Superstitious Belief Versus Nudge as Contract-Enforcing Mechanisms: Evidence from a Field Experiment

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December 28, 2019

Abstract

Can informal mechanisms help enforce economic contracts in the *field*? Despite extant affirmative evidence from the laboratory, we conduct a natural field experiment in a real marketplace to test if the lab results generalize qualitatively in the field. Due to the lack of contract-enforcing institutions (monitoring, detection, punishments, reputations, etc.), our marketplace experiences widespread contractual breaches by the sellers *after* bilateral agreements over the price and quantity are reached. In this setting, we explore two mechanisms: a buyer-driven nudge in the form of an ethics reminder before the purchase and rendering salient sellers' superstitious belief about the first transaction of the day. In a within-seller design, experimenter-buyers make scripted purchases in *Baseline*, *Nudge* and *Superstition* treatments. We discover that the sellers behave strikingly honestly when the superstition is made salient whereas nudge significantly decreases dishonesty, albeit the effect is markedly weaker than under *Superstition*. Although we find that the prevailing superstition is most effective in mitigating dishonesty and boosting contract enforcement, making normative demand through a nudge is also observed to push the breaching party substantively towards the agreement.

Keywords: Superstition, Nudge, Bargaining, Cheating, Field Experiment.
JEL Codes: C7, D8, C93

PRELIMINARY DRAFT: Please do not cite without the authors' permission.

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1 Introduction

There is an established body of literature in economics arguing that individuals' ability to enforce economic agreements (contract enforcement) is an essential ingredient for economic growth (MacLeod, 2007; Greif, 2005, 2004, 1998, 1993, 1989; Kahkonen and Meagher, 2001; North, 1981). In the presence of formal contract enforcement apparatuses (i.e., legal institutions and private institutions that evolve in the shadow of the law), contracting parties can rely on formal mechanisms to enforce contracts. However, without recourse to well-functioning legal enforcement structures, parties often resort to informal mechanisms to enforce agreements (MacLeod, 2007; Greif, 2006; North, 1990; Macauley 1963). As a result, a sizable body of experimental evidence using an array of economic games has emerged from the laboratory showing that a wide range of informal mechanisms can enforce contractual obligations with ample success (e.g., communication, long-term relations, social networks, reciprocity, promise keeping, social norm, guilt aversion, among others).[1]

Despite the impressive data generated by the controlled laboratory experiments, little evidence has been presented as to whether informal mechanisms can indeed help enforce economic contracts in the *field*.[2] To supply evidence on this issue, we conduct a controlled natural field experiment to test the power of two informal mechanisms to mitigate or at best eliminate the incidence of contract violations in a real marketplace that is fraught with contractual breaches. We approach a large and established real-world decentralized marketplace - fish markets in Kolkata, India - where a substantial number of trades takes place between buyers and sellers via bilateral bargaining over price and where the latter

[1] We view informal mechanisms as any mechanism that lies outside the purview of formal legal boundaries (MacLeod, 2007). Indeed, results from laboratory experiments indicate that informal mechanisms help in enforcing contracts even when opportunistic breaches may be profitable (Chandrasekhar et al., 2018; Dufwenberg et al., 2017; Brandts and Charness, 2016; Fehr et al., 2015, 2011, 2009, 1997; Kessler and Leider, 2012; Charness and Dufwenberg, 2011, 2006; Ben-Ner and Putterman, 2009; Wu and Roe, 2007; Brown et al., 2004; Irlenbusch, 2004; Malhotra and Murnighan, 2002).

[2] Laboratory experiments in the social sciences are valuable for understanding human behavior in controlled environments. However, there is an active debate about the extent to which lab experiments have external validity. In an influential paper, Levitt and List (2007) have questioned whether findings in laboratory studies generalize in the real world, arguing that "because the lab systematically differs from most naturally occurring environments...experiments may not always yield results that are readily generalizable".

party frequently engages in a contractual breach by cheating on the *weight* of the fish *after* both parties agree on a mutually agreed-upon price. Thus a breach unambiguously increases the seller's payoff at the expense of that of the buyer. The two characteristics that make our marketplace an ideal testing ground for gauging the success of our mechanisms are that formal contract enforcement is lacking and the subtle nature of the breach renders monitoring, detection and punishment of an incident of breach nearly impossible.[3] As a result, any observed reduction in the frequency of contract violations in the presence of our interventions can be safely attributed to the success of the mechanisms and not to other confounding factors.

Within such a setting, we explore the performance of the following two informal mechanisms: one-way communication by the buyer before a purchase is being made that provides a nudge to the seller and rendering salient a widely-held superstitious belief by the sellers in our markets.

Even though laboratory experiments have documented that communication can play a vital role in enabling parties to enforce economic agreements (Brandts and Charness, 2016; Fehr et al., 2015; Charness and Dufwenberg, 2011, 2006), to the best of our knowledge there has been no empirical work showing that communication can indeed help alleviate the incidence of contract violation in real life markets. We adopt a communication scheme whereby before the seller weighs the fish, the buyer communicates to the seller, by following a pre-set script, of her expectation of contractually-obligated behavior from the seller after a bilateral agreement as regards the price and quantity has been reached. Specifically, the communication script provides a nudge to the seller to 'give everything all right' without direct reference to cheating. The standard preferences would dictate that such communication prior to a transaction mimicking a standard one-shot interaction between a trading pair is

[3]The buyers in our markets may be aware of the potential of cheating, but due to the subtle nature of the fraudulent activity it may not be immediately clear to them if there was a breach. Even if a buyer could detect such a breach, the buyer may decide not to enforce the contract since suing over small transactions is clearly too costly for many consumers. Costs of writing a complete contract can also be prohibitive. While reputation concerns may be thought to discipline the cheating-seller, such a mechanism is almost absent in our markets due to the non-observability of the contract violation. We discuss these issues in Section 4.

simply 'cheap talk' and hence would be ineffective in reducing fraud. By contrast, the buyer's message may act as a nudge and affect a (guilt-averse) seller's second-order belief about the buyer's (first-order) belief about the expected level of cheating and consequently may affect his cheating behavior. To minimize the utility loss induced by guilt in case the seller cheats a quantity that exceeds the buyer's expectation, the seller may reduce, or at best refrain from cheating. Thus cheating aversion (Dufwenberg and Dufwenberg, 2018) or guilt aversion (Charness and Dufwenberg, 2006) may provide a route by which apparently payoff-irrelevant nudge may reduce contract violations. Our experiment explores the empirical relevance of this point.

There is a growing body of experimental and empirical literature documenting that cultural beliefs, even those that are completely untrue (i.e., superstitious beliefs), may impact the behavior of individuals who hold these beliefs (Invernizzi et al., 2019; Johnson and Nye, 2011; Wong and Yung, 2005; Yip et al., 2002; Goodkind, 1991)[4]. The second informal mechanism we explore again operates via sellers' belief in our markets, but unlike buyer-induced-communication, it is triggered by an existing business specific superstition widespread in the Indian subcontinent called 'Bohni'. 'Bohni' (referred to as 'Bouni' in the local language of our marketplace) is based on a belief that the first transaction of the day is auspicious and it determines a seller's luck for the subsequent transactions during the remainder of the day and, therefore, dishonest treatment (e.g., engaging in cheating) of the first buyer of a day or making first sale on credit or offering discounts may prove to be damaging to the seller's material interests by bringing in 'bad luck' for the seller. We exploit this exogenous seller-belief by making demand-side interventions that ensure that the experimenter-buyer is indeed the first buyer of the day for a given seller. If the superstitious belief is strong enough in the sense that contravening the belief is assumed to lead to a substantial loss of utility on

[4]Most common superstitions involve behavior related to the control of good or bad luck. See for instance Kramer and Block (2008). The term 'superstition' does not appear to have a commonly agreed upon definition; see Invernizzi et al., 2019; Vyse (2013), Risen (2016) and Lindeman and Svedholm (2012) for different accounts and relevant discussions.The commercial custom of 'Bohni' induced by superstitious belief is so deeply entrenched in the specific cultures that it has even commanded an entry in *Wikipedia*. Please follow the link here: https://en.wikipedia.org/wiki/Bohni

the part of the seller, then such a superstitious belief may reduce the frequency or extent of contract violations. Our experiment examines the empirical validity of our hypothesis.

To precisely tease out the effects of the nudge in form of one-way communication and superstition on the resultant buyer surplus, we design three treatments: *Baseline, Nudge* and *Superstition*. In our experiment, undercover experimenter-buyers purchase 1Kg of a popular fish from 61 individual sellers in a within-seller design. These 61 sellers were randomly drawn from a large pool each of whom offers the fish at a quoted price and allows buyers to engage in alternating, sequential offer bargaining. Our scripted bargaining involved negotiating over the price and allowed exactly two back-and-forth offers between a given bargaining pair.

Transactions under all three treatments involved asking for the quoted price and then requesting for a pre-set focal price discount and making a purchase irrespective of the seller's decision to agree to reduce the price or not. Upon an agreement (*Bargain Success*), the discounted price became the final price, whereas in case of a disagreement (*Bargain Failure*), a purchase was made at the quoted price. In the *Nudge* treatment, after agreeing to make a purchase but before the seller weighed the fish, the buyer appealed to the seller to 'give everything all right', which is in agreement with a popular phrase often used in marketplaces in India. In the *Superstition* treatment, the buyer made sure that he is indeed the first customer of the day the veracity of which was confirmed either by a voluntary revelation from the seller or by a pre-transaction checking by the buyer. Thus our pre-scripted interventions on the demand side of the market allow us to induce a particular extensive form game and information structure in the negotiation process and help us exercise full control on the method of bargaining (see Figure 1 for the negotiation process). For all transactions, we weighed the received quantity using a calibrated digital scale to detect any possible weight discrepancy. Given that we employ bargaining practices that are regularly used in the field and we are able to control for the bargaining protocol, number of interactions between a given bargaining pair, seller specific effects, and other potential sources of frictions such as parties' time cost of haggling, buyers' bargaining ability or their gender and age, etc.,

our experiment provides a useful setting for investigating how specific informal mechanisms alleviate or eliminate the problem of contract violations.

We provide a brief preview of our findings. We find that in *Superstition* treatment none of the sellers cheated, whereas in *Baseline* and *Nudge* we observe significant proportions of weight discrepancies that can be statistically supported as evidence in favor of intentional cheating by the sellers. After evaluating the cheated quantity, a measure of intensity of cheating, we discover that the lower average final prices brought about by higher frequency of bargain success in *Nudge* and *Baseline* treatments does not translate into higher buyer surplus as the monetary value of the cheated quantity more than offsets the gains from the price reductions relative to *Superstition*. Specifically, the cheated value is the lowest in *Superstition*, the second highest in *Nudge* and the highest in *Baseline*. The data demonstrates that although *Nudge* succeeds in generating higher buyer surplus than *Baseline* by reducing the intensity of contract violations, the superstitious belief held by the sellers is the most powerful as it eliminates contract violations and, therefore, generates the highest level of buyer surplus. In sum, our findings indicate an important role for prevailing business culture in form of a superstition for contract enforcement. By contrast, the nudge or ethics reminder helps in mitigating the incidence of contract violations, however, its success pales in comparison to that of the superstitious belief.

The rest of the paper is organized as follows. In Section 2 we describe the features of our marketplace. In Section 3 we present the experimental treatments and the procedure.The empirical results are reported in Section 4 and Section 5 concludes.

2 The Marketplace

We conducted our field experiment in large retail fish markets in the city of Kolkata. Kolkata is the capital city of the state of West Bengal in India and has a population of approximately 4.5 million as per the 2011 Census of India. Fish is considered a marker of Bengali identity

as it is an integral part of West Bengal's cuisine and culture (Reeves, 2003; Walker, 1998). Therefore, fish is an essential food item for an average Bengali household. There are 81 small and large retail fish markets in Kolkata.[5] Our experiment entailed purchase of a common Indian major carp, Rohu, from 16 randomly selected large retail fish markets of Kolkata.

We gathered information about the marketplace using pre-experiment surveys of buyers and sellers.[6] The following information helped us design our experiment.

Anecdotal evidence[7] and data from our buyers' survey suggest that sellers frequently cheat on weight in these markets (Q7 in buyers' survey). Cheating is facilitated by the use of traditional hand-held weighing scales (see Figure A3 in Appendix A for a photograph of a hand-held weighing scale). Rigged scale, rigged measurement weights, and skillful maneuvering of the scale are perceived as common cheating methods (Q10 in buyers' survey). It is difficult even for experienced buyers to detect cheating by visual scrutiny, unless the weight discrepancy is remarkably large (Q8 in buyers' survey) as the perceived probability of detection is nearly zero for up to 100 grams of cheating conditional on 1Kg of purchase of Rohu (Q9 in buyers' survey and Q20 in sellers' survey). Inspection of weights and scales by government officials is rare (Q16 in sellers' survey). Therefore, lack of implementation of formal regulations and the difficulty of private monitoring imply that the sellers face no or negligible economic penalty for cheating. These market features coupled with relatively high proportion of non-repeat buyers (Q10 in sellers' survey) diminishes sellers' concerns for potential sanctions and weakens their incentive to invest in reputation-building.

[5]Data source: http://www.wbagrimarketingboard.gov.in/bazar/kolkata1.html (last accessed in July, 2013). A cached version of the page is retrievable by pasting the web address in: https://archive.org/

[6]A summary of the the buyers' and sellers' responses to relevant questions from the surveys are provided in Appendix B and Appendix C, respectively.

[7]A news article in *The Telegraph*, the fourth most widely read newspaper in India (Indian Readership Survey, 2012), summarized the cheating problem in Kolkata fish markets as follows: "Hundreds of thousands of consumers are cheated every day, thanks to weights and measures that have been rigged on purpose." This news article noted the experience of a buyer who paid for 2 Kg of fish and actually received 1.3 Kg, and still could not detect the difference in weight at the time of transaction. The article also stated: "Indeed, the problem is so rampant that most people have become quite inured to it. Few complain, and fewer measures are taken by the authorities to bring the guilty to book" and "Ninety-nine times out of 100, customers do not object even if they feel they have been cheated." See Figure A1 in Appendix A for a copy of the news article.

Rohu is a common Indian major carp (see Figure A2 in Appendix A for a picture of Rohu) and according to Aquaculture Asia (2006) Rohu that weighs between 1 to 2 Kg is classified as 'small'. Rohu has high demand and it is affordable for an average income buyer (Q12, Q14 in sellers' survey and Q6, Q3 in buyers' survey). The average quantity of purchase per transaction for Rohu is about 1Kg (Q13 in sellers' survey). It is a common practice to purchase a desired quantity of the fish cut into pieces from a whole Rohu (Q11 in sellers' survey). By cutting small enough pieces a seller can deliver the quantity requested by a buyer and therefore, if the quantity received by a buyer is less than the quantity purchased, it cannot be attributed to a lumpiness problem.

Bargaining over price is a common practice (Q12 in buyers' survey and Q9 in sellers' survey). The large retail fish markets in Kolkata are populated with dozens of sellers and the number of customers run into hundreds during the peak business hours (between 8am to 10am) (Q8 in sellers' survey) and the markets are generally busier on weekends than weekdays.

There exists a widespread superstitious belief among the sellers that the first transaction of the day is auspicious and there is a specific term for the first transaction in the local language - 'bouni' (Q18, Q19 in sellers' survey). The superstitious belief that good conduct in the first transaction is expected to bring good luck to the seller in form of good business for the rest of the day implies that the first buyer of the day is likely to receive especially generous treatment by the seller.

3 The Experiment

Undercover experimenter-buyers purchased small Rohu from randomly selected sellers in large retail fish markets of Kolkata.[8] All the buyers who made the purchases were male, aged between 25-30 years, with experience in purchasing fish and native speakers of the local

[8] Ayres and Siegelman (1995) and Dugar and Bhattacharya (2017) also employed undercover buyers in field experiments.

language, Bengali. All the buyers were dressed casually during the purchases so that they blend well with other buyers in these markets. At no time it was made apparent to the sellers or anyone in the market that these buyers knew each other.

Each transaction in the experiment entailed purchase of one Kg of small Rohu cut into pieces and involved a scripted bargaining protocol following which the buyer requested a price discount of 10 Rupees for one Kg of purchase. If the seller agreed to reduce the price, either by the discount amount requested by the buyer or by another smaller amount, then the transaction was completed with the discounted price as the final price. Even if the seller refused to reduce the price at all, the buyer still bought the fish with the quoted price as the final price. This sequence of interaction between the buyer and seller is represented in Figure 1.

Using a within-subjects design, we employed three treatments in our experiment: *Baseline*, *Nudge* and *Superstition*. Specifically, three purchases were made from each seller and therefore we have one observation for each treatment from each seller. A buyer making a purchase for the *Baseline* treatment made a transaction following the bargaining protocol described above. There was no additional communication in the *Baseline*. In the *Nudge* treatment, each transaction followed the same protocol as in the *Baseline* till the buyer agreed to make a purchase. After agreeing to make a purchase, the buyer communicated an additional sentence to the seller which essentially translates into 'give everything all right', which serves as a nudge as it coneys that the buyer expects a fair transaction. For a transaction in the *Superstition* treatment the buyer first asked the seller whether he had made his 'bouni' transaction of the day and upon getting a negative response made a purchase following the same protocol as in the *Baseline*. While the purchases for the *Baseline* and *Nudge* treatments were made during the peak business hours, the purchases for the *Superstition* treatment were made early in the morning.

For the *Superstition* treatment, four of our buyers went to a market around 6 am, a time when the markets usually start opening. Each buyer made a purchase from a different seller

and left the market after making his purchase and noted down the quoted price, the final price and the specific location of the fish stall in the market on a post it note and attached it to the fish packet. We used a digital scale to weigh the purchased fish and recorded the actual weight in order to detect any weight discrepancy. The digital scale was calibrated before the experiment to ensure its accuracy (see Figure A4 in Appendix A for a picture of the digital scale). On the same day, around 8 am, two different buyers went to the same market and made purchases for the *Baseline* and *Nudge* treatments. The information about the specific location of the stalls of the fish sellers from whom the purchases had been made for the *Superstition* treatment earlier that morning was shared with these two buyers so that they could make purchases from those specific sellers. These two buyers approached a given seller one after another. One of them made a purchase for the *Baseline* and other one made a purchase for the *Nudge* treatment. After making his purchase, each buyer moved away from the seller and noted down the transaction information on a post-it note and attached it to the fish packet and put it in an opaque bag that each one was carrying. Following the same protocol, the two buyers procured observations from the other target sellers of the market. We randomized the order of the *Baseline* and *Nudge* treatments and the buyer who made the purchase in the *Baseline* transaction. Again we used a digital scale to weigh the purchased fish. Thus, we procured three observations from each seller - one for *Baseline*, one for *Nudge* and one for *Superstition*.

We procured observations from 16 different markets following the same procedure. All the transactions for a given market were made in a single day to ensure one-shot nature of the transactions. All the purchases were made on weekdays in June 2017. Our experiment generated a total of 61 observations for each treatment.[9]

The within-seller design allows us to control for factors such as a seller's intrinsic preferences, fish quality, etc. that may affect a seller's response to our interventions and thereby facilitates clear identification of the treatment effects.

[9]For three of the 16 markets, only three of the four buyers for the *Superstition* treatment could visit the market, therefore we have observations from only three sellers from those markets.

4 Results

Table 1 presents summary statistics for each of the three treatments as well as the full sample. Table 2 presents summary statistics of paired differences for each treatment pair, where a difference is based on matched pairs of observations for a given seller. Table 3 presents comparative test results and Table 4 presents regression results.

4.1 Price

The data on quoted price (p) and final price ($p - d$), measured in Rupees per Kg, provide us the following insights. First, all the summary statistics of p are identical across the three treatments (see Table 1) and the mean and standard deviation of the paired differences in p for each treatment pair are zero (see Table 2). These statistics illustrate that none of the sellers price discriminated between the buyers when quoting the price of small Rohu. Second, within each treatment the mean final price is lower than the mean quoted price (see the statistics of p and $p - d$ in Table 1), which implies that on average the bargaining was successful in reducing the price in each treatment. Third, the final prices are identical in *Baseline* and *Nudge* treatments as the summary statistics of $p - d$ are identical in Table 1 and the mean and standard deviation of the paired differences in $p - d$ are zero in Table 2. Identical final prices in *Baseline* and *Nudge* treatments can be attributed to the design of our experiment wherein the buyers who made purchases for these two treatments approached a given seller one after another during peak business hours. Fourth, the final prices are significantly lower in *Baseline* and *Nudge* treatments compared to *Superstition* treatment (see the $p - d$ statistics in Table 2 and test results in Table 3). The higher mean final price in *Superstition* treatment is attributable to fewer sellers agreeing to reduce the price in *Superstition* treatment compared to the *Baseline* and *Nudge* treatments. We refer to a transaction where bargaining resulted in a price reduction (i.e. $d > 0$) as bargain success and find that 59 percent of the transactions resulted in bargain success in *Baseline* as well as

Nudge treatments, however, the corresponding statistic is significantly lower in *Superstition* treatment as it is approximately 7 percent (see the Bargain success statistics in Table 1 and test results in Table 3). Logit regression estimates (see model (1) in Table 4) also corroborate that probability of bargain success is significantly lower in *Superstition* treatment compared to the other two treatments. These results apparently suggest that buyers are better off in *Baseline* and *Nudge* treatments as they are more likely to receive a price reduction by bargaining than in *Superstition* treatment.

4.2 Incidence of weight discrepancy

Small discrepancy between the quantity for which the buyer paid the seller (q) and the quantity actually received by the buyer (q^a) may be conjectured to arise due to the use of hand-held weighing scales that are less precise than a digital scale. If weight discrepancy, defined as $x = q - q^a$ and measured in grams, is unintentional, we would expect it to be random and approximately symmetrically distributed around zero in every treatment. Figure 2 presents x for each transaction in our experiment and it clearly refutes the conjecture that the observed x is a result of unintentional random measurement error. We observe $x > 0$ in all the transactions of the *Baseline* and *Nudge* treatments, and $x < 0$ in majority of the *Superstition* transactions. The histograms of x in Figure 3 further substantiate this pattern. While the entire distribution of x is below 10 grams and predominantly below zero in *Superstition* treatment, the distribution shifts remarkably to the right with all observations above zero in *Nudge* treatment and even further right in *Baseline* treatment.

To further enrich our analysis, we examine three categories of weight discrepancies: $x > 0$, $x \geq 25$ and $x \geq 50$. Since the sellers usually carry 25 grams and 50 grams weight denominations in these markets, it indicates that these weights command economic significance for the market participants. Therefore, incidence of $x \geq 25$ and $x \geq 50$ are stronger markers of intentional weight discrepancy. In Table 1, the mean value corresponding to each of the three categories of x represents the proportion of transactions where a particular category

of weight discrepancy was observed. We find that while only 23 percent of the *Superstition* transactions belong to $x > 0$ category, 100 percent of the *Baseline* and *Nudge* transactions belong to that category. Turning to $x \geq 25$ and $x \geq 50$, we find that none of the *Superstition* transactions belong to these categories. In contrast, 100 percent and 95 percent of *Baseline* and *Nudge* transactions belong to $x \geq 25$ category, and these shares decline to 95 percent and 66 percent respectively for the $x \geq 50$ category. No statistical test is needed to infer that incidence of $x \geq 25$ and $x \geq 50$ is significantly higher in *Baseline* and *Nudge* treatments than in *Superstition* treatment.

In sum, the above evidence provides the following key insights. In *Superstition* treatment none of the sellers demonstrate intent to cheat the buyers as they are mostly over generous in weighing ($x < 0$) and even when they err on the other side ($x > 0$) the magnitudes are all below 10 grams, which can be considered small enough to be treated as unintentional weighing error. By contrast, in *Baseline* and *Nudge* treatments, a very high proportion of transactions belong to $x \geq 25$ and $x \geq 50$ categories. Given our within-seller design, this evidence clearly implies that the sellers intentionally cheated the buyers in *Baseline* and *Nudge* treatments. Therefore, in the ensuing analysis we refer to x as the cheated quantity.

4.3 Cheated quantity

The mean x in *Superstition*, *Nudge* and *Baseline* treatments are approximately -6 grams, 54 grams and 77 grams, respectively (see the statistics of x in Table 1). The summary statistics of the paired differences in x in Table 2 reiterate the ranking that x is the lowest in *Superstition*, the second highest in *Nudge* and the highest in *Baseline*. The comparative tests of x (see Table 3) and the regressions that control for factors like price quote, bargain success (see models (2) and (4) in Table 4) establish that the observed differences in x between the treatments are significant.

These results imply that *Nudge* is effective in reducing the cheated quantity by a significant amount relative to *Baseline*, however it does not completely eliminate cheating. By

contrast, when a buyer is in a position to invoke the *Superstition*, the sellers do not cheat altogether. Therefore, the superstitious belief of the sellers about first transaction of the day has a much stronger effect on their cheating behavior than a nudge by a buyer that essentially coveys an expectation of a fair transaction.

The evidence of significantly higher intensity of cheating in *Nudge* and *Baseline* treatments relative to *Superstition* treatment also suggests that the lower average final price in the *Nudge* and *Baseline* treatments may not necessarily translate into higher buyer surplus as the monetary value of the cheated quantity may more than offset the gain from the price reduction.

4.4 Cheated value

The cheated value, $v = x(p - d)/1000$, represents the monetary value of cheated quantity and is measured in Rupees. The mean v in *Superstition*, *Nudge* and *Baseline* treatments are approximately -2 Rupees, 15 Rupees and 22 Rupees, respectively (see the statistics of v in Table 1). The summary statistics of the paired differences in v in Table 2 also demonstrate that v is the lowest in *Superstition*, the second highest in *Nudge* and the highest in *Baseline*. The comparative tests of v (see Table 3) and the regression results (see models (3) and (5) in Table 4) establish that the observed differences in v between the treatments are significant.The mean cheated value expressed as a percentage of the mean final price stands at approximately 5% and 8% in the *Nudge* and *Baseline* treatments, respectively. Therefore, the cheated values are economically significant for the market participants in the *Nudge* and *Baseline* treatments as these figures reflect considerable monetary loss for buyers who buy this essential food item regularly.

4.5 Buyer surplus

To evaluate the net monetary impact of sellers' cheating behavior on the buyers, we adapt the definition of buyer surplus to account for the cheated value and define it as $S = V-(p-d)-v$,

where V is the buyer's valuation of 1 Kg of small Rohu. Assuming a common buyer's valuation, V, we compute the difference in S between each pair of treatments using matched pairs of observations for each seller based on the observed $(p-d)$ and v. For example, based on paired transactions with a given seller $S_{Baseline} - S_{Superstition} = (p-d)_{Superstition} + v_{Superstition} - (p-d)_{Baseline} - v_{Baseline}$.

The mean difference in S between *Baseline* and *Nudge* is -6.33 Rupees (see statistics of S in Table 2) and this difference is significant (see tests results of S in Table 3). It implies that a simple one sentence communication by the buyer induces the sellers to cheat less, which translates into a higher buyer surplus in *Nudge* treatment than in *Baseline*.

The mean difference in S between *Nudge* and *Superstition* is -11.87 Rupees (see statistics of S in Table 2) and this difference is significant (see test results of S in Table 3). It implies that the significantly higher cheated value in *Nudge* treatment more than offsets the gain from lower final price than in *Superstition* treatment, which translates into a lower buyer surplus in *Nudge* than *Superstition* treatment where cheating is effectively eliminated.

The mean difference in S between *Baseline* and *Superstition* is -18.2 Rupees (see statistics of S in Table 2) and this difference is significant (see test results of S in Table 3). It again implies that just like *Nudge* treatment, higher cheated value in *Baseline* treatment more than offsets the gain from lower final price than in *Superstition* treatment, which translates into a lower buyer surplus in *Baseline* treatment than *Superstition* treatment where cheating does not occur.

The above three results imply that buyer surplus is the lowest in *Baseline*, the second highest in *Nudge* and the highest in *Superstition*. Put differently, although the extrinsic *Nudge* succeeds in generating higher buyer surplus than *Baseline* by reducing the intensity of contract violation, however, the intrinsic superstitious belief of the sellers is much more powerful in assuring contract non-violation and therefore generates the highest higher buyer surplus in spite of higher average final price than *Nudge* and *Baseline*.

5 Conclusion

People's confidence in enforcing economic contracts is a key asset for the long-term prosperity of an economic system. Understanding the determinants of contract enforcement is therefore essential for the development of possible remedies. In this study, we design a natural field experiment to examine whether two informal mechanisms, superstition and nudge, can reduce or at best eliminate contract violations in a marketplace where sellers regularly cheat on the provisions of a contract reached via bilateral bargaining. We introduce an experimental design that allows us to systematically study the potential impact of these informal mechanisms on the incidence of contract violations.

Our results suggest that some superstitious beliefs, however untrue, can be encouraged to curb dishonest behavior as the superstitious belief about the first transaction of the day is found to eliminate contract violations in our marketplace that is otherwise rife with contract violations. We also find evidence that sending subtle normative nudge to the breaching party before that party engages in the act of contract violation goes a significant way to reduce contract violations, even though it does not succeed in eliminating contract violations. The last result is in line with the existing research suggesting that ethics reminders may promote compliance with the honesty norm (Pruckner and Sausgruber, 2013; Mazar et al., 2008; Shu et al., 2012). The use of ethics reminders or nudge requires a detailed analysis of work routines to find out where and when people make critical decisions regarding violating a contract, so that normative demands can be rendered salient at the right time and place. In essence, these findings highlight that the informal mechanisms, like superstition and nudge, may be important for fostering enforcement of contracts in marketplaces where formal contract enforcing mechanisms are lacking or weak.

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Figures

Figure 1: The bargaining protocol in the experiment

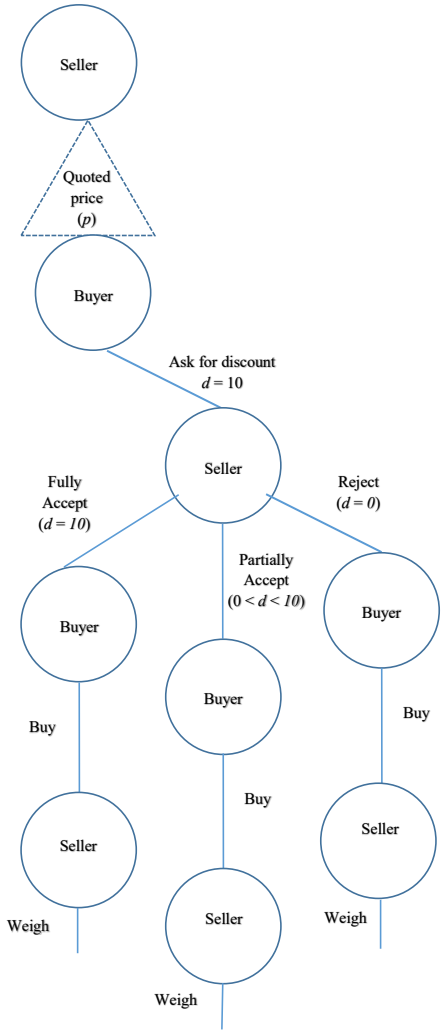


Figure 2. Cheated quantity (in grams) by seller id and by treatment

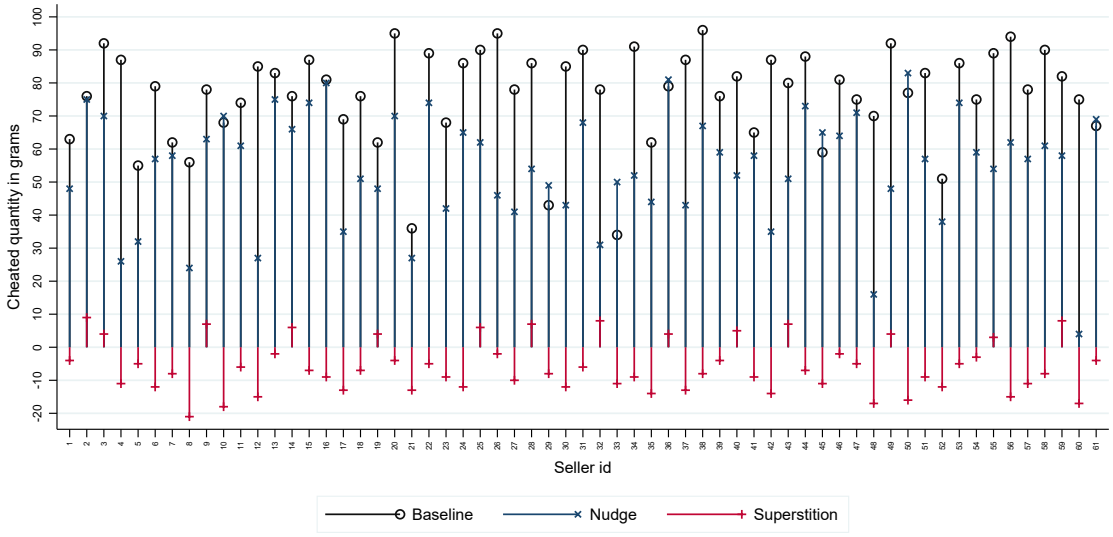
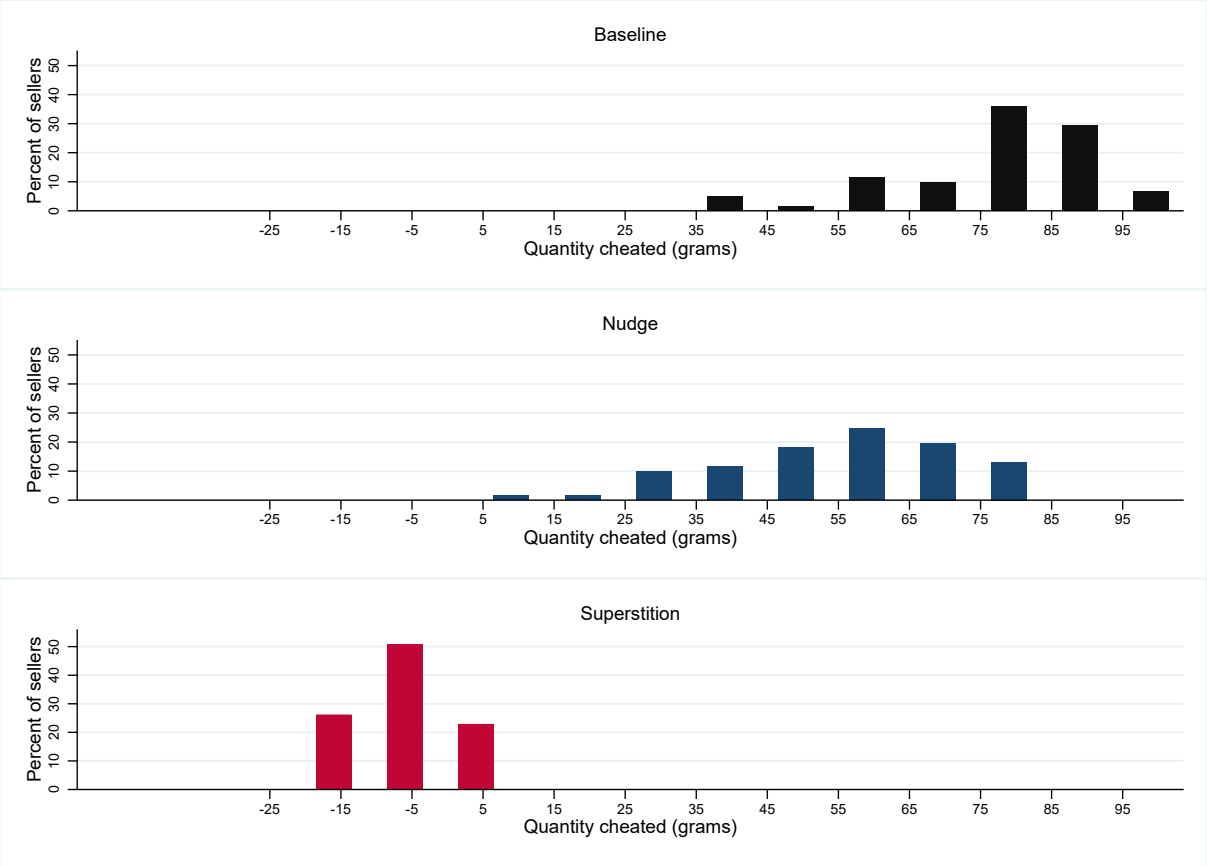


Figure 3. Histograms of cheated quantity (in grams)



Tables

Table 1. Summary statistics by treatment

	N	Mean	S.D.	Min	Median	Max
Quoted price (p)						
Baseline	61	287.87	7.61	270	290	300
Nudge	61	287.87	7.61	270	290	300
Superstition	61	287.87	7.61	270	290	300
Full sample	183	287.87	7.57	270	290	300
Final price ($p - d$)						
Baseline	61	282.29	7.56	270	280	300
Nudge	61	282.29	7.56	270	280	300
Superstition	61	287.46	7.34	270	290	300
Full sample	183	284.02	7.84	270	280	300
Bargain success ($d > 0$)$^{\#}$						
Baseline	61	0.5901	0.50	0	1	1
Nudge	61	0.5901	0.50	0	1	1
Superstition	61	0.0656	0.25	0	0	1
Full sample	183	0.4153	0.49	0	0	1
Incidence of $x > 0^{\#}$						
Baseline	61	1	0	1	1	1
Nudge	61	1	0	1	1	1
Superstition	61	0.23	0.42	0	0	1
Full sample	183	0.74	0.44	0	1	1
Incidence of $x \geq 25^{\#}$						
Baseline	61	1	0	1	1	1
Nudge	61	0.95	0.22	0	1	1
Superstition	61	0	0	0	0	0
Full sample	183	0.65	0.48	0	1	1
Incidence of $x \geq 50^{\#}$						
Baseline	61	0.95	0.22	0	1	1
Nudge	61	0.66	0.48	0	1	1
Superstition	61	0	0	0	0	0
Full sample	183	0.54	0.50	0	1	1

	N	Mean	S.D.	Min	Median	Max
Cheated quantity (x)						
Baseline	61	76.71	14.04	34	79	96
Nudge	61	54.38	16.94	4	57	83
Superstition	61	-5.92	7.71	-21	-7	9
Full sample	183	41.72	37.47	-21	54	96
Cheated value (v)						
Baseline	61	21.67	4.09	9.52	22.4	27.73
Nudge	61	15.34	4.82	1.2	15.95	23.24
Superstition	61	-1.69	2.21	-5.88	-2.1	2.52
Full sample	183	11.77	10.61	-5.88	15.12	27.73

Notes:

i. $^{\#}$ denotes a binary variable where mean represents the proportion.

ii. p and d are in Rupees per Kg; x is in grams; v is in Rupees.

Table 2. Summary statistics of paired differences

	Baseline - Nudge	*Baseline - Superstition*	*Nudge - Superstition*
Price quote (p)	0	0	0
	(0)	(0)	(0)
Final price ($p - d$)	0	-5.16	-5.16
	(0)	(4.74)	(4.74)
Cheated quantity (x)	22.33	82.62	60.29
	(18.16)	(14.13)	(16.03)
Cheated value (v)	6.33	23.36	17.04
	(5.21)	(4.12)	(4.54)
Buyer surplus (S)	-6.33	-18.2	-11.87
	(5.21)	(6.83)	(6.22)

Notes:

i. Mean of differences (left hand side treatment - right hand side treatment) and the corresponding standard deviation of differences are reported in parentheses.

ii. p and d are in Rupees per Kg; x is in grams; v & S are in Rupees.

Table 3. Comparative tests based on matched pairs of observations

	Baseline - Nudge	*Baseline - Superstition*	*Nudge - Superstition*
Final price $(p-d)$			
Paired Student's t-test	-	-8.51**	-8.51**
		(0.000)	(0.000)
Wilcoxon signed-rank test	-	-5.84**	-5.84**
		(0.000)	(0.000)
Bargain success $(d>0)^{\#}$			
McNemar's test	-	32.00**	32.00**
		(0.000)	(0.000)
Cheated quantity (x)			
Paired Student's t-test	9.60**	45.68**	29.38**
	(0.000)	(0.000)	(0.000)
Wilcoxon signed-rank test	6.34**	6.79**	6.79**
	(0.000)	(0.000)	(0.000)
Cheated value (v)			
Paired Student's t-test	9.48**	44.25**	29.33**
	(0.000)	(0.000)	(0.000)
Wilcoxon signed-rank test	6.34**	6.79**	6.79**
	(0.000)	(0.000)	(0.000)
Buyer surplus (S)			
Paired Student's t-test	-9.48**	-20.82**	-14.90**
	(0.000)	(0.000)	(0.000)
Wilcoxon signed-rank test	-6.34**	-6.79**	-6.79**
	(0.000)	(0.000)	(0.000)

Notes:

i. p-values in parentheses, ** p-value < 0.01 and * p-value < 0.05.

ii. $^{\#}$ denotes a binary variable.

iii. '-' indicates that the test is not relevant as the outcomes were identical for that treatment pair.

Table 4. Regressions results

	(1) P(*Bargain success*)	(2) x	(3) v	(4) x	(5) v
Nudge		-22.33**	-6.327**	-22.17**	-6.28**
		(0.000)	(0.000)	(0.000)	(0.000)
Superstition	-0.528**	-82.84**	-23.68**		
	(0.001)	(0.000)	(0.000)		
Price quote	0.0140*	0.193	0.0936	0.240	0.130
	(0.024)	(0.372)	(0.134)	(0.357)	(0.084)
Bargain success		-0.421	-0.603	0.829	-0.357
		(0.902)	(0.537)	(0.844)	(0.765)
Tuesday	-0.129	0.527	0.160	2.177	0.624
	(0.345)	(0.895)	(0.885)	(0.674)	(0.667)
Wednesday	-0.0196	-3.061	-0.852	-3.115	-0.869
	(0.885)	(0.482)	(0.489)	(0.575)	(0.577)
Thursday	-0.185	-0.671	-0.154	0.920	0.322
	(0.145)	(0.876)	(0.900)	(0.872)	(0.841)
Friday	0.00300	0.132	0.0547	2.228	0.667
	(0.982)	(0.971)	(0.958)	(0.644)	(0.623)
Baseline first				2.889	0.865
				(0.414)	(0.383)
Buyer id 6				3.205	0.951
				(0.182)	(0.166)
Constant		21.95	-4.783	3.535	-16.46
		(0.721)	(0.785)	(0.962)	(0.431)
Observations	183	183	183	122	122
Test for coefficient of *Nudge* = coefficient of *Superstition*:					
F-test statistic		405.76**	402.02**		
		(0.000)	(0.000)		

Notes:

i. ** p-value < 0.01 and * p-value < 0.05; p-values reported in parentheses correspond to standard errors that account for seller level clustering.

ii. x: cheated quantity in grams; v: cheated value in Rupees.

iii. Logit marginal effects reported in (1) and OLS estimates reported in (2) – (5).

iv. *Baseline* treatment is the benchmark treatment in regressions (2) – (5). In regression (1) the *Baseline*

and *Nudge* form the comparison group for the *Superstition* treatment as the there was no difference in the outcome variable between the *Baseline* and *Nudge*. Monday is the comparison group for the days of the week. '*Baseline* first' is a binary variable that takes a value 1 if the *Baseline* transaction occurred before the Nudge transaction for a seller. We refer to the two experimenter-buyers for the Nudge and *Baseline* treatments as buyer 5 and buyer 6, and the 'Buyer id 6' is a binary variable that takes a value 1 if buyer 6 made a transaction.

Appendix A.

Figure A1. Newspaper article on cheating in a Kolkata fish market

Figure A2. Rohu

Figure A3. Traditional scale used by fish sellers (left) and fish being cut for sale (right)

Figure A4. Digital scale used in the experiment to detect cheating

Appendix B.

Buyers' survey

200 randomly selected buyers of fish from ten large retail fish markets of Kolkata answered the following questions. The survey was conducted in July 2013. We hired ten research assistants to conduct the survey, who approached a buyer outside one of the main entrances of a market. It took each buyer on average 15 minutes to answer all the questions. The research assistants were naive to our research hypothesis. The survey was conducted in the Bengali language. The following is a direct translation from the Bengali script.

Q1. Gender: (a) Male 76% (b) Female 24%

Q2. Which income group do you belong to?
(a) Low income 14.5%
(b) Middle income 59%
(c) High income 26.5%

Q3. Identify the group of customers by their income group, who mostly buy each of the following fish types:

	Very low income	Low income	Middle income	High income	Very high income
Small Rohu	2%	15%	72%	11%	0%
Large Rohu	0%	16%	75%	9%	0%

Note: Small implies whole fish 1-2Kg; Large implies whole fish 2-3Kg.
Percentages are rounded off to the nearest whole number.

Q4. Do you always buy fish from a particular seller in this market?
(a) Yes 39% (b) No 61%

Q5. How long (in years) have you been buying fish? Mean 19.5 years

Q6. In your opinion what is the demand category for each of the following type of fish in this market?

	Very low demand	Low demand	Medium demand	High demand	Very high demand
Small Rohu	0%	0%	0%	11%	89%
Large Rohu	0%	0%	0%	9%	91%

Note: Small implies whole fish 1-2Kg; Large implies whole fish 2-3Kg.
Percentages are rounded off to the nearest whole number.

Q7. Do you think fish sellers cheat on quantity when someone buys fish like Rohu cut into pieces?
(a) Yes 93.5% (b) No 6.5%

Q8. Have you ever caught a seller cheating during a transaction?
(a) Yes 0% (b) No 100%

Q9. Suppose you purchased 1Kg of fish like Rohu cut into pieces. The list below shows possible amounts of cheating. Which interval represents the lowest cheating amount that you would be able to detect by mere visual inspection?

		Probability of detection						
		Zero chance	Very low chance	Low chance	Medium chance	High chance	Very high chance	100%
Cheated quantity	<50 grams	98	2	0	0	0	0	0
	50-100 grams	91	8	1	0	0	0	0
	101-150 grams	57	19	15	9	0	0	0
	151-200 grams	24	28	29	15	4	0	0
	>200 grams	10	11	16	37	14	12	0

Note: Percentages are rounded off to the nearest whole number.

Q10. What are the possible methods of cheating? Please mention all that apply.

(a) Rig the weights 74%
(b) Rig the scale 63%
(c) Manipulate the way sellers hold the scale 58%
(d) Other methods 21%

Q11. After you made a purchase have you ever re-weighed the purchased fish?

(a) Yes 2%
(b) No 98%

Q12. Do you bargain about fish price?

(a) Yes 83%
(b) No 17%

Appendix C.

Sellers' survey (Q1 - Q19) and the seller perception experiment (Q20)

200 randomly selected fish sellers from ten fish markets of Kolkata answered the following questions. The survey was conducted in July 2013. The survey was conducted in late morning (off-peak hours). It took each seller on average 20 minutes to answer all the questions. We paid each seller 50 Rupees (approximately $1) for participation and any additional money from the game. We hired research assistants to conduct the survey. The research assistants were naive to our research hypothesis. The survey was conducted in the Bengali language. The following is a direct translation from the Bengali script.

Q1. Gender: (a) Male 100% (b) Female 0%

Q2. What level of formal education have you completed?

(a) No formal education	4.5%
(b) Less than 10th grade	46.5%
(c) Completed Secondary education (10th grade)	42%
(d) Completed Higher Secondary education (12th grade)	7%
(e) Some college	0%
(f) Have a college degree	0%

Q3. What is your approximate monthly income (in Rs.) from selling fish only (if owner)?

(a) Less than 2500	8.5%
(b) 2501 - 5000	21%
(c) 5001 - 7500	47%
(d) 7501 - 10000	20.5%
(e) More than 10000	3%

Q4. How long have you been selling fish? Mean: 21 years

Q5. Do you operate in more than one market? No: 100%

Q6. How many fish sellers, do you think, are there in this market? Mean: 54

Q7. Are you working for somebody else? No: 100%

Q8. Which time interval represents the peak business hours during weekdays? 8:00am -10:00am: 91.5%

Q9. What proportion of customers bargain about price?
None: 0%
Less than half: 9%
About half: 37%
More than half: 54%

Q10. Out of every 10 customers, how many are repeat customers?
Mean: 3.25

Q11. Out of every 10 customers, how many prefer to buy a fish like Rohu cut into pieces?
Mean: 6.25

Q12. In your opinion what is the demand category for each of the following type of fish?

	Very low demand	Low demand	Medium demand	High demand	Very high demand
Small Rohu	0%	0%	2%	31.5%	66.5%
Large Rohu	0%	0%	4%	21%	75%

Note: Small implies whole fish 1-2Kg; Large implies whole fish 2-3Kg.

Q13. What is the usual amount of a fish like Rohu (in Kg) that an average customer buys in one transaction? Mean: 1.05Kg

Q14. Identify the group of customers by their income group, who mostly buy the following fish types:

	Very low income	Low income	Middle income	High income	Very high income
Small Rohu	0.0%	5.5%	88.5%	6.0%	0.0%
Large Rohu	0.0%	4.0%	83.0%	13.0%	0.0%

Note: Small implies whole fish 1-2Kg; Large implies whole fish 2-3Kg.

Q15. How often do you encounter a customer who carries his/her own weighing scale?
(a) Always 0%
(b) Almost always 0%
(c) Sometimes (50-50 chance) 0%
(d) Almost never 0%
(e) Never 100%

Q16. How often do government officials visit to check your weighing scale and weights?
(a) Yearly 13.5% (b) Rarely 82% (c) Never 4.5%

Q17. What is the minimum weight denomination that you use?
(a) 10grams 3%
(b) 25grams 86.5%
(c) 50grams 10.5%

Q18. Are you familiar with the term 'bouni'?
(a) Yes 100%
(b) No 0%

Q19. If yes, why is the term 'bouni' relevant for you? Open ended responses that contained the following words or similar phrases.
(a) Auspiscious / good luck 100%

Q20. Elicited beliefs about probability of detection

		Probability of detection						
		Zero chance	Very low chance	Low chance	Medium chance	High chance	Very high chance	100%
Cheating scenario	Small Rohu							
	<50 grams	**93.5**	6.5	0	0	0	0	0
	50-100 grams	**94.5**	4	1.5	0	0	0	0
	101-150 grams	**66**	22.5	8.5	3	0	0	0
	151-200 grams	27	29	**36.5**	6.5	1	0	0
	>200 grams	9	15	21	**38.5**	12	4.5	0
	Large Rohu							
	<50 grams	**93**	7	0	0	0	0	0
	50-100 grams	**93.5**	5.5	1	0	0	0	0
	101-150 grams	**64.5**	21.5	10.5	3.5	0	0	0
	151-200 grams	26.5	27.5	**38**	7	1	0	0
	>200 grams	9.5	14.5	22	**37.5**	13	4.5	0

Notes:
(i) Procedure: Each seller was asked to consider a hypothetical buyer who purchases 1Kg of fish. For each fish type, we listed five different cheating scenarios, each representing a distinct quantity of cheating. For each scenario, sellers were asked to choose one of the seven qualitative detection probability categories. After each seller was led through the situation, but before he responded, he was told that after other sellers from his market have been surveyed, one of the fish types and then one of the five cheating scenarios from that selected fish type would be selected at random for all the sellers. If his response were the same as the modal response of his group, then he would receive an additional payment of 100 Rupees (approximately $2.00). Thus, sellers' beliefs about detection probability were incentive-compatible.
(ii) Each cell reports % of responses for $n = 200$. Modal response for each scenario is represented in bold.