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

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Motivation

- An influential body of literature arguing that contract enforcement is important for economic growth (MacLeod, 2007; Greif, 2005; North, 1981)

- When formal contract-enforcing mechanisms are lacking or weak, can informal mechanisms help enforce contracts? (evidence from the lab/lab-in-the-field exists)

- We use a field experiment to examine the performance of the following two mechanisms as a contract-enforcing device in a real marketplace
  - Superstitious belief
  - Nudge

- Emerging literature on the cost of superstitious beliefs
  - E.g., 13th floor labeled as the 14th hampers emergency response (Perkins, 2002); disproportionate number of births in dragon years causes demand spikes for limited public services (Wong and Yung, 2005)

- Large literature showing that nudge (Thaler & Sunstein, 2008) can promote desirable behavior in various domains
  - health, energy, savings, law compliance, charitable giving, etc. (see Egan (2013)’s database on nudge for an overview)
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Key features of this paper

▶ A natural field experiment in a marketplace fraught with contractual breaches

▶ Sellers violate the provisions of a contract (cheat on the weight) reached via bilateral bargaining and it is hard to detect the breach and costly to enforce the contract

▶ Contractual breach can more than offset the material gain from bargaining (Dugar & Bhattacharya, 2019)

▶ We examine the impacts of our interventions on the incidence of contractual breaches using the following treatments:

▶ Superstition: Sellers' superstitious belief that the first transaction of the day (aka 'bohni') is auspicious is rendered salient

▶ Nudge: Buyer says to the seller 'Give everything all right' after bargaining but before the weighing of the good

▶ Baseline: Neither the first transaction of the day nor includes the nudge
The marketplace and the purchased good

- An established decentralized marketplace - large retail fish markets in Kolkata, the capital city of West Bengal (India)
  - Fish is a vital part of Bengali cuisine; a marker of Bengali identity (Walker, 1998)
  - Kolkata, with approximately 4.5 million population (2011 Census of India), has 81 large retail fish markets
  - Interventions in 16 large retail fish markets of Kolkata

- We purchased Rohu, a common Indian carp
  - High demand and supply across all seasons, affordable
  - Purchasing a desired quantity by cutting Rohu into pieces is common
  - Seller can provide desired quantity by cutting small enough pieces (∼ divisible good)
  - Average purchase quantity per transaction is about 1Kg (sellers’ survey and literature)
Important features of the markets

- Based on pre-experiment survey of 200 buyers and 200 sellers:
  - Prices are set by face-to-face negotiations i.e. buyers and sellers engage in alternating, sequential offer bargaining (83% buyers said they bargain)
  - Sellers cheat on the weight of the fish purchased and cheating is subtle and difficult to detect even for experienced buyers
    - 91% of buyers and 94.5% of sellers perceive the probability of getting caught from cheating close to zero if cheating ≤ 100 grams | 1Kg purchase
  - Formal (e.g., regulations) and informal (e.g., monitoring) contract-enforcing mechanisms missing - almost no consequences for sellers for cheating up to a point
    - Inspection of weights and scales by government officials is rare (82% sellers said rarely)
  - High proportion of non-repeat buyers (67% non-repeat); reduced concern of reputation loss
  - Each market is populated with over 50 sellers and hundreds of customers during the peak business hours (8am to 10am)
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The modus operandi of cheating

- Sellers typically use hand-held weighing scales

- Cheating techniques are subtle and include:
  
  - Rigged measurement weights (usual weight denominations 25 grams, 50 grams, 100 grams, 500 grams, 1 Kg and so on)
  
  - Rigged scale
  
  - Skillful maneuver of the scale

- Nearly impossible even for an experienced buyer to detect by visual scrutiny unless the weight discrepancy is remarkably large

- None of the 200 buyers surveyed said they caught a cheating seller and 98% of them have never reweighed the purchased fish

- Costly to verify whether cheating occurred even after the purchase
Experimental design and procedure

- **Three treatments**: Baseline, Nudge, Superstition

- Within-seller design: Three observations (one for each treatment) per seller

- Procedure: Each transaction involved requesting for a discount of 10 Rupees and purchasing 1Kg of Rohu cut into pieces

  - Four (or three) experimenter-buyers visited a market very early in the day and made a purchase after confirming that he is the first buyer for the seller
  
  - Two more experimenter-buyers visited the same market and the same sellers during peak business hours and sequentially made purchases
    
    - One purchased with the nudge and the other purchased without the nudge
  
  - The buyers recorded the quoted and final prices, and we measured weight discrepancies using a calibrated digital scale

  - The Nudge and Baseline treatment orders and experimenter roles were randomized

- Total 61 observations (triplets) from 16 markets
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The experimenter-buyers

- All male
- Belonged to age group 20-25 years
- Well versed in the local language, Bengali
- Experienced in purchasing fish
- Dressed in casual clothing so that they blend well among the buyers in the markets
## Summary statistics of prices by treatment

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th></th>
<th>Nudge</th>
<th></th>
<th>Superstition</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
<td>Mean</td>
<td>S.D.</td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>Price Quote ($p$)</td>
<td>287.87</td>
<td>7.61</td>
<td>287.87</td>
<td>7.61</td>
<td>287.87</td>
<td>7.61</td>
</tr>
<tr>
<td>Final Price ($p - d$)</td>
<td>282.29</td>
<td>7.56</td>
<td>282.29</td>
<td>7.56</td>
<td>287.46</td>
<td>7.34</td>
</tr>
<tr>
<td>Bargain Success #</td>
<td>0.59</td>
<td>0.50</td>
<td>0.59</td>
<td>0.50</td>
<td>0.07</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Note: # denotes a binary variable; $p$, $d$ in Rupees per Kg; sample size 61 for each treatment.

- Price quotes identical across treatments
- Bargain success ($d > 0$) incidence significantly lower in Superstition
Summary statistics of weight discrepancy by treatment

▶ Weight discrepancy: $x = \text{quantity purchased} - \text{quantity received}$ (measured in grams)

<table>
<thead>
<tr>
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<th>Nudge</th>
<th></th>
<th>Superstition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
<td>Mean</td>
<td>S.D.</td>
<td>Mean</td>
</tr>
<tr>
<td>$x &gt; 0^#$</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0.23</td>
</tr>
<tr>
<td>$x \geq 25^#$</td>
<td>1</td>
<td>0</td>
<td>0.95</td>
<td>0.22</td>
<td>0</td>
</tr>
<tr>
<td>$x \geq 50^#$</td>
<td>0.95</td>
<td>0.22</td>
<td>0.66</td>
<td>0.48</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: #$#$ denotes a binary variable; sample size 61 for each treatment.

▶ Sellers carry 25 gram and 50 gram weights $\Rightarrow$ significant for market transactions

▶ Evident that weight discrepancies are not random measurement errors
  ▶ $\therefore$ we refer to $x$ as cheated quantity
x by seller id

![Graph showing data distribution by seller id](image-url)
Histogram of $x$ by treatment

Baseline

Nudge

Superstition
Mean $x$ by treatment

![Bar chart showing the mean cheated quantity (in Grams) across different treatments: Baseline, Nudge, and Superstition. The Baseline has a mean of 77, Nudge has a mean of 54, and Superstition has a mean of -6.](chart.png)
Results

Statistics of paired differences, comparative tests and regression results for cheated quantity \([x]\) and cheated value \([v = x(p - d)/1000]\) show that

\[
\bar{x}_{Baseline} > \bar{x}_{Nudge} > \bar{x}_{Superstition}
\]
\[
\bar{v}_{Baseline} > \bar{v}_{Nudge} > \bar{v}_{Superstition}
\]

The resulting buyer surplus \([S = V - (p - d) - v\), where \(V\) is common buyer valuation of the product\] therefore follows the following pattern:

\[
\bar{S}_{Baseline} < \bar{S}_{Nudge} < \bar{S}_{Superstition}
\]
The nudge significantly reduces cheated quantity relative to Baseline, however it does not eliminate cheating.

By contrast, when a buyer happens to be the first buyer, the sellers do not cheat altogether.

The intrinsic superstitious belief of the sellers about first transaction of the day has a much stronger effect on their cheating behavior than the extrinsic nudge by a buyer that implicitly conveys an expectation of a fair transaction.

Therefore, informal mechanisms do help in contract enforcement.
Thank You!
Rohu
Handheld weighing scale
Digital scale
Bargain protocol

Seller

Buyer

Quoted price ($p$)

Buyer

Ask for discount
$d = 10$

Seller

Buyer

Fully Accept
$d = 10$

Seller

Buyer

Partially Accept
$0 < d < 10$

Seller

Buyer

Reject
$d = 0$

Seller

Buyer

Buy

Seller

Buyer

Buy

Seller

Buyer

Buy

Seller

Buyer

Buy

Weigh
Summary statistics of paired differences

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

Notes: Mean of differences (left hand side treatment - right hand side treatment) and the corresponding standard deviation of differences are reported in parentheses. $p$ and $d$ are in Rupees per Kg; $x$ is in grams; $v = x(p - d)/1000$, in Rupees; & $S = \text{valuation} - (p - d) - v$, in Rupees.
Comparative tests based on matched pairs of observations

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<th>Baseline - Superstition</th>
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<tr>
<td>Cheated quantity (x)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paired Student’s t-test</td>
<td>9.60** (0.000)</td>
<td>29.38** (0.000)</td>
<td>45.68** (0.000)</td>
</tr>
<tr>
<td>Wilcoxon signed-rank test</td>
<td>6.34** (0.000)</td>
<td>6.79** (0.000)</td>
<td>6.79** (0.000)</td>
</tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paired Student’s t-test</td>
<td>9.48** (0.000)</td>
<td>29.33** (0.000)</td>
<td>44.25** (0.000)</td>
</tr>
<tr>
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<td>6.79** (0.000)</td>
<td>6.79** (0.000)</td>
</tr>
<tr>
<td>Buyer surplus (S)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paired Student’s t-test</td>
<td>-9.48** (0.000)</td>
<td>-14.90** (0.000)</td>
<td>-20.82** (0.000)</td>
</tr>
<tr>
<td>Wilcoxon signed-rank test</td>
<td>-6.34** (0.000)</td>
<td>-6.79** (0.000)</td>
<td>-6.79** (0.000)</td>
</tr>
</tbody>
</table>

Notes: p-values in parentheses, ** p-value < 0.01 and * p-value < 0.05.
Regressions for $x$ and $v$

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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<tbody>
<tr>
<td>$Nudge$</td>
<td>-22.33**</td>
<td>-6.327**</td>
<td>-22.17**</td>
<td>-6.28**</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>$Superstition$</td>
<td>-82.84**</td>
<td>-23.68**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price quote</td>
<td>0.193</td>
<td>0.0936</td>
<td>0.240</td>
<td>0.130</td>
</tr>
<tr>
<td></td>
<td>(0.372)</td>
<td>(0.134)</td>
<td>(0.357)</td>
<td>(0.084)</td>
</tr>
<tr>
<td>Bargain success</td>
<td>-0.421</td>
<td>-0.603</td>
<td>0.829</td>
<td>-0.357</td>
</tr>
<tr>
<td></td>
<td>(0.902)</td>
<td>(0.537)</td>
<td>(0.844)</td>
<td>(0.765)</td>
</tr>
<tr>
<td>Tuesday</td>
<td>0.527</td>
<td>0.160</td>
<td>2.177</td>
<td>0.624</td>
</tr>
<tr>
<td></td>
<td>(0.895)</td>
<td>(0.885)</td>
<td>(0.674)</td>
<td>(0.667)</td>
</tr>
<tr>
<td>Wednesday</td>
<td>-3.061</td>
<td>-0.852</td>
<td>-3.115</td>
<td>-0.869</td>
</tr>
<tr>
<td></td>
<td>(0.482)</td>
<td>(0.489)</td>
<td>(0.575)</td>
<td>(0.577)</td>
</tr>
<tr>
<td>Thursday</td>
<td>-0.671</td>
<td>-0.154</td>
<td>0.920</td>
<td>0.322</td>
</tr>
<tr>
<td></td>
<td>(0.876)</td>
<td>(0.900)</td>
<td>(0.872)</td>
<td>(0.841)</td>
</tr>
<tr>
<td>Friday</td>
<td>0.132</td>
<td>0.0547</td>
<td>2.228</td>
<td>0.667</td>
</tr>
<tr>
<td></td>
<td>(0.971)</td>
<td>(0.958)</td>
<td>(0.644)</td>
<td>(0.623)</td>
</tr>
<tr>
<td>Baseline first</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.889</td>
<td>0.865</td>
<td>(0.414)</td>
<td>(0.383)</td>
</tr>
<tr>
<td>Buyer id 6</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>3.205</td>
<td>0.951</td>
<td>(0.182)</td>
<td>(0.166)</td>
</tr>
<tr>
<td>Constant</td>
<td>21.95</td>
<td>-4.783</td>
<td>3.535</td>
<td>-16.46</td>
</tr>
<tr>
<td></td>
<td>(0.721)</td>
<td>(0.785)</td>
<td>(0.962)</td>
<td>(0.431)</td>
</tr>
</tbody>
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Test for coefficient of $Nudge = coefficient of Superstition$:
F-test statistic $405.76**$ $402.02**$

Notes: p-values in parentheses based on s.e. for seller level clustering, ** p-value < 0.01 and * p-value < 0.05.