Impact of India’s demonetization on agricultural markets

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When 86% of the money was deemed invalid in one stroke!

Impact of India's demonetization on agricultural markets
Focus of this paper

- Significant economy-wide impact, but more so on the *informal* and *agricultural* sector.
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This study: what was the impact of demonetization on agricultural markets
Focus of this paper

- Significant economy-wide impact, but more so on the *informal* and *agricultural* sector.

- **This study**: what was the impact of demonetization on agricultural markets in terms of *value*, *volumes* and *prices*. 
Focus of this paper

- Significant economy-wide impact, but more so on the *informal* and *agricultural* sector.

- **This study**: what was the impact of demonetization on agricultural markets in terms of *value*, *volumes* and *prices*.

- Why agricultural markets:
  1. Provides an estimate of what was the impact on farmers, and the agricultural economy.
  2. Anecdotal evidence on adverse impact, but several observers claim that it was short-lived, with several mandis doing cheque-based payments.
Agricultural transactions in India

- Under the APMC Act, sale of primary agricultural produce via designated markets (*mandis*)
- But not all agricultural produce passes through mandis.
  - Local private traders, input dealers, co-operatives, processors, state agencies
- Mandi share: Onion (49%), Mustard (57%), Gram (64%), Banana (10%), Jowar (40%), Coriander seed (68%), Soyabean (35%)
- Most of the transactions in mandi occur via cash.
Hypotheses
Likely impact

- **On demand side**: Liquidity crunch → Reduced demand from commission agents and traders. Demand curve shifts inwards, resulting in lower price, lower quantity.
**Likely impact**

- **On demand side:** Liquidity crunch → Reduced demand from commission agents and traders. Demand curve shifts inwards, resulting in lower price, lower quantity.
Demand contraction

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Leftward shift in demand
Decline in quantity, reduced prices.

Price

D2
D1
S

Q2
Q1

P1
P2
Likely impact

- **On supply side:** Anticipated fall in demand and transactions costs to bring the produce to mandis. Supply curve shifts inwards, with higher price, lower quantity.

Net effect: depends on which effect dominates.
Likely impact

**On supply side:** Anticipated fall in demand and transactions costs to bring the produce to mandis. Supply curve shifts inwards, with higher price, lower quantity.

**Net effect:** depends on which effect dominates.
Hypotheses: Impact on volumes

- Volumes expected to **decline** significantly
- **Non perishables**: contraction in demand, and a contraction in supply (if farmers expected to hold on).
- **Perishables**: contraction in demand, but not probably in supply where farmers may not have a choice to store.
- Decline in non perishables volumes likely to be **larger** than that of the perishables.
Hypotheses: Impact on prices

- Depends on **which effect dominates**, whether supply-side or demand-side.
- If demand-side effect dominates, prices expected to fall, and vice-versa.
- **Perishables**: Likely that demand side effect will dominate. Hence, prices likely to fall.
- **Non perishables**: Ambiguous.
Heterogeneous impacts

Varying impacts across mandis and commodities.

Across mandis:

- **Producer versus consumer markets**: Mandis connected to urban areas likely to be affected more.
- **Bank penetration**: Mandis in districts with less bank penetration likely to be impacted more, expected to take longer to recover.
- **Big versus small mandis**: If farmers were unable to take their produce to far-off (larger) mandis, then probably smaller mandis experienced higher arrivals?
- **Kharif versus rabi or summer crops**: Kharif harvest (October to January).
Commodities selection: Commodities selected across 12 commodity groups identified by the Ministry of Agriculture,
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Final sample: 35 commodities across 12 groups.

Period: July 2011 to April 2017.

Data source: Agmarknet, Ministry of Agriculture, GOI.

Frequency: Daily data.

Mandis: 2953 mandis, spread across the country.

Close to 85 lacs of observations in total (after truncating at 0.05%).
Final sample, with percentage of arrivals that come during Kharif season

<table>
<thead>
<tr>
<th>Cereals:</th>
<th>Pulses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bajra (49%), Ragi (35%), Rice (36%)</td>
<td>Arhar (35%), Bengal Gram (18%)</td>
</tr>
<tr>
<td>Maize (56%), Paddy (77%), Jowar (38%)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oilseeds:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soyabean (63%), Mustard (17%), Groundnut (55%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spices:</th>
<th>Plantations:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumin (13%), Coriander seed (18%), Dry Chillies (25%), Turmeric (20%)</td>
<td>Copra Arecanut (38%), Cashewnuts (7%)</td>
</tr>
</tbody>
</table>

**Cotton (65%), Sugarcane (10%)**

<table>
<thead>
<tr>
<th>Fruits:</th>
<th>Vegetables:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple (50%), Banana (34%), Guava (54%), Lemon (23%), Lime (30.11%), Orange (74%)</td>
<td>Brinjal (35%), Cabbage (39%), Cauliflower (46%), Okra (21%), Onion (34%)</td>
</tr>
<tr>
<td></td>
<td>Potato (35%), Tomato (33%)</td>
</tr>
</tbody>
</table>

Impact of India’s demonetization on agricultural markets
Weekly arrivals for sample commodities

Impact of India’s demonetization on agricultural markets
Weekly arrivals for sample commodities

**Impact of India’s demonetization on agricultural markets**
Empirical strategy

- Time-space framework using a difference-in-differences regression approach.
- **Treated unit**: 2016-17, **Comparison units**: Remaining years from 2011-12 to 2015-16.
- **Pre-event period**: Jul to Nov 8; **Post-event period**: Nov 9 to Jun 30.
- Impact assessed at different windows post the event: 7, 15, 21, 30, 45, 60, 75, 90 days.
Regression specification

**Arrivals:**

\[
\ln Y_{c,m,t} = \beta_0 + \beta_1 D_{\text{post-Nov8}, t} + \beta_2 D_{2016, t} + \beta_3 D_{\text{post-Nov8}, t} \times D_{2016} \\
+ \beta_4 X_{c,m,t} + \epsilon_{c,m,t}
\]

**Prices:**

\[
\ln P_{c,m,t} = \gamma_0 + \gamma_1 D_{\text{post-Nov8}, t} + \gamma_2 D_{2016, t} + \gamma_3 D_{\text{post-Nov8}, t} \\
+ \gamma_4 Y_{c,m,t} + \beta_4 X_{c,m,t} + \eta_{c,m,t}
\]

**Total value:**

\[
\ln V_{c,m,t} = \alpha_0 + \alpha_1 D_{\text{post-Nov8}, t} + \alpha_2 D_{2016, t} + \alpha_3 D_{\text{post-Nov8}, t} \times D_{2016} + \\
+ \beta_4 X_{c,m,t} + \nu_{c,m,t}
\]

**X’s:** Includes mandi effects, day of the week effect, month effect, variety effects, Diwali effect. Control for rainfall (lagged rainfall upto previous 12 months).
Parallel trends assumption

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Parallel trends assumption

Impact of India’s demonetization on agricultural markets

Graphs showing the mean cumulative arrivals for Turmeric, Coriander seed, Tomato, and Banana. The graphs compare the cumulative arrivals in Comparison Years (Mean) and Treatment Year (2016-17) across months from July to May.
Results
Impact of India's demonetization on agricultural markets
Impact on arrivals and prices, $\beta_3$ coefficient

Impact of India’s demonetization on agricultural markets

Arrivals

Prices

Tomato

Banana
Impact on arrivals and prices, $\beta_3$ coefficient

Arrivals

Prices
### Impact of India’s demonetization on agricultural markets

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Value</th>
<th>Prices</th>
<th>Arrivals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\beta_3$</td>
<td>t-stat</td>
<td>$R^2$</td>
</tr>
<tr>
<td>Jowar</td>
<td>-0.28</td>
<td>-3.76</td>
<td>0.60</td>
</tr>
<tr>
<td>Bajra</td>
<td>-0.4</td>
<td>-5.71</td>
<td>0.62</td>
</tr>
<tr>
<td>Maize</td>
<td>-0.02</td>
<td>-0.44</td>
<td>0.69</td>
</tr>
<tr>
<td>Paddy</td>
<td>0.32</td>
<td>8.46</td>
<td>0.85</td>
</tr>
<tr>
<td>Ragi</td>
<td>-0.19</td>
<td>-0.92</td>
<td>0.66</td>
</tr>
<tr>
<td>Rice</td>
<td>-0.11</td>
<td>-3.68</td>
<td>0.85</td>
</tr>
<tr>
<td>Wheat</td>
<td>-0.2</td>
<td>-5.57</td>
<td>0.70</td>
</tr>
<tr>
<td>Cotton</td>
<td>0.22</td>
<td>4.36</td>
<td>0.78</td>
</tr>
<tr>
<td>Bengal Gram</td>
<td>0</td>
<td>-0.06</td>
<td>0.74</td>
</tr>
<tr>
<td>Arhar</td>
<td>-0.27</td>
<td>-3.67</td>
<td>0.69</td>
</tr>
<tr>
<td>Soyabean</td>
<td>-0.69</td>
<td>-9.54</td>
<td>0.61</td>
</tr>
<tr>
<td>Mustard</td>
<td>-0.01</td>
<td>-0.17</td>
<td>0.71</td>
</tr>
<tr>
<td>Groundnut</td>
<td>-0.34</td>
<td>-3.66</td>
<td>0.60</td>
</tr>
<tr>
<td>Cumin</td>
<td>0.31</td>
<td>1.42</td>
<td>0.64</td>
</tr>
<tr>
<td>Coriander seed</td>
<td>-0.82</td>
<td>-6.38</td>
<td>0.72</td>
</tr>
<tr>
<td>Dry Chillies</td>
<td>-0.23</td>
<td>-1.67</td>
<td>0.76</td>
</tr>
<tr>
<td>Turmeric</td>
<td>-0.42</td>
<td>-2.72</td>
<td>0.77</td>
</tr>
<tr>
<td>Areca nut</td>
<td>-0.25</td>
<td>-2.60</td>
<td>0.73</td>
</tr>
<tr>
<td>Cashew nuts</td>
<td>-0.43</td>
<td>-1.58</td>
<td>0.89</td>
</tr>
<tr>
<td>Copra</td>
<td>0.05</td>
<td>0.50</td>
<td>0.79</td>
</tr>
</tbody>
</table>
### Impact of India’s demonetization on agricultural markets

The table below shows the coefficients ($\beta_3$) across perishable commodities, with a window size of 7.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Value</th>
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<th>Arrivals</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>$\beta_3$</td>
<td>t-stat</td>
<td>$R^2$</td>
</tr>
<tr>
<td>Brinjal</td>
<td>-0.15</td>
<td>-7.11</td>
<td>0.78</td>
</tr>
<tr>
<td>Cabbage</td>
<td>-0.14</td>
<td>-4.79</td>
<td>0.76</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>-0.23</td>
<td>-9.37</td>
<td>0.72</td>
</tr>
<tr>
<td>Okra</td>
<td>-0.13</td>
<td>-4.22</td>
<td>0.74</td>
</tr>
<tr>
<td>Onion</td>
<td>-0.13</td>
<td>-5.90</td>
<td>0.78</td>
</tr>
<tr>
<td>Potato</td>
<td>-0.24</td>
<td>-12.69</td>
<td>0.82</td>
</tr>
<tr>
<td>Tomato</td>
<td>-0.36</td>
<td>-16.94</td>
<td>0.79</td>
</tr>
<tr>
<td>Apple</td>
<td>-0.27</td>
<td>-7.20</td>
<td>0.74</td>
</tr>
<tr>
<td>Banana</td>
<td>0.01</td>
<td>0.24</td>
<td>0.78</td>
</tr>
<tr>
<td>Guava</td>
<td>-0.16</td>
<td>-2.06</td>
<td>0.71</td>
</tr>
<tr>
<td>Orange</td>
<td>-0.25</td>
<td>-3.21</td>
<td>0.71</td>
</tr>
<tr>
<td>Lemon</td>
<td>-0.18</td>
<td>-3.71</td>
<td>0.74</td>
</tr>
<tr>
<td>Lime</td>
<td>-0.27</td>
<td>-2.39</td>
<td>0.77</td>
</tr>
<tr>
<td>Sweet Lime</td>
<td>-0.03</td>
<td>-0.42</td>
<td>0.76</td>
</tr>
</tbody>
</table>
In summary,

- Broadly, the results show a similar trend from 1-25 window size. Recovery post the 25th day.
- Between consumer and producer markets, an amplified effect on consumer markets.
- No clear pattern with mandis with higher bank penetration.
- FCI procurement, trade diversion back to mandis, sale on credit, other tricks that traders used to dispose off cash, could be the reasons behind insignificance / positively significant coefficients.
Further work

- Synthetic control
- Placebos using pre-event window
- Money supply linkage with recovery pattern
- Robustness checks using dairy data, oilmeal/coffee exports.
Thank you

Comments / Questions?