



Do Microenterprises Maximize Profits? A Vegetable Market Experiment in India

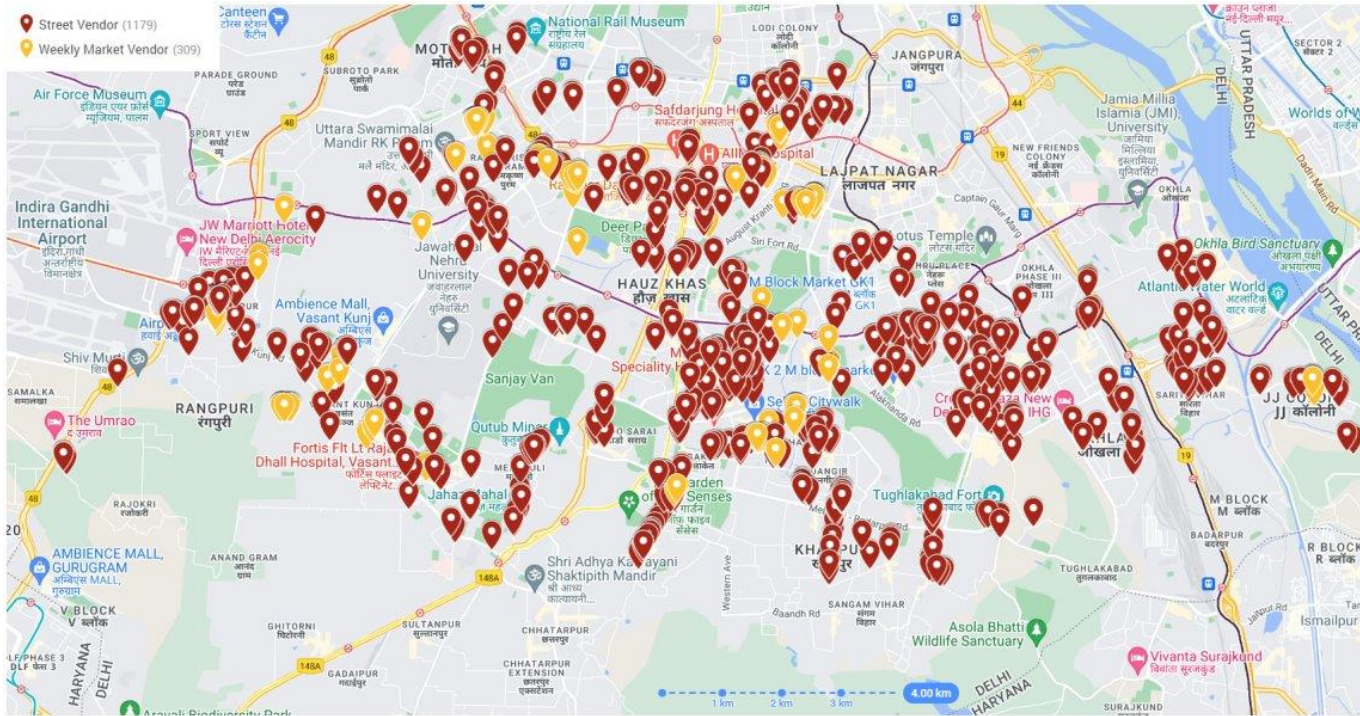
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NEUDC Paper Presentation – Nate Ukoha

Question: Do Microenterprises Maximize Profits?

Goal: Evaluating long term impact of subsidy on additional produce for street vendors in India

- Non-randomized experiment in select vegetable markets
- If profits are observed during subsidy period, **is additional produce maintained to sustain increased earnings? What factors might discourage expansion?**
- Paper attempts to explain gaps between vendor behavior and profit-maximization in the informal market



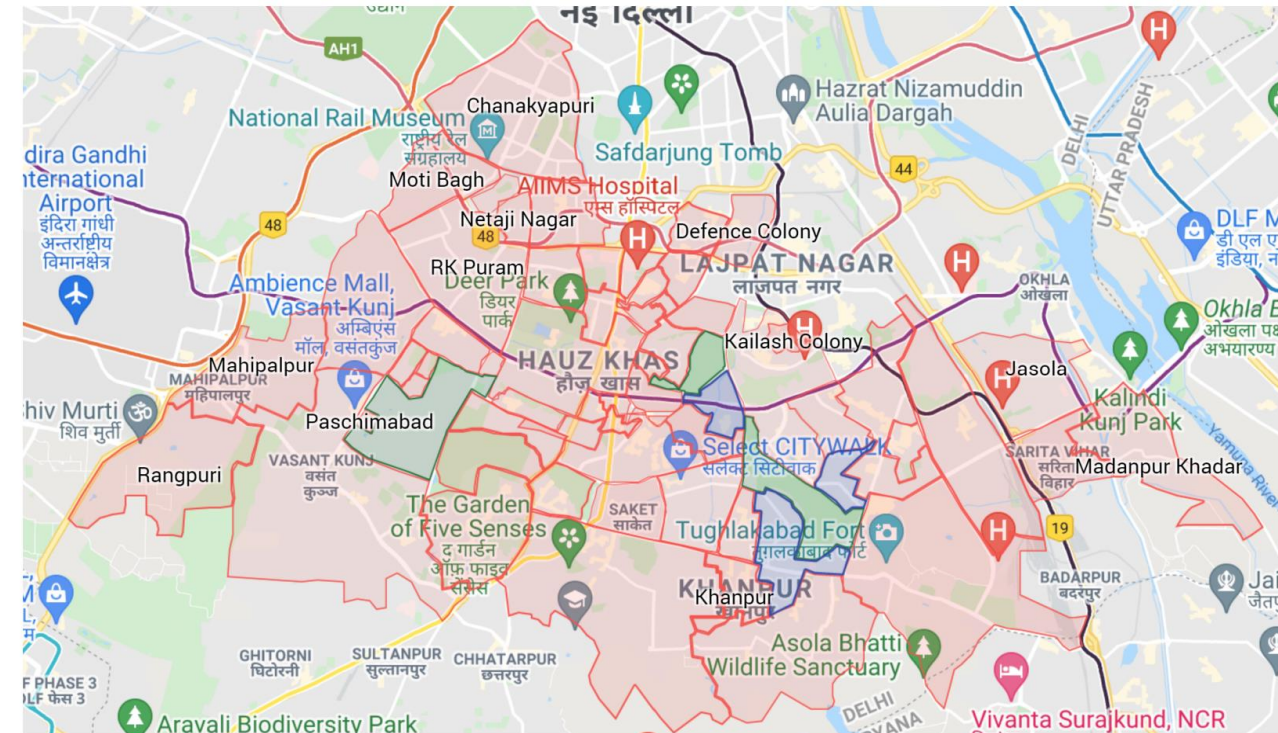
Understanding the Market

- In addition to their experiment, authors conducted 3-month survey to better understand spatial competition in informal markets
- Surveyed each vendor about daily earnings, produce, demographics, revenues etc.
- 80% of vendors responded while remaining 20% of info had estimated by peer surveyor observations
- Authors use these observations to suggest 4 main facts that justify expansion is feasible for vendors
- 1100 vendors daily street vendors and 300 weekly market vendors in 135km area are included in the survey
- Location: South Delhi fruit markets

Survey Findings Pt.1

1. **Vendors exhibit high degree of spatial clustering**
 - Each vendor has roughly 4 other vendors in a 25m radius and 1 other vendor in a 10m radius
 - ~30% of vendors have another vendor selling the same fruit
 - Higher density for weekly vendors than daily street vendors
 - (64% vs 43% sell within 10m of another vendor)
- Implication: Opportunity for vendor to expand business by acquiring nearby competitors**

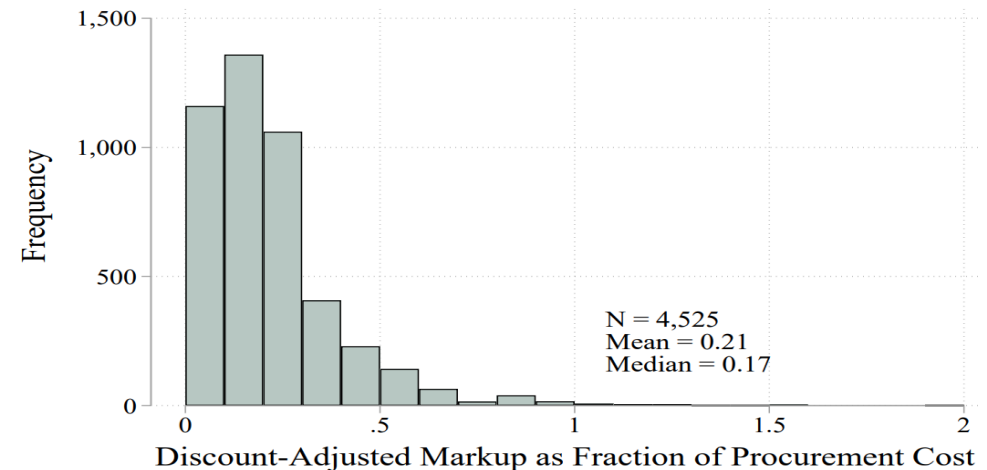
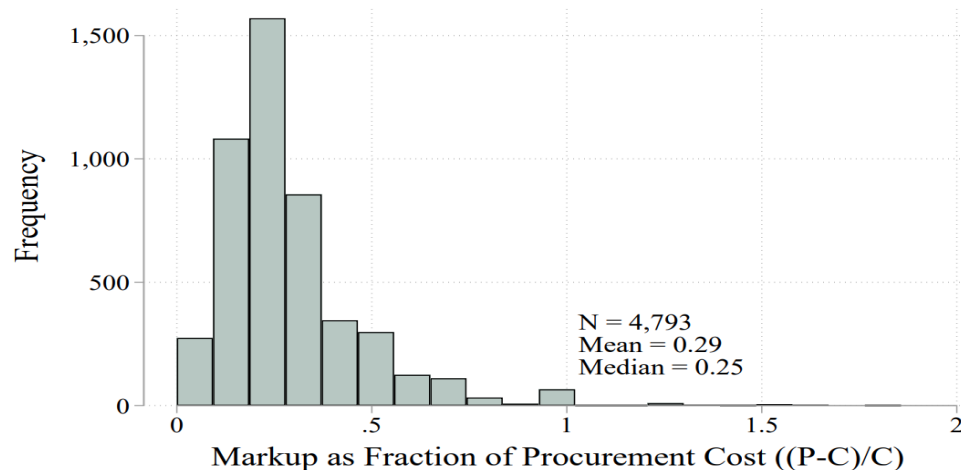
Figure A1: Fruit Vendor Census Area



Survey Findings Pt.2

2. Vendors charge non-trivial markups over their marginal costs

- 29% average markup per sale (selling price – cost to procure fruit)
- 21% after considering likely discounts
- **Implication: lowering prices could undercut and possibly drive out neighboring competition**

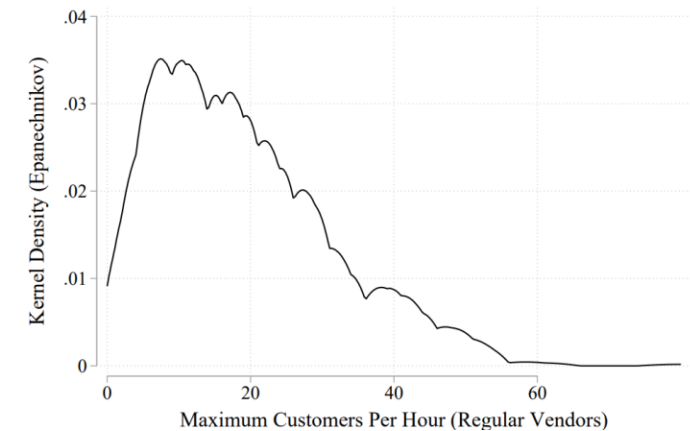
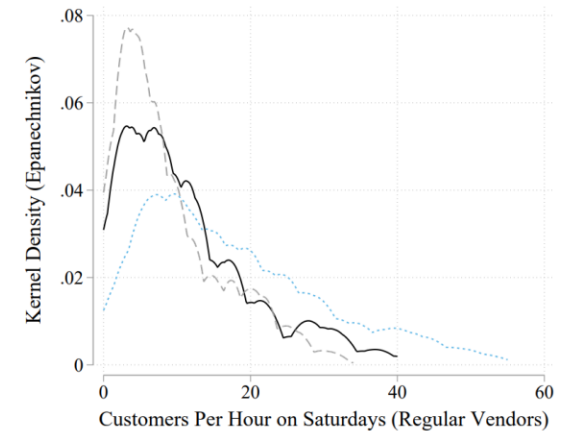
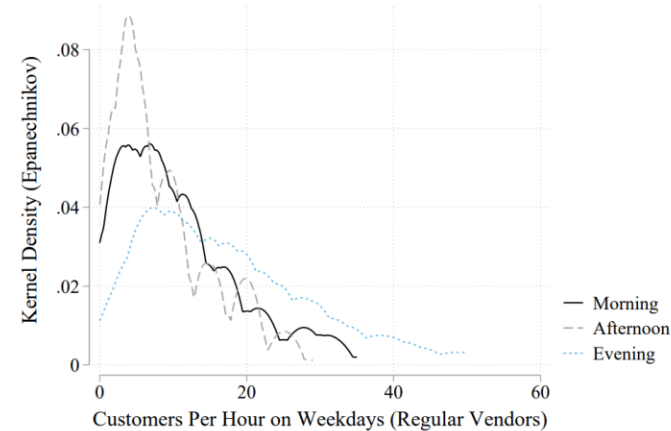


Survey Findings Pt.3

•3 Much of vendors time is spent waiting for customers

- Wide range of customers per hour throughout the day (Saturday evenings busiest)
- Avg. of 15 customers per hour
- 42 customers/hr in 95th percentile
- Assuming all vendors can operate with 42 customers, the median vendor serves less than half of their capacity at busiest hours

Vendors can increase scale without hiring more labor



Survey Findings Pt.4

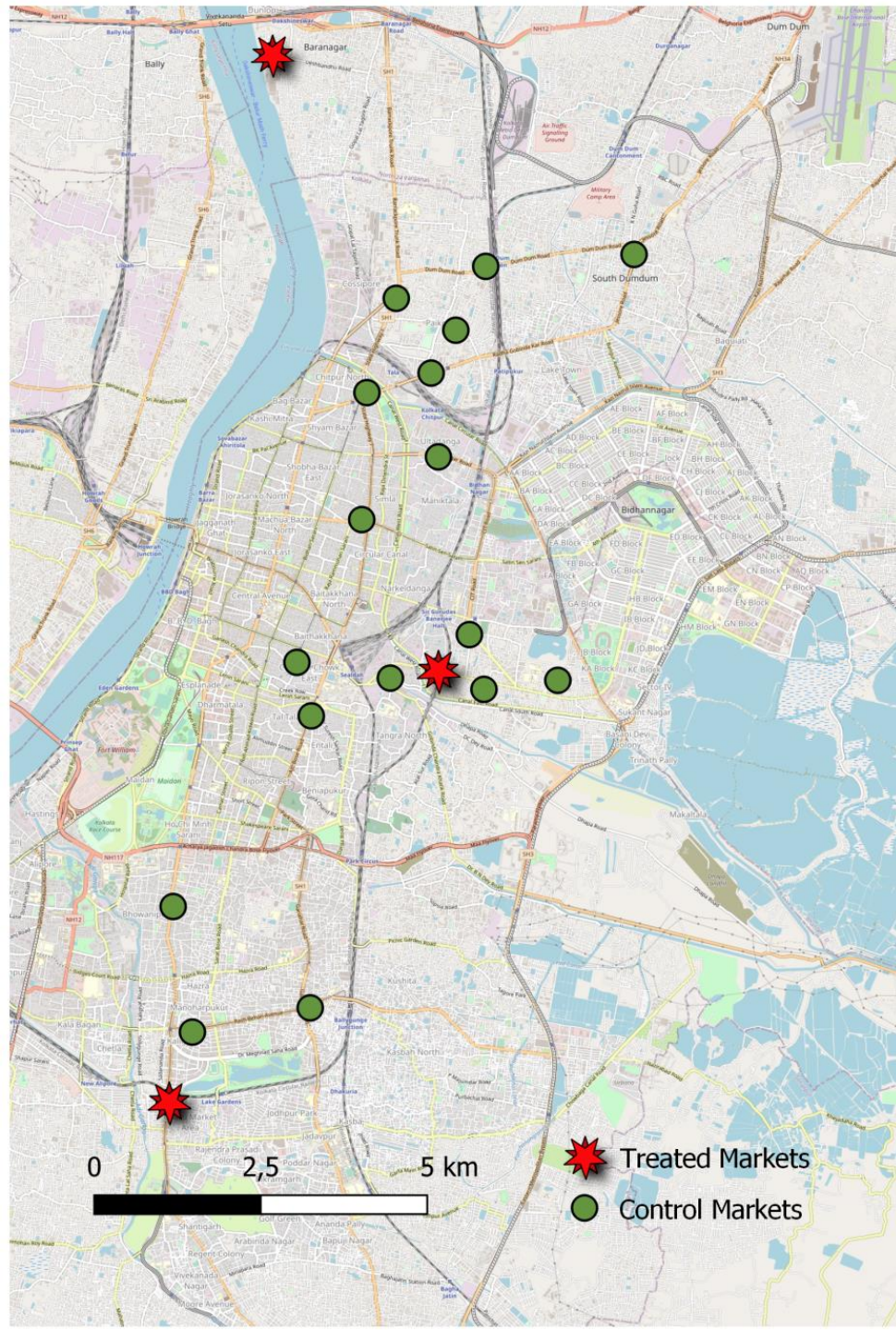
4. Greater product differentiation for closer vendors

- Less dense clustering by fruit
- For any given fruit, only 1 other vendor selling the same within a 25m radius
- Only 10% of fruits have two vendors selling it within a 5m radius

Greater product differentiation -> more opportunity for larger profit margins

Experiment Setup

- December 2018 – March 2019
- 20 vegetable markets near Kolkata India
- Non-random experiment in which they granted a subsidy (cash grant) to 3 of these markets
 - Sarkar Bazar
 - Alam Bazar
 - Charu Market
- **Chosen because they have minimal price volatility and are markets with medium size**
- Experiment segmented into three phases:
 - Pre-subsidy (3 weeks)
 - Subsidy (3 weeks)
 - Post-subsidy (2 weeks)
- Data collected from each market daily from all vendors
 - Quantity of vegetables procured
 - Quantity sold day prior
 - Per unit prices and costs for each vegetable
- Vendors responsible for knowledge and capital required to acquire additional fruit/veg.



Subsidy Intervention

- Carrots:

- All vendors in three designated markets received a subsidy for carrots
- 20 rupees/kg
 - Median purchasing costs
- **Purpose: induce inventory expansion**

• Peas:

- Only the most infrequent sellers (vendors who sold peas in fewer than eight days during pre-subsidy period)
- 30 rupees/kg
- **Purpose: induce new entry / business stealing**

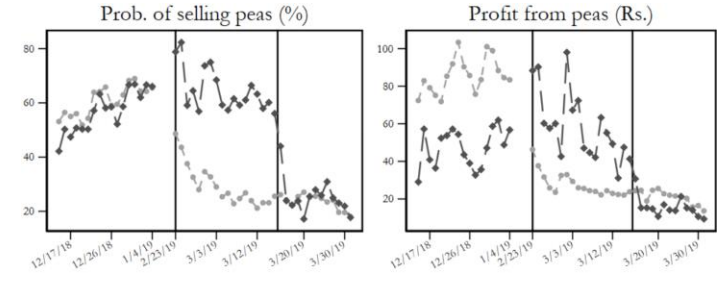
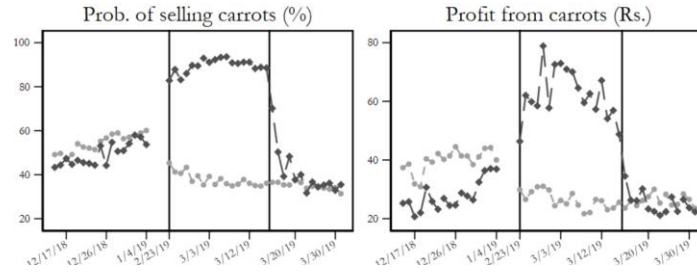
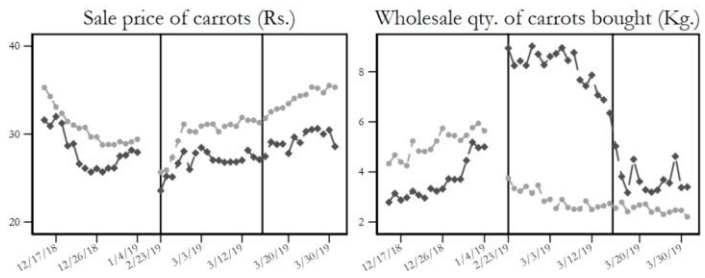
Maximum Quantity Subsidized

- Weekly, maximum quantity subsidy granted was either low or high:
 - If low 2kg was subsidized
 - If high, max is median of distribution of daily sales made during pre-subsidy period
 - Charu: 7kg for carrots , 8kg for peas
 - Sarkar Bazar: 5kg, 6kg for peas
 - Alam Bazar: 5kg, 10kg for peas

Model Design / Empirical Approach

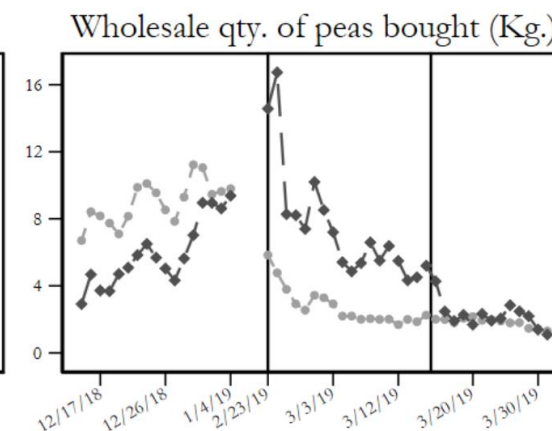
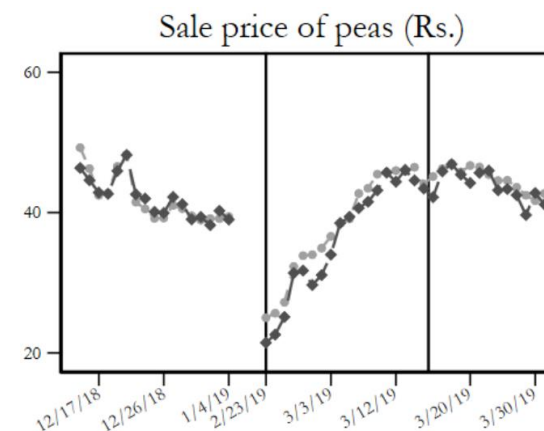
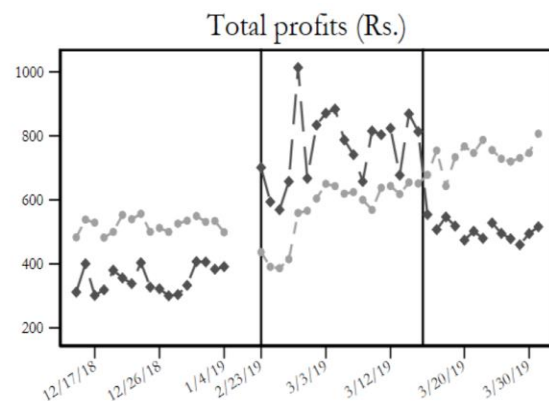
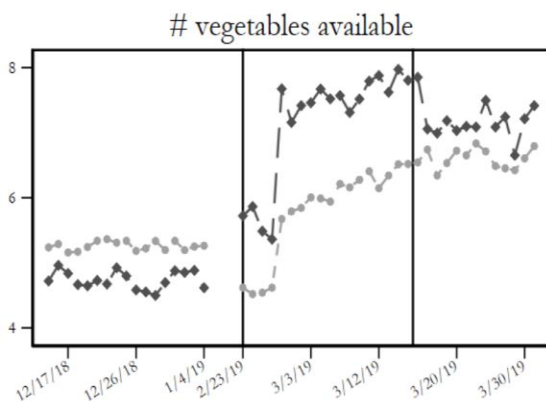
Estimation: $y_{imt} = \alpha + \beta_1 \text{During}_t + \beta_2 \text{Post}_t + \beta_3 \text{Treat}_m + \gamma_1 \text{During}_t \cdot \text{Treat}_m + \gamma_2 \text{Post}_t \cdot \text{Treat}_m + \varepsilon_{imt} \quad (1)$

- Authors use differences in differences technique to compare changes in outcome between treatment and control markets
- y_{imt} measures this expected outcome
 - (Δ profits, Δ quantity purchased, Δ selling price, etc.)
- γ_1 : effect of subsidy during subsidy phase
- γ_2 : persistent effect of subsidy during after subsidy phase
- Looking to see if γ_1 and γ_2 are statistically different



— ◆ — : Treatment markets - - - ● - - - : Control markets

Results – Graphical Overview



—◆— Treatment markets

- - -●- - - Control markets

Results – Graphical Overview (cont.)

Regression Results – Subsidy Period

Table 1: Subsidy Impacts: Carrots and Peas

	Carrot				Peas			
	Prob. of selling (%) (1)	Sale price (Rs.) (2)	Wholesale qty. bought (kg) (3)	Profits (Rs.) (4)	Prob. of selling (%) (5)	Sale price (Rs.) (6)	Wholesale qty. bought (kg) (7)	Profits (Rs.) (8)
β_3 Treat	-0.05 [-0.287, 0.191] { 0.651 } < 0.602	-2.62 [-6.699, 3.012] { 0.086 } < 0.147	-1.40 [-3.615, 1.010] { 0.303 } < 0.264	-12.71 [-26.549, 7.743] { 0.307 } < 0.141	-0.04 [-0.319, 0.264] { 0.563 } < 0.604	-0.01 [-3.260, 2.661] { 0.986 } < 0.989	-2.53 [-7.632, 1.997] { 0.089 } < 0.147	-33.29 [-82.570, 26.028] { 0.082 } < 0.049
γ_1 Treat \times During Subs	0.57 [0.398, 0.725] { 0.002 } < 0.001	-0.44 [-3.122, 2.035] { 0.617 } < 0.685	5.99 [3.758, 7.725] { < 0.001 } < 0.001	44.75 [21.061, 60.080] { 0.002 } < 0.001	0.39 [0.160, 0.644] { 0.018 } < 0.001	-0.81 [-4.005, 2.755] { 0.757 } < 0.686	6.73 [3.956, 10.007] { 0.016 } < 0.001	59.67 [10.170, 97.985] { 0.039 } < 0.002

- Vendors 57% more likely to sell carrots and 39% more likely to sell peas on any given day
- On average, vendors bought an extra 6kg and 7kg of carrots and peas respectively
- Profits increased substantially
 - +45 rupees in profit from carrots
 - +48 rupees in profit from peas
- Changes in sales price are statistically insignificant

Regression Results – Post-Subsidy

- Impact of subsidy almost fully dissipated after subsidy period
 - Vendors in treatment markets do not sell additional carrots or peas compared to control group
 - Treatment vendors only purchase 1.9 & 2.6 additional carrots and peas respectively
 - Δ in profits from carrots was now only +9 rupees and +26.5 additional rupees from peas

<u>γ_2 Treat \times After Subs</u>								
	0.10	-2.04	1.94	8.79	0.05	-0.87	2.58	26.52
	[-0.075, 0.273]	[-7.815, 5.228]	[-0.162, 3.975]	[-14.129, 34.962]	[-0.187, 0.274]	[-4.614, 2.027]	[-0.936, 6.475]	[-18.532, 63.079]
	{ 0.410 }	{ 0.160 }	{ 0.069 }	{ 0.245 }	{ 0.453 }	{ 0.586 }	{ 0.063 }	{ 0.075 }
	< 0.354 >	< 0.187 >	< 0.192 >	< 0.200 >	< 0.546 >	< 0.532 >	< 0.068 >	< 0.055 >

Regression Results – Aggregate Impacts

	Aggregate			
	Total Cost of Wholesale Purchases (Rs.) (1)	Sales (Rs.) (2)	Profits (Rs.) (3)	# vegetables available (4)
β_3 Treat	-448.49 [-1073.389, 58.919] { 0.058 } < 0.032 >	-589.02 [-1203.300, 46.070] { 0.052 } < 0.030 >	-140.53 [-385.185, 114.969] { 0.128 } < 0.075 >	-0.50 [-2.525, 1.784] { 0.547 } < 0.471 >
γ_1 Treat \times During Subs	689.60 [234.192, 1149.070] { 0.027 } < 0.001 >	917.98 [275.331, 1496.020] { 0.033 } < 0.005 >	228.32 [-52.334, 530.698] { 0.066 } < 0.025 >	1.97 [0.506, 3.388] { 0.031 } < 0.012 >
γ_2 Treat \times After Subs	527.12 [-126.081, 1079.258] { 0.266 } < 0.268 >	466.27 [-303.151, 1240.917] { 0.322 } < 0.342 >	-60.84 [-414.986, 250.636] { 0.325 } < 0.403 >	1.16 [-0.552, 2.651] { 0.309 } < 0.228 >
Pre-subsidy intervention market mean	825.121	1167.304	342.183	4.733

Crowding In Effect: Increase in total profits are larger than the sum of increase in sum of profits from peas and carrots

- Same observation for purchasing costs
- Likely from complement produce

- Total wholesale purchases rose by 690 rupees
- Vendor profits rose by 228 rupees per day
- Vendors stocked an additional two types of vegetables per day
- Aggregate subsidy effects also disappear in post-subsidy phase

Effects for Subsidy Vs. Non-Subsidy Pea Sellers

Table 3: Subsidy Impacts: By Pea Subsidy Eligibility

	Eligible				Ineligible			
	Prob. of selling (%) (1)	Sale price (Rs.) (2)	Wholesale qty. bought (kg) (3)	Profits (Rs.) (4)	Prob. of selling (%) (5)	Sale price (Rs.) (6)	Wholesale qty. bought (kg) (7)	Profits (Rs.) (8)
β_3 Treat	-0.03 [-0.062, 0.035] { 0.114 } < 0.053	0.38 [-9.990, 14.333] { 0.835 } < 0.908	-0.10 [-2.347, 0.354] { 0.081 } < 0.060	-17.39 [-50.080, 17.587] { 0.098 } < 0.033	0.01 [-0.113, 0.120] { 0.755 } < 0.793	-0.05 [-3.125, 3.090] { 0.944 } < 0.961	-2.87 [-9.707, 3.420] { 0.319 } < 0.267	-37.71 [-96.298, 41.895] { 0.086 } < 0.104
γ_1 Treat \times During Subs	0.67 [0.538, 0.743] { < 0.001 } / 0.0002 \	4.35 [0.652, 9.503] { 0.036 } / 0.181 \	7.84 [4.120, 10.338] { < 0.001 } / 0.0005 \	65.59 [32.976, 96.680] { 0.004 } / 0.0008 \	0.16 [-0.084, 0.483] { 0.074 } / 0.124 \	-1.996 [-5.239, 1.326] { 0.282 } / 0.311 \	5.37 [0.993, 11.342] { 0.038 } / 0.007 \	50.90 [-24.166, 106.831] { 0.075 } / 0.018 \

- Subsidy-eligible sellers 66% more likely to stock peas
 - These vendors stocked on average 8 more peas daily
 - **Key difference: Selling price increase for peas which is not seen in other subsidy phase regression results (+4.4 rupees/kg)**

No business stealing:

- Even vendors ineligible for the pea subsidy bought more peas and enjoyed higher profits compared to their pre-subsidy

A result of larger ineligible vendors acquiring peas on behalf of subsidy-eligible vendors

Regression Results - Summary

Takeaways:

- Treated vendors can increase their profits over 60% (less the subsidy) by expanding their inventory when there aren't growth restraints on labor, capital and information
- Magnitude of profits extend beyond the size of profits realized from carrots and peas alone
- Yet vendors chose to reduce pea and carrot inventory back down to near pre-subsidy levels, thus foregoing profit opportunity that they recently experienced

Factors Discouraging Profit-Maximization

(1) - Unlikely Explanations

Risk Aversion: 100% of vendors in treatment markets who sold carrots and peas experienced profits from sale. Thus, post-subsidy outcome can't be attributed to the potential unprofitability of the expansion; the choice to stop selling occurred *despite* guaranteed profit. Risk is already low.

Lack of Knowledge: revenues from peas and carrots were consistently exceeding costs, which were tracked every day. Additionally, most vendors had excess capacity for additional produce without having to sacrifice other goods. Data shows that additional inventory complemented the sale of other existing produce.

Vendors require additional skill, labor and capital to stock and sell peas: Experiment model design ensured that this was not the case by only granting a subsidy once the additional produce was purchased by vendors

Vendors objectives deviate from profit-maximization: Individual Reasoning

- Often more stress and planning that goes into business expansion
 - Hours of work may not change but each hour becomes more arduous if more service is required
- Vendors may not hire more workers but may have to work more hours
- Marginal hours of labor could be costly to supply

Survey results back this reasoning:

Additional profits to them did not induce them to maintain additional inventory

- Majority of vendors said that carrots and peas were too expensive to acquire and that there was insufficient demand to stock them
- In some case, market price was too low

Vendors objectives deviate from profit- maximization: Group-level Reasoning

Social Norms or Implicit Agreements

- may discourage vendors from selling too much of the same produce as nearby competitors
- Prevents price undercutting to force others out of the market.
 - Smaller businesses cannot maintain a "price war"
- Not necessarily collusion because it does not maximize profits
 - Vendors seem to value maintaining relationships with competitors since they operate close to them
- Violating norms in short-term (subsidy phase) may be fine, but could be met with consequences if profit maximization continues in the long-run

Post-Experiment Survey Results:

- 9% and 8% of vendors stopped selling carrots and peas because they feared hostility from other vendors
- 37%-38% stopped selling because they thought too many others were sold the same product

Policy Implications – Returns to Capital (1)

- **Generally, academic research studying microenterprises finds that cash grants, rather than credit access, has the largest impact on a successful business' expansion:**
 1. One major implication from this paper is that profits may not be the best measure of welfare
 - unmeasurable, non-pecuniary costs of expansion might make ultimate individual payoff smaller than reported profits
 - Many informal sector vendors are 'forced entrepreneurs' thus they do not desire to work more than the local standards

Policy Implications – Returns to Capital (2)

2. Impact of cash grants highlight only non-financial costs of business growth

- When growing a business is free, it is worth doing
- However, may not be worth the cost of capital (borrowing costs)
 - Return on capital investment doesn't always outweigh cost of using credit, even if credit is readily available
 - Market interest rates are not always appealing / favorable to microentrepreneurs
- Grants thus induce more business growth because it only considers one dimension of costs
- **Meanwhile, microcredit must increase profits greater than sum of interest cost, and non-financial costs**

Conclusion

Industrial Organization of Microenterprises

- Due to density of microentrepreneurs in informal markets, consumers are not affected if number of businesses diminish
- On top of that, many of these companies operate below capacity, so the least efficient ones remain in the market
- Yet, market forces prevent the growth and consolidation of businesses due to high non-pecuniary costs that are prevalent in the informal market

Moving forward, authors suggest that preferences, rather than income should guide development policy since they don't always go hand-in-hand

Pros and Cons of the Paper

PROS

- Controls for possible spillovers in control group by removing top-substitutes to treatment markets
- Fair distribution of subsidy which doesn't allow for vendors to misappropriate cash grant

CONS

- 20% of vendors did not answer respond to initial survey, so **assumptions made about informal market may be flawed**
- Difficult to directly measure certain fixed costs such as transportation of goods to the market and opportunity costs of labor and variable costs such as the change in number of hours before and after subsidy

References

Banerjee, A., Fischer, G., Karlan, D., Lowe, M., & Roth, B. N. (2023). Do Microenterprises Maximize Profits? A Vegetable Market Experiment in India.