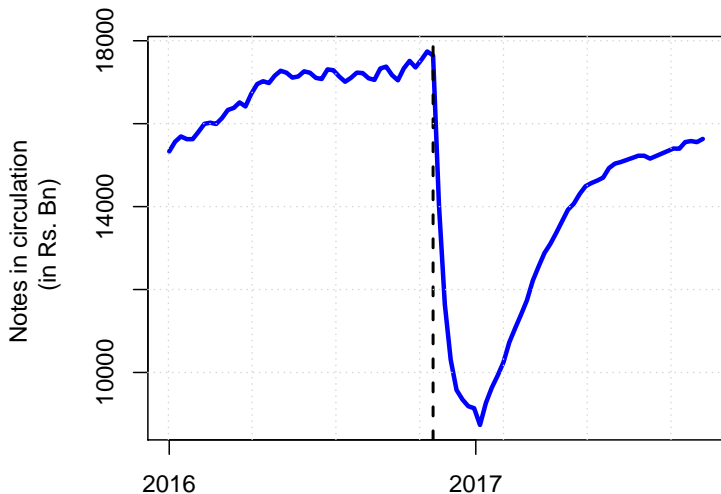


Impact of India's demonetization on agricultural markets

Nidhi Aggarwal Sudha Narayanan

October 11, 2017

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



Focus of this paper

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

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

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

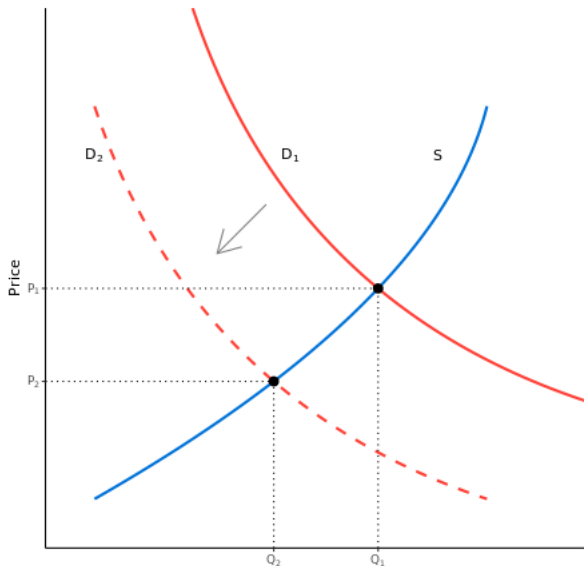
- **On demand side:** Liquidity crunch → Reduced demand from commission agents and traders. Demand curve shifts inwards, resulting in lower price, lower quantity.

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

Demand contraction

Leftward shift in demand

Decline in quantity, reduced prices.



- **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.

- **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,

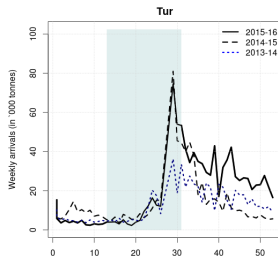
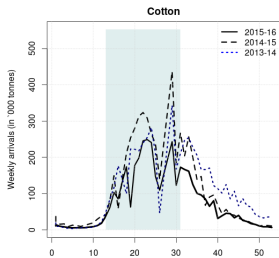
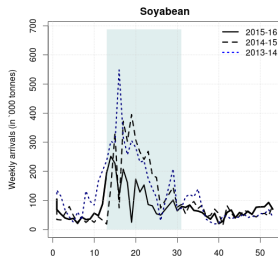
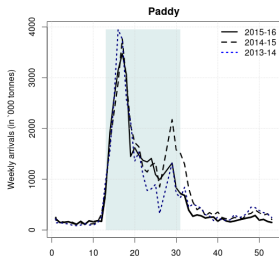
- **Commodities selection:** Commodities selected across 12 commodity groups identified by the Ministry of Agriculture, based on area under cultivation within each group.

- **Commodities selection:** Commodities selected across 12 commodity groups identified by the Ministry of Agriculture, based on area under cultivation within each group.
- **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%).

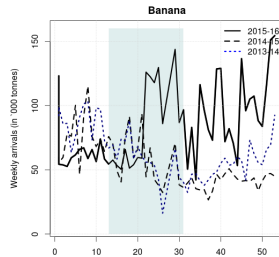
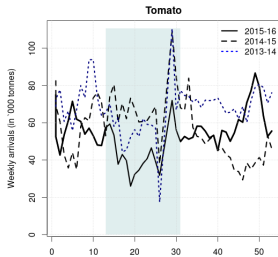
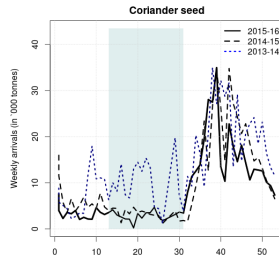
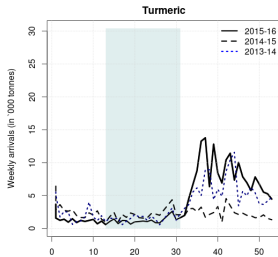
Final sample, with percentage of arrivals that come during Kharif season

Cereals: Bajra (49%), Ragi (35%), Rice (36%) Maize (56%), Paddy (77%), Jowar (38%),	Pulses: Arhar (35%) Bengal Gram (18%)
Spices: Cumin (13%), Coriander seed (18%), Dry Chillies (25%), Turmeric (20%)	Oilseeds: Soyabean (63%), Mustard (17%), Groundnut (55%)
Fruits: Apple (50%), Banana (34%), Guava (54%), Lemon (23%), Lime (30.11%), Orange (74%)	Plantations: Copra Arecanut (38%), Cashewnuts (7%) Cotton (65%), Sugarcane (10%)
	Vegetables: Brinjal (35%) Cabbage (39%), Cauliflower (46%) Okra (21%), Onion (34%) Potato (35%), Tomato (33%)

Weekly arrivals for sample commodities



Weekly arrivals for sample commodities



- 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:

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

Prices:

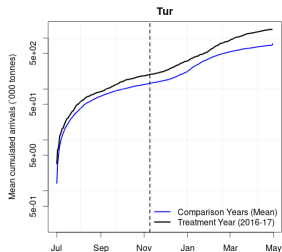
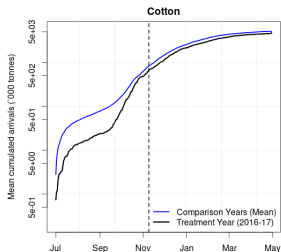
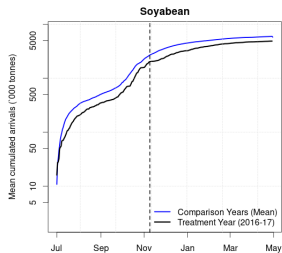
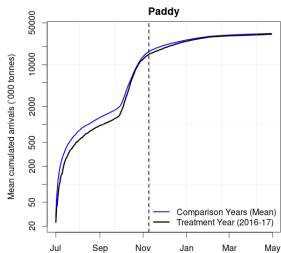
$$\ln P_{c,m,t} = \gamma_0 + \gamma_1 D_{post-Nov8,t} + \gamma_2 D_{2016,t} + \gamma_3 D_{post-Nov8,t} + \gamma_3 Y_{c,m,t} + \beta_4 X_{c,m,t} + \eta_{c,m,t}$$

Total value:

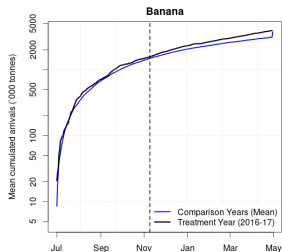
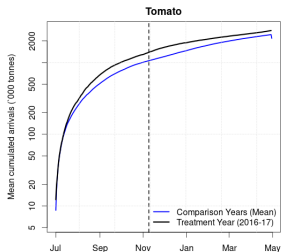
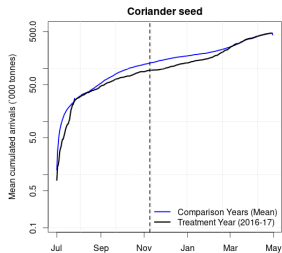
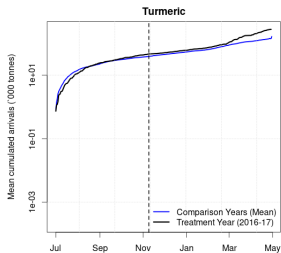
$$\ln V_{c,m,t} = \alpha_0 + \alpha_1 D_{post-Nov8,t} + \alpha_2 D_{2016,t} + \alpha_3 D_{post-Nov8,t} \times D_{2016} + \beta_4 X_{c,m,t} + \nu_{c,m,t}$$

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



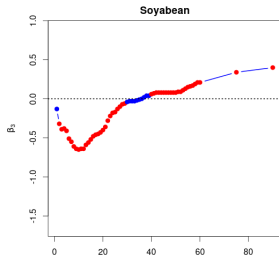
Parallel trends assumption



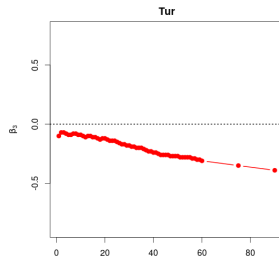
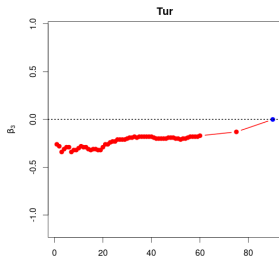
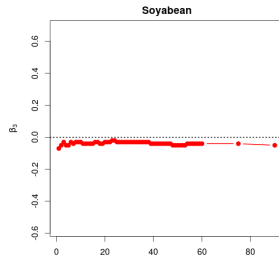
Results

Impact on arrivals and prices, β_3 coefficient

Arrivals

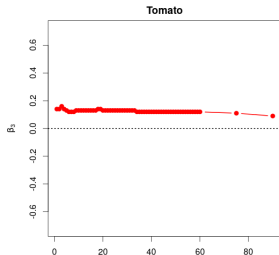


Prices

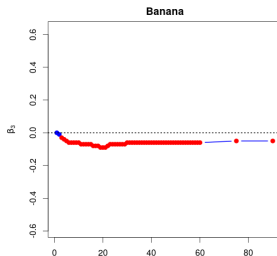
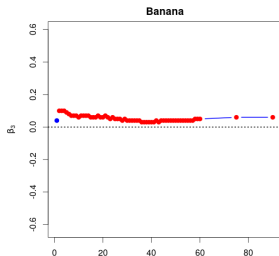
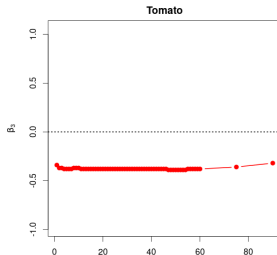


Impact on arrivals and prices, β_3 coefficient

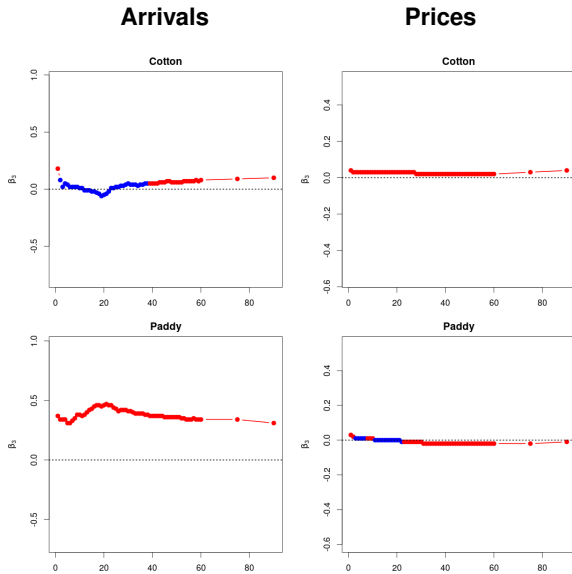
Arrivals



Prices



Impact on arrivals and prices, β_3 coefficient



β_3 coefficient across non perishables, window size = 7

Commodity	Value			Prices			Arrivals		
	β_3	t-stat	R ²	β_3	t-stat	R ²	β_3	t-stat	R ²
Jowar	-0.28	-3.76	0.60	0.01	0.53	0.52	-0.29	-3.89	0.58
Bajra	-0.4	-5.71	0.62	-0.08	-13.26	0.58	-0.33	-4.62	0.63
Maize	-0.02	-0.44	0.69	-0.04	-9.88	0.54	0.02	0.40	0.68
Paddy	0.32	8.46	0.85	-0.02	-4.02	0.46	0.34	8.93	0.85
Ragi	-0.19	-0.92	0.66	0.17	6.31	0.63	-0.37	-1.65	0.66
Rice	-0.11	-3.68	0.85	0	0.75	0.63	-0.11	-3.91	0.86
Wheat	-0.2	-5.57	0.70	0.02	5.27	0.52	-0.22	-6.12	0.70
Cotton	0.22	4.36	0.78	0.02	3.58	0.31	0.2	3.98	0.78
Bengal Gram	0	-0.06	0.74	0.14	13.46	0.77	-0.15	-2.82	0.73
Arhar	-0.27	-3.67	0.69	-0.15	-8.48	0.75	-0.13	-1.76	0.66
Soyabean	-0.69	-9.54	0.61	-0.05	-5.35	0.42	-0.66	-8.89	0.62
Mustard	-0.01	-0.17	0.71	-0.04	-8.95	0.55	0.03	0.59	0.70
Groundnut	-0.34	-3.66	0.60	-0.05	-3.44	0.61	-0.3	-3.24	0.61
Cumin	0.31	1.42	0.64	-0.12	-3.76	0.64	0.44	2.00	0.65
Coriander seed	-0.82	-6.38	0.72	-0.13	-3.51	0.55	-0.71	-5.57	0.75
Dry Chillies	-0.23	-1.67	0.76	-0.12	-2.90	0.76	-0.11	-0.76	0.80
Turmeric	-0.42	-2.72	0.77	0	0.09	0.65	-0.43	-2.73	0.78
Arecanut	-0.25	-2.60	0.73	-0.08	-2.36	0.65	-0.17	-1.90	0.76
Cashewnuts	-0.43	-1.58	0.89	-0.37	-2.55	0.72	-0.06	-0.24	0.94
Copra	0.05	0.50	0.79	0.09	2.75	0.44	-0.04	-0.39	0.80

β_3 coefficient across perishables, window size = 7

Commodity	Value			Prices			Arrivals		
	β_3	t-stat	R ²	β_3	t-stat	R ²	β_3	t-stat	R ²
Brinjal	-0.15	-7.11	0.78	-0.19	-16.45	0.64	0.04	1.95	0.77
Cabbage	-0.14	-4.79	0.76	-0.11	-8.83	0.68	-0.03	-1.12	0.80
Cauliflower	-0.23	-9.37	0.72	-0.14	-10.68	0.65	-0.1	-4.11	0.74
Okra	-0.13	-4.22	0.74	-0.18	-13.57	0.52	0.05	1.54	0.75
Onion	-0.13	-5.90	0.78	-0.03	-3.42	0.65	-0.1	-4.97	0.82
Potato	-0.24	-12.69	0.82	-0.31	-33.55	0.57	0.07	4.12	0.84
Tomato	-0.36	-16.94	0.79	-0.46	-47.47	0.61	0.11	5.54	0.83
Apple	-0.27	-7.20	0.74	-0.12	-9.08	0.71	-0.17	-4.27	0.75
Banana	0.01	0.24	0.78	-0.1	-9.48	0.85	0.11	3.68	0.81
Guava	-0.16	-2.06	0.71	-0.22	-5.71	0.69	0.07	0.86	0.69
Orange	-0.25	-3.21	0.71	-0.01	-0.36	0.75	-0.25	-3.47	0.75
Lemon	-0.18	-3.71	0.74	-0.45	-19.15	0.67	0.29	6.31	0.77
Lime	-0.27	-2.39	0.77	-0.41	-5.29	0.83	0.16	1.95	0.84
Sweet Lime	-0.03	-0.42	0.76	-0.03	-1.40	0.66	0	0.07	0.79

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?