		(6.66)	(6.88)		(5.36)	(5.43)	
Observations	1,680	1,680	-	1,215	1,215	-	465	465	-

Note: Bengali (Santal) indicates rice samples that were associated with a farmer bearing a Bengali (Santal) sounding name; Quality Score is the quality score (between 0 to 10) given to a rice sample where 10 corresponds to the highest quality; WTP is a buyer's willingness to pay (in taka) for 1 kilogram of a particular rice sample; Local Buyers are buyers who buy rice by visiting farmer households, and Wholesale Buyers are buyers in urban areas who operate large storehouses. The t-test is a two-sample test with unequal variances.

the two distributions are not statistically different for wholesale buyers (p-value= 0.969) but are significantly different for local buyers (p-value= 0.000).[20]

Figure 1: Distribution of Willingness to Pay, by Buyer Type
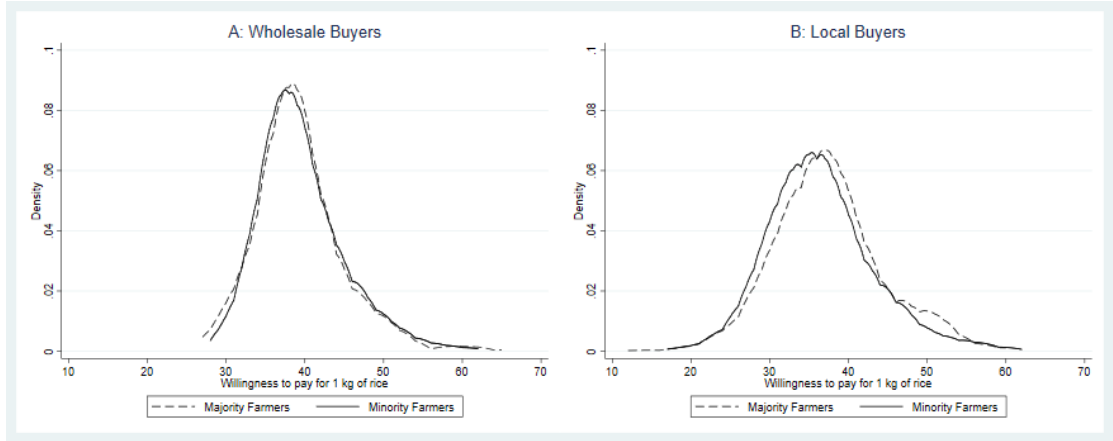
Note: This figure shows the distribution of WTP (estimated from kernel density estimation).

5.2   Main Results

Following our theoretical model, we are interested in assessing whether the buyers' judgment of rice quality and price depends on the ethnic identity of the farmer and the

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[20]For robustness, we also test for equality of the average WTP associated with minority and majority farmers, with each buyer acting as a single independent observation. This test confirms that local buyers do discriminate against ethnic minority sellers (Wilcoxon signed-rank or SR-test: p= 0.000), whereas wholesale buyers do not (SR-test: p= 0.604).

competition they face by estimating the following regression specification:

$$Y_{ij} = \alpha + \beta_1 Minority_j + \beta_2 BlindScore_j + v + b_i + \epsilon_{ij}, \tag{1}$$

where Y_{ij} is the outcome (rice quality or WTP) that buyer i assigns to rice sample j, $Minority_j$ is a dummy variable that takes a value of 1 if a rice sample j was assigned to an ethnic minority name and zero otherwise; $BlindScore_j$ is the blind quality score given to each rice sample j; v are dummies for each variety of rice and b_i are buyer fixed effects, allowing us to hold buyers' individual standards fixed. For willingness to pay, besides the above set of regressors, we also add quality scores as a control, because buyers assess rice quality prior to stating their willingness to pay, so, the score that has been assigned may also affect buyers' willingness to pay. Standard errors are clustered at the individual buyer level. We estimate the equations for the two outcomes independently, but the results presented below are robust to treating the two equations as a system and estimating it in a seemingly unrelated regressions framework.

In Table 4, we provide our main regression results for rice quality scores. In column (1), we show the results of the specification without any control variables. Then, in column (2), we control for the blind quality score of rice, rice variety fixed effects, and buyer fixed effects. Our results show that buyers do not assign to rice samples associated with Santal farmers a lower quality score, as the Minority indicator is negative but never statistically significant in any of the models. While adding controls increases the difference in quality scores between rice samples associated with Santal and Bengali farmers, this difference never reaches statistical significance at conventional levels. In other words, buyers do not seem to discriminate against ethnic minority farmers in terms of rice-quality assessment. To check whether there are differences across type of buyer, we add to our baseline specification an indicator for being a local buyer and its interaction with the $Minority$ dummy, dropping buyer fixed effects to avoid collinearity with the local buyer indicator, and introducing buyer characteristics instead. The results presented in columns (3) and (4) of Table 4 indicate that, while local buyers do, on average, assign higher quality scores to the rice samples, they do not differentiate on the basis of the ethnicity of the farmer who is associated with a rice sample.

Table 5 presents the results for buyers' willingness to pay. In column (1), without any control variables, we find that buyers are willing to pay for rice samples associated with Santal farmers 0.65 Taka less than those associated with Bengali farmers, a difference that is significant at the 1% level. Adding control variables in column (2), slightly increases the size of the coefficient. When we look into heterogeneity effects across buyer

Table 4: Effect of Assigned Ethnicity on Rice Quality Assessment

VARIABLES	(1)	(2)	(3)	(4)
Minority	-0.023	-0.056	-0.056	-0.083
	(0.049)	(0.049)	(0.048)	(0.090)
Local Buyer	-	-	0.587***	0.568***
			(0.207)	(0.214)
Minority×Local Buyer	-	-	-	0.038
				(0.106)
Blind Score	-	-0.018	-0.018	-0.018
		(0.039)	(0.038)	(0.038)
Buyer Characteristics	No	No	Yes	Yes
Rice Variety FE	No	Yes	Yes	Yes
Buyer FE	No	Yes	No	No
Observations	3,360	3,360	3,360	3,360
R-squared	0.000	0.372	0.217	0.217

Robust standard errors clustered at the buyer level are in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: OLS regression estimates reported; the dependent variable is a quality assessment score given to rice samples (any number between 0 and 10, where 10 corresponds to the highest quality); Minority is a dummy variable that equals 1 if a rice sample was assigned an ethnic minority name and 0 if an ethnic majority name was assigned; Blind Score is the blind (i.e., no name was assigned to rice samples) quality score given to each rice sample; Local Buyer is a dummy variable that equals 1 if the buyer is a local or *foriya* type and 0 if the buyer is a wholesale type; Buyer Characteristics include age, monthly income, level of education, land possession, years of experience in the rice buying business, quantity of rice bought every month for business, level of intercultural competence, interaction with ethnic minority farmers, and religion as controls; in total, 3,360 rice samples were assessed by 112 rice buyers (each of whom assessed 30 rice samples).

type in columns (3) and (4), two observations stand out: (i) local buyers quote lower prices than wholesale buyers; (ii) local buyers quote lower prices for rice samples associated with Santali names, as indicated by the negative and statistically significant interaction term, whereas wholesale buyers do not quote different prices.[21]

In summary, these results validate the three main results highlighted in Section

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[21]We also explore whether discrimination varies by the observable characteristics of buyers, particularly the ones that are significantly different across buyer types according to Table 2, namely, education, income, level of intercultural competence, and extent of business interaction with ethnic minority farmers. We find that among local buyers, the ethnic price gap is larger among those who do not have many business interactions (below median) with ethnic minority sellers than those who have many business interactions (above median). We do not find any significant differences for the other characteristics across the two type of buyers. These results are presented in Table A2

3. First, wholesale buyers, who face fierce competition, do not discriminate against the minority group in terms of WTP for rice (Result 1). Second, local buyers, who have monopsony power, discriminate against the Santal minority group by having a lower WTP for their rice (Result 2). Finally, local buyers have a lower WTP for rice when buying from the minority group than wholesale buyers (Result 3). As in our model, we believe that the difference in WTP between local and wholesale buyers is not due to their different tastes for discrimination (in fact, both are equally prejudiced as shown in Figure 2 in Section 6 below) but to the fact that they face different types of competition. Also, the experimental data show that there is no ethnic difference in both type of buyers' evaluation of rice quality, which is what we assumed in the model.

5.3 Understanding the nature of discrimination

In our model, we assumed taste-based discrimination. It is, however, possible that buyers statistically discriminate against minority sellers. Let us show that this is not the case. Indeed, our design enables us to distinguish between taste-based model of discrimination where buyers might have an aversion toward the minority ethnic group (Becker, 1957) and the statistical model of discrimination where buyers might use the ethnicity of farmers as a proxy for skills that are unobservable to them (Phelps, 1972; Arrow, 1973). Our first measure, rice quality scores, captures a buyer's belief about the skills or competence of farmers in cultivating rice. For instance, if a buyer believes that a rice is of lower quality, hence produced by a low skilled farmer, he would certainly give it a low quality score irrespective of its variety or market price. Therefore, finding ethnic differences in terms of rice quality assessment would be consistent with the statistical model of discrimination, where buyers' judgments would be entirely driven by stereotypes associated with skills or ability of ethnic minority farmers in terms of rice production. On the other hand, our second measure, willingness to pay, captures both buyers' preferences for a certain ethnic group as well as their judgments about skills of that particular group. For example, buyers might be willing to pay less for rice produced by Santal farmers because either they dislike paying more to Santal farmers or they believe Santal farmers produce lower-quality rice and, hence, deserve to get a lower price for their product. Therefore, differences in terms of willingness to pay would be consistent with both theories of discrimination. As our data show that buyers discriminate against ethnic minority farmers only in terms of willingness to pay and not in terms of the quality of rice they produce, this suggests that the underlying source for this is taste-based discrimination.

An alternative way to test if discrimination is due to animus or due to making a

Table 5: Effect of Assigned Ethnicity on Buyer's Willingness to Pay

VARIABLES	(1)	(2)	(3)	(4)
Minority	-0.654***	-0.691***	-0.702***	0.233
	(0.230)	(0.198)	(0.197)	(0.270)
Local Buyer	-	-	-2.711***	-2.065**
			(0.903)	(0.926)
Minority×Local Buyer	-	-	-	-1.293***
				(0.365)
Blind Score	-	0.006	0.003	0.014
		(0.108)	(0.105)	(0.105)
Quality Score	-	1.632***	1.460***	1.461***
		(0.133)	(0.160)	(0.160)
Buyer Characteristics	No	No	Yes	Yes
Rice Variety FE	No	Yes	Yes	Yes
Buyer FE	No	Yes	No	No
Observations	3,360	3,360	3,360	3,360
R-squared	0.003	0.596	0.324	0.326

Robust standard errors clustered at the buyer level are in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: OLS regression estimates reported; the dependent variable is the buyer's willingness to pay for one kilogram of each rice samples (in Bangladeshi Taka); Minority is a dummy variable that equals 1 if a rice sample was assigned an ethnic minority name and 0 if an ethnic majority name was assigned; Blind Score is the blind (i.e., no name was assigned to rice samples) quality score given to each rice sample; Quality Score is the rice quality assessment score given to each rice sample (any number between 0 and 10); Local Buyer is a dummy variable that equals 1 if the buyer is a local or *foriya* type and 0 if the buyer is a wholesale type; Buyer Characteristics include age, monthly income, level of education, land possession, years of experience in the rice buying business, quantity of rice bought every month for business, level of intercultural competence, interaction with ethnic minority farmers, and religion as controls; in total, 3,360 rice samples were assessed by 112 rice buyers (each assessed 30 rice samples).

statistical inference about skills is to exploit the order in which rice samples were assessed, following the logic of Hanna & Linden (2012). If there is any correlation between the quality scores/willingness to pay for a particular rice sample and the order in which it was assessed, then that would suggest statistical discrimination. For example, if buyers tend to discriminate at the beginning of the evaluation then that would suggest that buyers use the ethnic identity of farmers as a signal to where the quality of a particular rice sample will end up in the distribution, as the quality distribution is still unknown

to buyers at the beginning. On the other hand, the order of rice assessment should not affect the rice quality scores if discrimination is taste-based.

In Figure A1 in Appendix A, we plot the relationship between assessment order (x-axis) and quality score (A)/willingness to pay (B) (y-axis). The solid line is the assessment outcome of Bengali farmers and the dotted line is the assessment outcome of Santal farmers. From both figures, it is quite evident that there is no particular pattern in terms of the gap between the lines and the assessment order. To formally test this, we regress quality scores (willingness to pay) on assigned ethnicity, the order of assessment, and their interaction, while also controlling for buyer and rice variety fixed effects. These results are presented in Table 6. The 'Minority' term shows the average given score (column 1) or stated willingness to pay (column 3) to Santal farmers that is independent of any assessment order. The interaction term between order and the minority indicator, tells us whether the assessment of rice associated with minority farmers changes with the order in which it is presented. We find that the coefficient on the interaction term is insignificant in both columns (1) and (3), which suggests that the quality score or willingness to pay to Santal farmers does not change over time during the assessment session. In columns (2) and (4), we provide results of an alternative specification in which instead of measuring order linearly, we include an indicator variable of whether a rice sample was presented at the second half of the session, and its interaction with the minority indicator. With the interaction term being statistically insignificant, this analysis shows that the difference in assessment outcomes between Santal and Bengali farmers does not differ across the first and the second half of the assessment. Therefore, this alternative approach also indicates that there is no evidence of statistical discrimination at play in our data, which is also consistent to what was assumed in the theoretical model.

6 Are local buyers more discriminatory than wholesale buyers? A lab-in-the-field experiment

We have demonstrated that local buyers discriminate against ethnic minority rice sellers in terms of willingness to pay for rice, whereas wholesale buyers do not. Following our theoretical model, we argued that the observed ethnic price gap among local buyers was due to their monopsony power, as this gap is completely eliminated among wholesale buyers who operate in a competitive market.

However, an alternative interpretation could be that the ethnic gap in WTP is a reflection of differences in discriminatory attitudes across the two types of buyer. The

Table 6: Effect on Assessment Outcomes, by the Order of Assessment

VARIABLES	Quality Score		Willingness to Pay	
	(1)	(2)	(3)	(4)
Minority	-0.156	-0.080	-0.563*	-0.708***
	(0.100)	(0.067)	(0.334)	(0.244)
Order	0.003	-	0.036**	-
	(0.005)		(0.016)	
Minority×Order	0.006	-	-0.009	-
	(0.006)		(0.018)	
Second Half Order	-	0.008	-	0.438*
		(0.085)		(0.263)
Minority×Second Half Order	-	0.046	-	0.005
		(0.100)		(0.298)
Blind Score	-0.022	-0.020	-0.017	-0.019
	(0.038)	(0.038)	(0.108)	(0.109)
Quality Score			1.629***	1.631***
			(0.132)	(0.133)
Rice Variety FE	Yes	Yes	Yes	Yes
Buyer FE	Yes	Yes	Yes	Yes
Observations	3,360	3,360	3,360	3,360
R-squared	0.372	0.372	0.597	0.597

Robust standard errors clustered at the buyer level are in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: OLS regression estimates reported; the dependent variable in columns 1 and 2 is quality score and that in columns 3 and 4 is WTP; Minority is a dummy variable that equals 1 if a rice sample was assigned an ethnic minority name and 0 otherwise; Order is the order in which rice samples were assessed; Second Half Order is a dummy variable that equals 1 if the order is above 15 and 0 otherwise; 112 buyers (i.e., clusters) in total.

root of this difference in discriminatory attitudes could be geographic: local buyers reside and operate in rural areas as opposed to wholesalers who primarily operate in the urban region of the same district (see Figure B3 in Appendix B for a map of the location of the buyers).

To investigate whether there are regional differences in buyers' attitudes toward ethnic minorities that would explain the ethnic gap in WTP, we conduct a second (lab-in-the-field) experiment with local and wholesale rice buyers from the same Bangladeshi district as in the first field experiment. We next present the experimental design and results of our second field experiment.

6.1 The Lab-in-the-Field Experiment

Our second experiment was carried out in August 2019 drawing from the same population of rice buyers as the first one. It involved 81 rice buyers (51 local and 30 wholesale) from the Rajshahi District of Bangladesh. In fact, of these 81 participants, 41% of the local and 77% of wholesale buyers also participated in the first experiment. As demonstrated in Table A3 in Appendix A, buyers across the two experiments have very similar characteristics.[22]

Each rice buyer played an other-other allocation game in which they were anonymously matched with two farmers from the same district.[23] A buyer was given 100 Taka in 5 Taka bills and two empty envelopes – one for an ethnic minority recipient and the other for an ethnic majority recipient – with a unique buyer-ID number on both envelopes. To preserve the anonymity of recipients, we used common ethnic majority and minority sound names instead of actual farmers' names on the envelopes. The task of this game was to divide the money between these two anonymously matched recipients, without being able to keep any money for one's self. This design allows us to capture whether buyers exhibit a "taste for discrimination" toward ethnic minority farmers avoiding confounds for self-interest or strategic considerations.

To participate in this 10 minute-long experiment, buyers were invited to make allocation decisions individually either at their storehouses or at the NGO offices. The task was individually explained by an experimenter to buyers and, after answering any questions they might have, the experimenter turned his back when the buyer made decisions. After making allocation decisions, buyers sealed the envelopes and placed them in a bag ensuring that allocation decisions were blind to the experimenter on-site. After making decisions, they completed a short survey before being paid 50 Taka in cash. Instructions for this experiment are available in Appendix B.

6.2 Results

Panel A in Table 7 provides an overview of the average money allocated by rice buyers. Both local and wholesale buyers allocate roughly 40% of their endowment to ethnic minority recipients and roughly 60% to ethnic majority recipients, and this difference is statistically significant using a Wilcoxon Signed-Rank test (SR-test hereinafter:

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[22]There are no differences in terms of age, education, income, years of rice buying experience, business interaction with ethnic minority farmers, and religion (MW-test: all p-values< 0.01). We only find a difference in the amount of rice they buy for their businesses every month (MW-test: p-value$= 0.005$ for local buyers and p-value< 0.001 for wholesale buyers).

[23]This is a modified version of the game used in Angerer, Dutcher, Glätzle-Rützler, Lergetporer & Sutter (2017).

Table 7: Lab-in-the-Field Experiment: Summary of Money Allocation

	Panel A: Compares Allocation Within Buyer Types								
	Pooled			Local Buyers			Wholesale Buyers		
	Santal *(Std. Dev.)*	Bengali *(Std. Dev.)*	SR-test *p*-values	Santal *(Std. Dev.)*	Bengali *(Std. Dev.)*	SR-test *p*-values	Santal *(Std. Dev.)*	Bengali *(Std. Dev.)*	SR-test *p*-values
% Money Given to	0.39 (0.25)	0.61 (0.25)	0.000	0.36 (0.26)	0.64 (0.26)	0.001	0.42 (0.23)	0.58 (0.23)	0.011
Observations	81	81	-	51	51	-	30	30	-

	Panel B: Compares Allocation Between Buyer Types							
	Buyer Type	Buyer Type	MW-test *p*-values		Buyer Type	Buyer Type	MW-test *p*-values
Santal	Local vs	Wholesale	0.345	**Bengali**	Local vs	Wholesale	0.345

Note: Santal (Bengali) means a recipient is a Santal (Bengali); Local Buyers are buyers who buy rice by visiting farmer households and Wholesale Buyers are buyers in urban areas who operate large storehouses. SR-test is the Wilcoxon Signed-Rank test. MW-test is a two-sided Mann-Whitney U test.

p-values= 0.001 and 0.011 for local and wholesale buyers, respectively). In fact, the amount that local and wholesale buyers allocate to ethnic minority farmers is statistically indistinguishable (see Panel B), suggesting that attitudes toward ethnic minority farmers do not vary across locations. In addition, a Kolmogorov-Smirnov test also suggest that the distributions of money allocated to ethnic minority recipients by wholesale and local buyers are not statistically different at conventional levels (*p*-value= 0.230). We present these two distributions in Figure 2. These results are confirmed through a regression analysis in which we regress money given to ethnic minorities on buyer type while also controlling for individual characteristics (Table 8). We find that, with or without controlling for characteristics, local buyers do not make different monetary contributions toward ethnic minority farmers than wholesale buyers.

Further insight into the discriminatory inclinations of buyers can be gained through the survey measures of attitudes toward ethnic minorities that we elicited in the exit survey. Specifically, we asked three contextual questions to buyers about their views toward ethnic minorities.[24] A summary of their responses is provided in Table A4 in Appendix A. In all three questions, both local and wholesale buyers exhibit statistically indistinguishable views toward ethnic minorities.

All in all, the evidence from the lab-in-the-field experiment indicates that there are no differences in discriminatory tastes of the two type of buyers. Therefore, this

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[24]We asked (i) whether they would eat food offered by an ethnic minority while visiting their home; (ii) whether they would ask an ethnic minority visitor to sit inside or outside their house; and, (iii) whether they would like to move to an ethnically diverse neighborhood. The exact questions from the survey are available in Appendix C.

Figure 2: Distribution of Allocation to Minority, by Buyer Type

Note: This figure shows the distribution of money allocated to minority recipients.

Table 8: Effect of Buyer Type on Money Allocation

VARIABLES	(1)	(2)	(3)
Local Buyer	-0.062	0.010	0.052
	(0.056)	(0.061)	(0.081)
Age		-0.003	-0.009
		(0.003)	(0.006)
Education	-	0.013*	0.017**
		(0.008)	(0.009)
Income	-	0.000	0.000
		(0.000)	(0.000)
Other Characteristics	No	No	Yes
Observations	81	81	81
R-squared	0.015	0.071	0.119

Robust standard errors are in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: OLS regression estimates reported; the dependent variable is the proportion of money allocated to minority farmers; Local Buyer is a dummy variable that equals 1 if the buyer is a local or *foriya* type and 0 if the buyer is a wholesale type; Other Characteristics include years in current profession, quantity of rice bought every month, religion, business interaction with ethnic minorities, and number of ethnic minority neighbors as controls.

can be ruled out as an explanation of why local buyers price discriminate against ethnic minority farmers while wholesale buyers do not.

7 Conclusion

In this paper, we study the relationship between market competition and discrimination. We first develop a simple theoretical model. If discriminatory buyers have monopsony power because the sellers' search costs are so high so that they accept any take-it-or-leave-it offer from the buyers, we show that the latter will quote a lower price to ethnic minorities. On the contrary, if search costs for finding other buyers are negligible, fierce competition will force buyers to set the same non-discriminatory price, even if they experience distaste at buying from ethnic minority sellers. We also show that the price charged by buyers in the competitive setting, on average, is higher than the one set by monopsonistic buyers.

We test these predictions using data from a field experiment that we conducted in the Northwestern part of Bangladesh (Rajshahi District). We organized a competition among rice farmers followed by a rice evaluation program where ethnic majority rice buyers were invited to assess rice samples (eliciting both the quality of the rice and the price they would be willing to pay for the rice sample) to determine the winner of the competition. To experimentally measure whether the ethnic identity of farmers has any relationship with assessment outcomes, we randomly attached ethnic majority and minority sounding names to each rice sample to implicitly signal to buyers the ethnicity of participants in the rice competition. What is unique in our experiment is that we are able to compare the price-setting of buyers who have the same taste for discrimination, in different market contexts (monopsony versus perfect competition).

Independently of the degree of market power, we find that buyers do not discriminate against minority sellers in terms of the quality of the rice. Instead, because of their monopsony power, local buyers do discriminate against the Santal minority group by expressing a lower WTP for their rice. However, wholesale buyers, who face fierce competition, do not discriminate against the minority group in terms of WTP for rice. We also find that local buyers have a lower WTP for rice when buying from the minority group than wholesale buyers, confirming the three results of our theoretical model.

Importantly, in a second lab-in-the-field experiment, where buyers play an other-other allocation game, we test whether local and wholesale buyers are different in terms of prejudice against the ethnic minority group. We find that there are no significant differences between the two types of buyer and both allocate roughly 40% of their endowment to ethnic minorities and 60% to the majority group. In other words, both types of buyer are prejudiced against minority individuals, but the prejudices do not vary between them. Given that local and wholesale buyers have the same taste for dis-

crimination (Figure 2) but different perceptions of competition (i.e., wholesale buyers report facing more competition in buying rice and more pressure to offer a higher price than local buyers, see Table 1), we believe that our first field experiment cleanly isolates the impact of competition on discrimination and shows that the latter can be eliminated if there is enough competition.

We also believe that the results of this paper go beyond the case of farmers in Bangladesh and provide a powerful message helping fight discrimination. Indeed, many countries have broad laws that protect consumers and regulate how companies operate their businesses. In particular, antitrust laws (or competition laws) are statutes developed by the U.S. government to protect consumers and prevent businesses operating in a specific industry from gaining too much power over their competition. These laws have evolved along with the market, vigilantly guarding against would-be monopolies and disruptions to the productive ebb and flow of competition. Our paper shows that these laws, by increasing competition between firms, can also prevent the discrimination of ethnic minorities in terms of price or salary.

References

Ahmed, K. (2010). Defining 'Indigenous' in Bangladesh: International Law in Domestic Context. *International Journal on Minority and Group Rights*, *17*(1), 47–73.

AIPP (2010). *Traditional Livelihoods and Indigenous Peoples*. Asia Indigenous Peoples Pact Foundation, Chiang Mai, Thailand.

Ali, A. (1998). *Santals of Bangladesh*. Institute of Social Research & Applied Anthropology, West Bengal.

Altonji, J. G. & Blank, R. M. (1999). Race and gender in the labor market. In O. Ashenfelter & D. Card (Eds.), *Handbook of Labor Economics, Vol.3* (pp. 3143–3259). Elsevier.

Anderson, L. R., Fryer, R. G., & Holt, C. A. (2006). Discrimination: Experimental evidence from psychology and economics. In W. M. Rodgers (Ed.), *Handbook on the Economics of Discrimination* (pp. 97–115). Cheltenham, UK: Edward Elgar.

Angerer, S., Dutcher, E. G., Glätzle-Rützler, D., Lergetporer, P., & Sutter, M. (2017). Gender Differences in Discrimination Emerge Early in Life: Evidence from Primary School Children in a Bilingual City. *Economics Letters*, *152*, 15–18.

Arrow, K. J. (1973). The Theory of Discrimination. In O. Ashenfelter & A. Rees (Eds.), *Discrimination in Labor Markets*. Princeton, NJ: Princeton University Press.

Ashenfelter, O. & Hannan, T. (1986). Sex discrimination and product market competition: The case of the banking industry. *The Quarterly Journal of Economics*, *101*(1), 149–174.

Ayeduvor, S. (2018). Assessing Quality Attributes that Drive Preference and Consumption of Local Rice in Ghana. *International Food Policy Research Institute Working Paper*.

Ayres, I., Banaji, M., & Jolls, C. (2015). Race effects on ebay. *The RAND Journal of Economics*, *46*(4), 891–917.

Bäckman, S., Islam, K. Z., & Sumelius, J. (2011). Determinants of Technical Efficiency of Rice Farms in North-Central and North-Western Regions in Bangladesh. *Journal of Developing Areas*, *45*, 73–94.

Bangladesh Bureau of Statistics (2017). Yearbook of Agricultural Statistics. http://bbs.gov.bd/. Online; Accessed October 29, 2018.

Becker, G. S. (1957). *The Economics of Discrimination*. Chicago: University of Chicago Press.

Bertrand, M. & Duflo, E. (2017). Field Experiments on Discriminationa. In E. Duflo & A. Banerjee (Eds.), *Handbook of Economic Field Experiments*. Elsevier.

Bertrand, M. & Mullainathan, S. (2004). Are Emily and Greg More Employable Than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination. *American Economic Review*, *94*(4), 991–1013.

Black, S. E. & Brainerd, E. (2004). Importing equality? The impact of globalization on gender discrimination. *Industrial and Labor Relations Review*, *57*(4), 540–559.

Black, S. E. & Strahan, P. E. (2001). The division of spoils: Rent-sharing and discrimination in a regulated industry. *The American Economic Review*, *91*(4), 814–831.

Cavallaro, F. & Rahman, T. (2009). The Santals of Bangladesh. *The Linguistics Journal*, *4*(2), 192–220.

Charles, K. K. & Guryan, J. (2011). Studying discrimination: Fundamental challenges and recent progress. *Annual Review of Economics*, *3*, 479–511.

D'Costa, B. (2014). *Marginalization and Impunity: Violence Against Women and Girls in the Chittagong Hill Tracts*. International Work Group for Indigenous Affairs.

Debnath, M. K. (2010). *Living on the Edge: The Predicament of a Rural Indigenous Santal Community in Bangladesh*. PhD thesis, Ontario Institute for Studies in Education, University of Toronto.

Doleac, J. L. & Stein, L. C. (2013). The visible hand: Race and online market outcomes. *The Economic Journal*, *123*(572), F469–F492.

Edelman, B., Luca, M., & Svirsky, D. (2017). Racial Discrimination in the Sharing Economy: Evidence from a Field Experiment. *American Economic Journal: Applied Economics*, *9*(2), 1–22.

Ewens, M., Tomlin, B., & Wang, L. C. (2014). Statistical Discrimination or Prejudice? A Large Sample Field Experiment. *Review of Economics and Statistics*, *96*(1), 119–134.

Fantini, A. E. (2010). A Central Concern: Developing Intercultural Competence. In A. E. Fantini (Ed.), *SIT Occasional Papers Series: Addressing Intercultural Education, Training & Service*. SIT, Brattleboro, Vermont.

Fryer, R. G. & Levitt, S. D. (2004). The causes and consequences of distinctively black names. *The Quarterly Journal of Economics*, *119*(3), 767–805.

Hanna, R. N. & Linden, L. L. (2012). Discrimination in Grading. *American Economic Journal: Economic Policy*, *4*(4), 146–168.

Hellerstein, J. K., Neumark, D., & Troske, K. R. (2002). Market forces and sex discrimination. *The Journal of Human Resources*, *37*, 353–380.

Hirata, G. & Soares, R. R. (2016). Competition and the racial wage gap: Testing Becker's model of employer discrimination. IZA Discussion Paper No. 9764.

Islam, A., Pakrashi, D., Wang, L., & Zenou, Y. (2018). Determining the extent of statistical discrimination: Evidence from a field experiment in India. CEPR Discussion Paper No. 12955.

Lane, T. (2016). Discrimination in the laboratory: A meta-analysis of economics experiments. *European Economic Review*, *90*, 375–402.

Lang, K. & Lehmann, J.-Y. K. (2012). Racial discrimination in the labor market: Theory and empirics. *Journal of Economic Literature*, *50*, 959–1006.

Levine, R., Levkov, A., & Rubinstein, Y. (2008). Racial discrimination and competition. NBER Working Paper No. 14273.

Li, H., Lang, K., & Leong, K. (2017). Does competition eliminate discrimination? evidence from the commercial sex market in singapore. *The Economic Journal*, *128*(611), 1570–1608.

List, J. A. (2004). The Nature and Extent of Discrimination in the Marketplace: Evidence from the Field. *Quarterly Journal of Economics*, *119*(1), 49–89.

Neumark, D. (2018). Experimental Research on Labor Market Discrimination. *Journal of Economic Literature*, *56*(3), 799–866.

Nunley, J. M., Owens, M. F., & Howard, R. S. (2011). The effects of information and competition on racial discrimination: Evidence from a field experiment. *Journal of Economic Behavior & Organization*, *80*(3), 670–679.

Office of the Registrar General & Census Commissioner India (2017). http://www.censusindia.gov.in/2011census/PCA/ST.html. Online; Accessed September 01, 2019.

Peoples, J. & Talley, W. (2001). Black-white earnings differentials: Privatization versus deregulation. *The American Economic Review*, *91*(2), 164–168.

Phelps, E. S. (1972). The Statistical Theory of Racism and Sexism. *American Economic Review*, *62*(4), 659–661.

Rahman, S. M., Takeda, J., & Mohiuddin, M. (2006). Rice Farmers' Marketing Efficiency in South-Western Part of Bangladesh. *Journal of Applied Sciences*, *6*(9), 2043–2050.

Reardon, T., Minten, B., Chen, K., & Adriano, L. (2013). The Transformation of Rice Value Chains in Bangladesh and India: Implications for Food Security. *Asian Development Bank Economics Working Paper Series*, (375).

Riach, P. A. & Rich, J. (2002). Field experiments of discrimination in the market place. *The Economic Journal*, *112*, F480–F518.

Risley, H. H. (1891). *The Castes and Tribes of Bengal: Volume II*. Harvard Library: Bengal Secretariat Press.

Roy, R. D. (2012). Country Technical Notes on Indigenous Peoples' Issues: People's Republic of Bangladesh. *IFAD Country Report*.

Samad, M. (2006). The Santals in Bangladesh: Problems, Needs and Development Potentials. *Journal of Ethnic Affairs, 2*, 9–13.

Sarker, P. & Davey, G. (2009). Exclusion of Indigenous Children from Primary Education in the Rajshahi Division of Northwestern Bangladesh. *International Journal of Inclusive Education, 13*(1), 1–11.

Saunderson, L. E. (2006). The Adaptation and Immersion of Minority Cultures to a Predominately Mono-Cultural Nations. *Journal of Ethnic Affairs, 2*, 32–35.

Shariff, F. (2007). Micro Level Factors in the Pursuit of Social Justice: A Study of Power Relations in the Santal Village. *Law, Social Justice & Global Development, 1*, 1–23.

Shariff, F. (2008). Power Relations and Legal Pluralism: An Examination of 'Strategies of Struggles' Amongst the Santal Adivasi of India and Bangladesh. *The Journal of Legal Pluralism and Unofficial Law, 40*(57), 1–43.

Shelley, I. J., Takahashi-Nosaka, M., Kano-Nakata, M., Haque, M. S., & Inukai, Y. (2016). Rice Cultivation in Bangladesh: Present Scenario, Problems, and Prospects. *Journal of International Cooperation for Agricultural Development, 14*, 20–29.

Siddique, A. & Vlassopoulos, M. (2020). Competitive preferences and ethnicity: Experimental evidence from Bangladesh. *The Economic Journal*, forthcoming.

Zaman, Z.-U., Mishima, T., Hisano, S., & Gergely, M. (2001). The Role of Rice Processing Industries in Bangladesh: A Case Study of Sherpur District. *Review of Agricultural Economics, 57*, 121–133.

Zussman, A. (2013). Ethnic Discrimination: Lessons from the Israeli Online Market for Used Cars. *Economic Journal, 123*(572), F433–F468.

Market Competition and Discrimination

Appendix

By Abu Siddique[1], Michael Vlassopoulos[2] and Yves Zenou[3]

A   Additional Tables and Figures

Figure A1: Ethnic Discrimination, by Order of Assessment
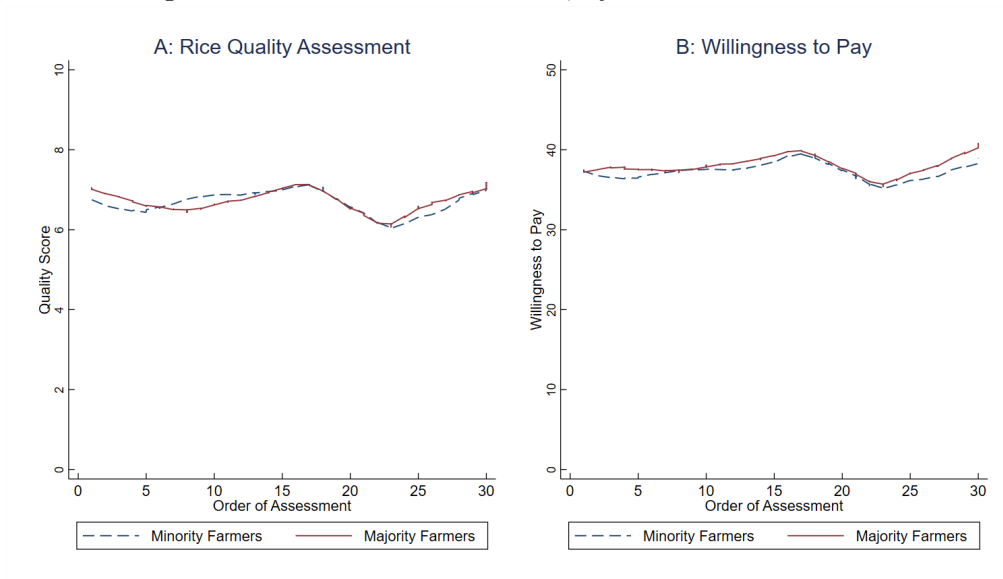
Note: This figure shows the relationship between the order in which buyers have assessment rice samples and assigned ethnicity of farmers.

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Table A1: Farmer Characteristics

Seller Characteristics	Pooled (*Std. Dev.*)	Majority (*Std. Dev.*)	Minority (*Std. Dev.*)	MW-test *p*-values
Age	42	39.93	44.07	0.299
	(10.47)	(10.87)	(10.00)	
Education	4.27	4.80	3.73	0.232
	(3.37)	(3.00)	(3.73)	
Income	6,377	6,920	5,833	0.010
	(1,155)	(1,050)	(1,015)	
Years in Current Profession	27.67	26.53	28.80	0.418
	(11.71)	(12.73)	(10.93)	
Rice Quantity	1,562	1,647	1,477	0.360
	(534)	(456)	(606)	
Last Selling Price	36.30	37.90	34.70	0.006
	(3.58)	(1.58)	(4.30)	
Reservation Price (Local)	29.73	32.87	26.60	0.000
	(5.15)	(2.29)	(5.34)	
Reservation Price (Wholesale)	31.05	34.13	27.97	0.001
	(5.09)	(2.70)	(5.09)	
Stress if Cannot Sell to Local	5.83	5.27	6.40	0.325
	(3.23)	(3.39)	(3.07)	
Stress if Cannot Sell to Wholesale	4.57	3.80	5.33	0.308
	(3.69)	(3.49)	(3.85)	
Frequency of Selling to Wholesale	0.20	0.20	0.20	1.000
	(0.21)	(0.21)	(0.21)	
Engage in Contracts	0.10	0.13	0.07	0.612
	(0.22)	(0.28)	(0.14)	
Sample Size	30	15	15	-

Note: Age and Education are in years; Income is monthly income in Bangladeshi Taka; Rice Quantity is the average quantity of rice (in kg) sold each month; Last Selling Price is the average price (per kg) at which one sold rice during the most recent season; Reservation Prices are the lowest prices at which a seller is willing to sell one kilogram of rice to local and wholesale buyers; Stress if Cannot Sell to Local/Wholesale is the level of stress (between 0 and 10) a seller feels when he cannot sell his rice to local/wholesale buyers, where a higher number corresponds to more stress; Frequency of Selling to Wholesale states how frequently one sells to wholesale buyers (between 0 and 1, where 1 corresponds to very frequently); Engage in Contracts with Local states how frequently one engages in contracts with local buyers to sell rice (between 0 and 1, where 1 corresponds to very frequently). MW-test is a two-sided Mann-Whitney U test.

Table A2: Effect on Willingness to Pay by Buyer's Characteristics

	1. LOCAL BUYERS		
	Belongs to panel title category?		
VARIABLES	**Yes** (1)	**No** (2)	**Difference** (3)
Panel A1: Above Median Education			
Minority	-0.946**	-1.152***	0.244
	(0.370)	(0.295)	(0.479)
Panel B1: Above Median Income			
Minority	-1.040***	-1.025**	0.036
	(0.290)	(0.405)	(0.503)
Panel C1: Above Median IC Competence			
Minority	-1.190***	-0.816**	-0.424
	(0.340)	(0.335)	(0.475)
Panel D1: Have Some Business Interaction			
Minority	-0.474*	-1.307***	0.820*
	(0.234)	(0.331)	(0.422)

	2. WHOLESALE BUYERS		
VARIABLES	**Yes** (1)	**No** (2)	**Difference** (3)
Panel A2: Above Median Education			
Minority	0.110	0.290	-0.097
	(0.408)	(0.389)	(0.565)
Panel B2: Above Median Income			
Minority	0.321	-0.047	0.368
	(0.422)	(0.370)	(0.581)
Panel C2: Above Median IC Competence			
Minority	0.458	-0.215	0.817
	(0.394)	(0.393)	(0.541)
Panel D2: Have Some Business Interaction			
Minority	0.999	-0.010	1.564
	(0.704)	(0.274)	(0.987)
Other Controls	Yes	Yes	Yes
Buyer Characteristics	Yes	Yes	Yes
Rice Variety FE	Yes	Yes	Yes

Robust standard errors clustered at the buyer level are in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: OLS regression estimates reported; the dependent variable is the buyer's willingness to pay; Minority is a dummy variable that equals 1 if a rice sample was assigned an ethnic minority name and 0 if an ethnic majority name was assigned; all panel title categories are subgroups that are analysed; Column 1 shows estimates for rice samples assessed by buyers who belong to the panel title category; Column 2 shows estimates for rice samples assessed by buyers who do not belong to the panel title category; Column 3 shows the coefficient of the interaction between the buyer's characteristic and being ethnic minority; Have Some Business Interaction is a dummy that equals to 1 if buyers have at least some interaction with ethnic minority farmers and 0 if they do not interact; Other Controls include Blind Score and Rice Quality; Buyer Characteristics include all characteristics from column 3 in Table 5; in total, 3,360 (2,430 by local and 930 by wholesale) rice samples were assessed by 112 (81 local and 31 wholesale) rice buyers.

Table A3: Rice Buyer Characteristics across the Two Experiments

Buyer Characteristics	Local 1 (Std. Dev.)	Local 2 (Std. Dev.)	MW-test p-values	Wholesale 1 (Std. Dev.)	Wholesale 2 (Std. Dev.)	MW-test p-values
Age	40.69	40.84	0.779	38.35	40.80	0.302
	(13.44)	(11.39)		(10.57)	(10.10)	
Education	7.36	7.29	0.908	9.13	9.63	0.763
	(3.94)	(3.95.)		(3.50)	(3.08)	
Income	12,361	12,069	0.776	18,571	19,483	0.383
	(6,786)	(4,719)		(7,233)	(6,173)	
Years in Current Profession	15.23	16.22	0.924	16.00	17.47	0.879
	(11.09)	(13.32)		(8.59)	(12.32)	
Rice Quantity	2,586	2,503	0.005	15,589	16,450	0.000
	(3,192)	(1,385)		(47,774)	(6,706)	
% Business Interaction	0.17	0.25	0.257	0.03	0.00	0.325
	(0.38)	(0.44)		(0.18)	(0.00)	
% Muslim	0.80	0.80	0.984	0.71	0.80	0.417
	(0.40)	(0.40)		(0.46)	(0.41)	
Sample Size	81	51	-	31	30	-

Note: Local 1 and 2 (Wholesale 1 and 2) correspond to characteristics collected during experiments 1 and 2 respectively. Age and Education are in years; Income is monthly (in Bangladeshi Taka); Years in Current Profession is the number of years a buyer is in his current profession; Rice Quantity is the amount of rice (in kilograms) one buys every month for business purpose; % Business Interaction is a dummy variable that equals 1 if buyers have moderate to frequent interactions with ethnic minority farmers and 0 otherwise; % Muslim is a dummy that equals to 1 if a buyer is a Muslim and 0 if Hindu; MW-test is a two-sided Mann-Whitney U test;

Table A4: Summary of Survey Measures of Discrimination

Buyer Characteristics	Pooled (Std. Dev.)	Local (Std. Dev.)	Wholesale (Std. Dev.)	MW-test p-values	CS-test p-values
Eat food offered at minority homes	0.25	0.22	0.31	0.350	0.347
	(0.44)	(0.42)	(0.47)		
Offer seats to minority visitors	0.47	0.53	0.37	0.159	0.156
	(0.50)	(0.50)	(0.49)		
Likelihood of moving to a diverse neighborhood	0.38	0.41	0.33	0.486	0.483
	(0.49)	(0.50)	(0.48)		
Sample Size	81	51	30	-	-

Note: 'Eat food offered at minority homes' is a dummy that equals 1 if food offered are eaten very frequently or frequently and 0 otherwise; 'Offer seats to minority visitors' is a dummy if a minority guest is allowed to seat inside the house (chair or floor) and 0 otherwise; 'Likelihood of moving to a diverse neighborhood' is a dummy that equals 1 if yes and 0 if no; MW-test is a two-sided Mann-Whitney U test; CS-test is a Pearson's Chi-Squared test.

B   Experimental Details

B.1   Pictures and Rice Assessment Materials

Figure B1: A Typical Rice Market in Rajshahi, Bangladesh

Note: A rice market street or *chal-potti* with wholesale buyers in Rajshahi, Bangladesh.

Figure B2: A Rice Board

Note: On top of each rice sample, on the left is the rice ID and next to it is the assigned name of the farmer. All rice boards were 60cm×90cm in dimensions.

Table B1: List of Rice Varieties and Market Prices

	Rice Variety	Market Price per kg
1.	Atash Grade 1	56
2.	Atash Grade 2	52
3.	Atash Grade 3	50
4.	Aush	45
5.	Gutishorna	42
6.	Jeera	58
7.	Paijam	60
8.	Parija	45
9.	Shorna	40

Note: All prices are in Bangladeshi Taka.

Figure B3: Map of Rajshahi District
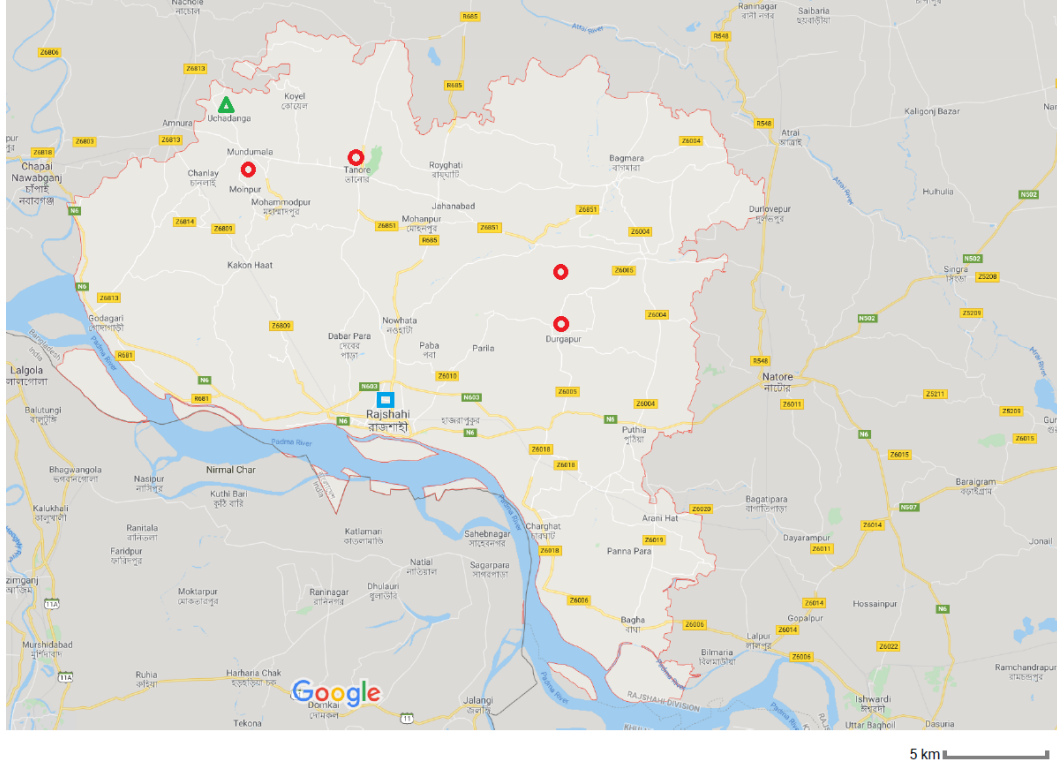
Note: The green triangle is the location of rice farmers who took part in the rice competition; red circles are locations of local rice buyers; the blue square is the location of wholesale buyers.

Table B2: List of Bengali and Santal Sounding Names

	Bengali Names	Santal Names
1.	Mohammad Mannan	Horen Hasda
2.	Rafiqul Islam	Hopna Kisku
3.	Jashim Ali	Swapon Murmu
4.	Abul Kalam	Anmel Hasda
5.	Ashraful Islam	Mungla Hembrom
6.	Khairul Islam	Phanichandra Hasda
7.	Mohammad Zakaria	Jogi Murmu
8.	Mazharul Islam	Piuch Tudu
9.	Mohammad Saifuddin	Robi Saren
10.	Imam Hossain	Joydeb Mardi
11.	Rajab Ali	Dhiren Hembrom
12.	Mohammad Rafique	Brijlal Kisku
13.	Borhan Hossain	Niren Mardi
14.	Mohammad Selim	Morme Tudu
15.	Amirul Islam	Philmon Saren

Table B3: The Evaluation Sheet

Rice ID	Name of Farmer	Quality Score	Willing to Pay

Note: Buyers had to write the rice ID and then the farmer's name, and then give the quality score and write how much they are willing to pay for one kilogram of this particular rice (always in this order).

B.2 Advertisements and Experimental Instructions

<u>Experiment 1</u>

Advert for Rice Competition (Farmers)

[While talking to the male head of the household who is a farmer]

The NGO *Ashrai* is organizing a rice competition in your village. The idea is to reward the farmer who has cultivated the "best" rice in this region during the last rice growing season. To participate, all you have to do is submit 500 grams of rice that you cultivated during the most recent season. Your rice will be judged by rice buyers from various locations but they will not be from your own village. Based on buyers' scores, the farmer with the highest total score would receive a cash prize of 2,000 Taka.

If you wish to take part then please submit 500 grams of your cultivated rice. We would only contact the winner after 6 weeks. If you have any questions then you can either ask me now or you can call [name] at [phone number].

Thank you!

Advert for Rice Assessment (Buyers)

We are organizing a competition on rice quality produced by local farmers in the Rajshahi region. Farmers have already submitted their rice for the competition. Now, we need rice buyers to assess these rice samples to determine the winner. Based on your assessment, the farmer who receives the highest total score would receive a monetary reward. Also, by taking part, you will receive 200 Taka in cash. In addition, you will have a chance to earn 150 Taka by assessing rice samples. Therefore, by taking part, you can earn up to 350 Taka for 60 minutes of your time.

Please note that, in order to take part, you have to know how to read and write simple sentences. If you wish to take part, then please go to [location] on the [date] at [time].

If you have any questions then you can either ask me now or you can call [name] at [phone number]. Further details will be provided at the time of the assessment.

Thank you!

Instructions (Evaluation Program)

Welcome to our rice quality assessment program. This session will last for 50 minutes during which you will be asked to assess rice quality of 30 different rice samples produced by 30 different farmers from villages of the Rajshahi region. These farmers

are participants in a rice competition that we are organizing, where the farmer who cultivated the best rice during the most recent rice season will win a cash prize of 2,000 Taka. We have recruited you to determine the winner of the competition.

We will give you a big board which will have 30 different rice samples attached to it [*show them a board*]. Each rice sample will have a rice ID and the name of the farmer who has cultivated that particular rice. All you have to do is to look at each rice sample closely to check its quality and then give a quality score of between 0 to 10 for each rice sample, where 0 is the lowest score (indicating the rice quality is extremely bad) and 10 is the highest score (indicating the rice quality is very good). Then for that same rice sample, you will also have to say how much you are willing to pay for one kilogram of that rice. In short, you will analyze each rice sample and then give that rice a quality score and a price that you are willing to pay per kilogram on a separate piece of paper that we will provide. Before writing scores and prices, you will have to copy the rice ID and the name of the farmer for each sample. For a final score, we would give 50% of the weight to quality score and the remaining 50% to price. Therefore, both quality score and price are equally important to determine the winner. In the end, the farmer with the highest overall score will win a cash prize of 2,000 Taka. Please see the example below:

Example: If you think a rice with rice ID 01 produced by [First Name] [Surname] is of excellent quality then you could give this sample a score of, for example, 8 or 9 or 10 and state how much you are willing to pay, for example, 38 or 48 or 58 Taka per kilogram of this rice. In that case, you will have to first copy the rice ID, the name of the farmer, then write the quality score and then state the price that you are willing to pay. You always have to write it in this order (from left to right):

Rice ID	Name of Farmer	Quality Score	Willing to Pay
01	[First Name] [Surname]	10	58

This is only an example. You can give any score or state any price you like. Please raise your hand if you have any questions.

Along with the participation fee of 200 Taka, you can also earn 5 Taka for assessing each rice sample. That means you can earn up to 150 Taka when you assess all 30 rice samples. After completing this task, we will ask you to fill out a short survey that will not take more than 10 minutes. You can leave blank any question that you are not willing to answer.

Please do not talk to other buyers or show them your scores. Please assess rice

samples privately.

Do you have any questions?

Now we will distribute the boards with rice samples.

Experiment 2

Instructions (Other-Other Allocation Game)

Thank you for agreeing to participate in this short meeting. During this 10 minutes-long meeting, you are required to complete a short task and a survey. To complete the task, we will give you 100 Taka in 5 Taka bills that you will be required to divide between two people. These two people that you are matched with are actual rice farmers from the Tanore Upazilla. The name of these two recipients are written on two separate envelopes. All you have to do is to divide the 5 Taka bills between these two envelopes. So money placed in an envelope will go to that specific person. For example, if you put 10 Taka in envelope with name "X" then you will have to put 90 Taka in envelope with name "Y". Then 10 Taka will go to person "X" and 90 Taka will go to person "Y". For completing the task and the survey, you will receive 50 Taka in cash at the end of this meeting.

Please note that instead of your name, we will use your ID number on the envelopes. You will make the division in private and then, after completing the task, put the two envelopes in the bag in front of you. Do you have any questions? While you make your division, I will turn my back. Please do not tell me what you plan to do or have already done. Tell me when you are ready.

C   Individual Surveys

Experiment 1

Survey for Rice Buyers

(Please leave blank if you do not want to answer a question)

ID Number: _____

Age (in years): _____

Marital Status: _____

Number of children (if any): _____

Ethnicity (tick one): Adivasi / Bengali

Maximum education obtained: _____

Occupation of mother (if known): _____

Occupation of father (if known): _____

Income of mother (if known): _____

Income of father (if known): _____

Education of mother (if known): _____

Education of father (if known): _____

Years in current occupation: _____

Is rice-buying your own business or do you work for someone else (tick one)? own / someone else

What is your monthly income (in Taka): _____

How much land do you own (in Katha): _____

When did your family last migrate (in years): _____

Which village are you from: _____

In which market is your rice shop: _____

How often do you buy rice from Adivasi farmers in a month (tick one):
                    very often / often / not that often / not at all

How often Adivasi farmers bargain while selling rice (tick one):
                    very often / often / not that often / not at all

How often Bengali farmers bargain while selling rice (tick one):
                    very often / often / not that often / not at all

Do you buy rice by going door-to-door (tick one)? Yes / No

What is the main feature you look at while assessing rice quality (tick one):

   shape / colour / chalkiness / size / proportion of damaged grains / something else

How much rice do you buy in a month (in kilograms): [ ]

Intercultural Competence Questions

- What is the language spoken by Santals? [ ]

- Do you speak that language? [ ]

- What is their major religion? [ ]

- What is their major religious festival? [ ]

Experiment 2

Survey for Rice Buyers

(*Please leave blank if you do not want to answer a question*)

ID Number: [ ]

Age (in years): [ ]

Maximum education obtained: [ ]

Years in current occupation: [ ]

Religion: [ ]

What is your monthly income (in Taka): [ ]

How much rice do you buy in a month for business purpose (in kilograms): [ ]

How often do you buy rice from Adivasi farmers in a month (circle one):

                    very often / often / not that often / not at all

How many Adivasi neighbours have you got? (circle one)

                    many / some / very few / none

Would you like to move to a neighbourhood which is ethnically diverse? (circle one)

                    definitely / maybe yes / maybe no / no

When you visit an Adviasi home, do you eat food offered by them? (circle one)

                    very often / often / not that often / not at all

If Adivasis visit your home, where do they sit? (circle one)

chair / floor / other / they always wait outside

Did you participate in a rice assessment session last year? Yes / No

Whom do you buy rice from mostly?

farmers / middlemen / others

In a month, what percentage of your total rice are directly bought from farmers, middlemen, and other? Separate %'s with comma

While buying rice from farmers, who quotes the price first, you or the farmer? You / Farmer

While buying rice from farmers, with whom do you haggle the most? Adivasi / Bengali

Do you find it relatively easy to buy rice from Adivasi farmers than from Bengali farmers? Yes / No

Do you fear losing a prospective seller/farmer to other buyers in this street/region? Please give a number from 0 to 10 to show your level of fear, where 10 means maximum fear.

Do you think buying rice is very competitive in this street/region? Please give a number from 0 to 10 to show the level of competition, where 10 means very competitive.

How often do you lose rice sellers to other competitors in this street/region?

very often / often / not that often / not at all

Does competition in this street/region force you to offer higher price to rice sellers? Yes / No

How much does concern of losing a seller to a competitor influence the price you quote?

very / somewhat / little / not at all

Survey for Rice Farmers

(*Please leave blank if you do not want to answer a question*)

ID Number:

Ethnicity:

Age (in years):

Maximum education obtained:

Years in current occupation:

What is your monthly income (in Taka):

How much rice do you sell each month on average (in kg):

What price did you get for selling 1 kilogram of rice during the most recent season?

Do you sell rice to more than one buyer in a single season? If yes, how many? [   ]

What is the minimum price (per kilogram) that you are willing to accept from a buyer while selling rice? Foriya: [   ] & City wholesaler: [   ]

How often do you sell rice to city buyers?

<div align="center">very often / often / not that often / not at all</div>

How often do you have contracts with specific Foriyas to sell your rice?

<div align="center">very often / often / not that often / not at all</div>

While selling rice to buyers, who quotes the price first, you or the buyer?

While selling rice to buyers, with whom do you haggle the most? Foriya/City wholesaler

Do you find it stressful if you cannot sell your rice to a Foriya? Please give a number from 0 to 10 to show your level of stress, where 10 means maximum stress. [   ]

Do you find it stressful if you cannot sell your rice to a City wholesaler? Please give a number from 0 to 10 to show your level of stress, where 10 means maximum stress. [   ]

How easy it is to find an alternative buyer in rice markets in the city?

<div align="center">very easy / somewhat easy / not so easy / very difficult</div>

How easy it is to find an alternative Foriya in the villages?

<div align="center">very easy / somewhat easy / not so easy / very difficult</div>