Chatterjee (2018), 'Market Power and Spatial Competition in Rural India'

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Environment

- S regions (independent for now)
- One crop (we'll add more later)
- Within each region,
  - farmers, $f \in \{1, ..., F\} \equiv \mathcal{F}$
  - intermediares, $m \in \{1, ..., M\} \equiv \mathcal{M}$
- Iceberg trade costs: $\tau_{fm} > 1$.
- Partial equilibrium (demand side is exogenously given)

Technology

- Farmers have Cobb-Douglas production technology,

$$y_f = \tilde{A}_f \left(h_f^{\gamma} l_f^{\nu} \prod_{k=1}^{K} (x_f^k)^{\alpha_k} \right)$$

  - $\{x^k\}$ intermediate inputs, prices $\{w^k\}$ (exogenously given)
  - h_f and l_f are endowments of land and labor (i.e. fixed).

Market choice

- Farmer's problem is to choose the market m that maximizes profit (note the trade cost):

$$\max_{m \in \mathcal{M}} \left\{ \frac{p^f(m) y_f}{\tau_{fm}} \right\}$$

Price determination

- Once farmer f reaches market m, all costs are sunk.
- Farmer's price is determined via Nash Bargaining.
- Farmer's outside option:

$$\underline{p}(m) = \max_{k \in \mathcal{M} \setminus \{m\}} \left\{ \frac{p^f(k)}{\tau_{mk}} \right\}$$

- Intermediary's outside option is zero.

Price determination: Nash bargaining

- NB outcome is the solution to

$$\max_{\lambda} \ (\lambda - \underline{p}(m)q_m)^{\delta}(p^r_m q_m - \lambda)^{1-\delta}$$

  - λ is farmer's income
  - p^r_m is the retail price (exogenous)

Equilibrium

Set of farmer prices $p^f(\cdot)$, intermediate input choices $\{x_f^k\}_{k\in\mathcal{K},f\in\mathcal{F}}$, and the optimal market choice of each farmer $\{\mu(f)\}_{f\in\mathcal{F}}$:

1. Farmers maximize profits;
2. Farmers optimally choose the market to sell their output;
3. At each market, the farmer's price is determined by the NB solution, assuming that NB in all other markets have reached an agreement.

Equilibrium – solution

- Solution to NB problem:

$$p^f(m) = (1-\delta)\underline{p}(m) + \delta p^r_m$$

  using $p^f(m) = \lambda/q_m$.

- System of M equations in M endogenous variables $\{p^f(m)\}_{m\in\mathcal{M}}$

- **T1**: Equilibrium exists and is unique.

- **L1**: Given retail prices, removing the interregional trading restriction improves farmer prices.
  $\Longrightarrow$ Intuition: farmer's outside option is better!

Taking model to the data

- Expand to include multiple crops and time periods; system of $M \times C \times T$ equations/variables.
- Semi-annual data (7 years): market locations, farmer prices and retail prices for each crop, district-level crop choice.
- Estimation: (i) parameterize τ; (ii) estimate δ + trade cost parameters using SMM.
- Calibrate other parameters (γ, ν).

Counterfactual #1: changing farmers' outside option

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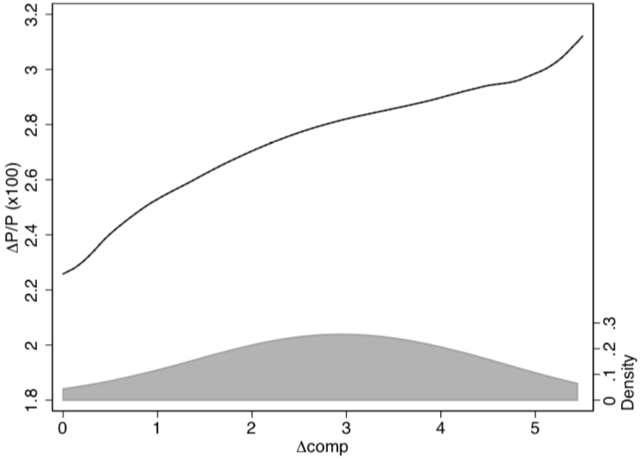


Figure: Change in Price vs. Change in Spatial Competition

Counterfactual #1: changing farmers' outside option

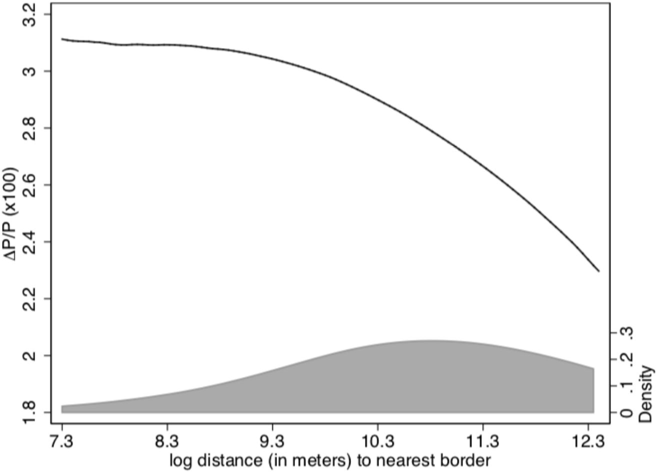


Figure: Change in Price vs. Distance to Nearest Border

Other counterfactuals

Table: **Summary of Counterfactual Exercises**

Change in farmer prices (%)

	Median		Mean	
	Fall	*Spring*	*Fall*	*Spring*
#1: Change outside option	1.75	2.50	2.74	2.65
#2: #1 + change market choice	8.35	5.82	12.60	10.72
#3: #2 + adjust retail prices	5.98	6.21	9.62	9.56

Conclusion

- Very cool paper: nice data work + simple, but powerful model!
- Increasing spatial competition between intermediaries by removing interstate trade restrictions is good for farmers.

Appendix

Causal estimates

- Basic idea: choose market pairs that are close together but separated by a border
- Factors that affect price (other than spatial competition) should be similar for the market pairs.
- For each market pair (m, m') estimate:

$$\Delta \log p^f_{cmdt} = \beta_1(\Delta \text{comp}_m) + \gamma_{ss'} + \tilde{\epsilon}_{cmdt}$$

Causal estimates

Table: Border Discontinuity Regressions

	Distance between market pairs (km)		
	< 25	< 30	< 35
$\hat{\beta}_1$	0.025	0.035	0.036
Robust std. err.	0.011	0.013	0.009

Estimation + calibration

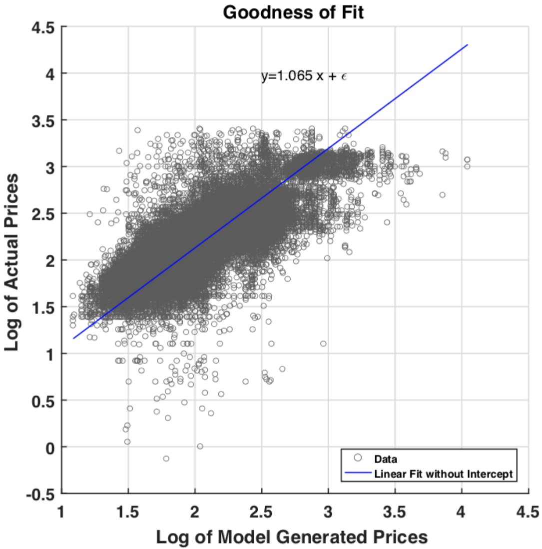
- Parameterize τ:

$$\tau_{mkct} = \begin{cases} 1 & \text{if } m = k \\ 1 + A \cdot d_{mk} + \epsilon_{mct} & \text{if } m \neq k \\ \infty & \text{if } m, k \text{ in diff states} \end{cases}$$

$$\epsilon_{mct} \sim \mathcal{N}(0, \sigma^2)$$

- Estimate (δ, σ^2, A) using SMM.

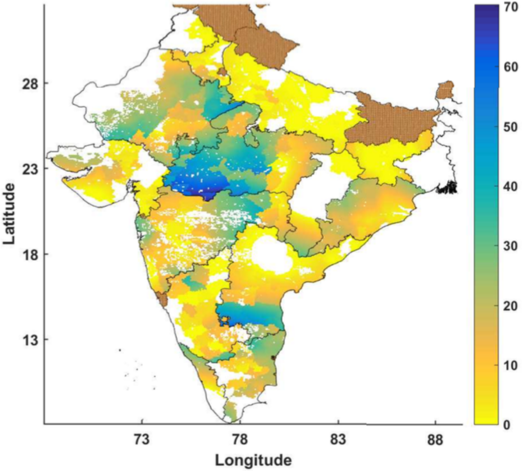
Model fit



Goodness of Fit
y=1.065 x + ϵ
Log of Actual Prices
Log of Model Generated Prices
Data
Linear Fit without Intercept
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
1
1.5
2
2.5
3
3.5
4
4.5

54

Counterfactual # 2: Allow farmers to sell at different market



Counterfactual # 3: Allowing retail prices to adjust