Decentralized Targeting of Agricultural Credit: Private v. Political Intermediaries

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WIDER Seminar Presentation

February 27, 2019
Decentralized Targeting of Development Programs

- Significant recent trend towards delegating delivery of development programs to local governments
  - in the hope this will utilize local information and boost accountability (World Dev Report 2004)

But political decentralization is not a panacea; local governments may be captured by community elites (WDR 2004, Mansuri & Rao 2013) or behave clientelistically, targeting benefits to swing voters rather than based on merit (Stokes 2005, Khemani 2016, Bardhan et al 2015).

Need to explore alternative ways to decentralize: e.g., private intermediaries, NGOs, community management.

We examine private intermediaries as an alternative.
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Private Intermediaries

- Our context: A microcredit program for smallholder farmers, designed to facilitate financing of high-value cash crops (esp. potato)
- Local traders/lenders know much about productivity of different farmers from past experience
Private Intermediaries

- Our context: A microcredit program for smallholder farmers, designed to facilitate financing of high-value cash crops (esp. potato)
- Local traders/lenders know much about productivity of different farmers from past experience
- They could be incentivized appropriately to reveal this information...
- And restricted/regulated suitably so as to avoid abuse of power (bribery, cronyism)
Our microcredit program provided Individual Liability loans, intermediated by a local agent

In two potato growing districts of West Bengal, India

48 villages allocated randomly to one of two treatments:

- TRAIL: agent chosen randomly from list of established local trader/lenders
- GRAIL: agent choice delegated to local government/village council
Role of the Agent

- **Selection:**
  - recommends 30 borrowers from households who own \( \leq 1.5 \) acres of cultivable land
  - 10 out of these chosen by lottery to receive offer of a subsidized loan

- Both types of agents: commission = 75% interest paid by recommended clients; penalty for client defaults (loss of upfront deposit)
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- No other formal role for the agent; after borrowers are selected, all subsequent lending and collection implemented by NGO working with us

- However, agent may informally monitor borrowers, remind/pressurize them to repay, help with production or sales advice
Preview of Main Results: Average Treatment Effects

- TRAIL: significant ATEs on potato output (26%), potato profits (41%), farm value added (21%)

- GRAIL: significant ATEs on potato output (23%), but insignificant effects on potato profit (4%) and farm value added (1%)

- TRAIL-GRAIL difference in ATEs on potato profits and farm value added significant at 10% level

- ATE on unit costs in TRAIL negative (6%), in GRAIL positive (1%); difference is significant at 1%

- Both schemes had similar loan repayment rates (93%); TRAIL loans had higher take-up (81% vs 67%)
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Experimental design combined with “semi-structural” model, used to estimate selection patterns.
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Positive selection: In both schemes, recommended borrowers were more productive than non-recommended
Preview of Results, contd.: Explaining ATE Differences

- To what extent can these results be explained by different selection patterns, e.g., with respect to farmer productivity?

- Experimental design combined with “semi-structural” model, used to estimate selection patterns

- Positive selection: In both schemes, recommended borrowers were more productive than non-recommended

- Better selection in TRAIL: TR-recommended borrowers were more productive than GR-recommended

- Evidence is consistent with clientelistic behavior of GRAIL agent, which was absent in TRAIL
Explaining ATE Differences, contd.

- However, selection differences contributed only a small fraction of overall ATE difference.

- 75% of ATE differences are associated with higher treatment effects conditional on farmer ability in TRAIL.
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We develop and test a model of agent-farmer interactions, to explain these differences in CTEs.
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75% of ATE differences are associated with higher treatment effects conditional on farmer ability in TRAIL.

We develop and test a model of agent-farmer interactions, to explain these differences in CTEs.

Trade relationship between TRAIL agent and farmers induced sharing of upside and downside risk, and the agent to help treated farmers (esp. the most productive) with business advice on how to lower costs.

GRAIL agent by contrast was motivated primarily to reduce default risk, so monitored treated farmers (esp. the least productive) and insisted on cultivation practices that raised costs.
Related Literature: Targeting

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- **Agent Intermediated Loans versus Group Loans**: In similar vein, our previous paper (Maitra et al 2017) compared TRAIL and traditional group-based micro-lending (GBL): selection differences accounted for at least 40% of ATE differences; remaining unexplained
Related Literature: Targeting


- *Agent Intermediated Loans versus Group Loans*: In similar vein, our previous paper (Maitra et al 2017) compared TRAIL and traditional group-based micro-lending (GBL): selection differences accounted for at least 40% of ATE differences; remaining unexplained

- This paper also finds selection differences between TRAIL and GRAIL, but this turns out to play a small role compared to differences in incentives for respective agents to engage informally with treated farmers

- Hence performance of microcredit (in terms of impacts on borrowers’ incomes) could be substantially improved with suitable design of intermediation and loan features
Utilizing community members occupying central positions in local networks as intervention nodes, to promote take-up and diffusion of loans or new technology (Banerjee et al (2013), Chandrasekhar et al (2018))
Related Literature: Networks

- Utilizing community members occupying central positions in local networks as intervention nodes, to promote take-up and diffusion of loans or new technology (Banerjee et al (2013), Chandrasekhar et al (2018))

- *Which network?* TRAIL/GRAIL can be thought of as selecting nodes of different (economic, political) networks
Utilizing community members occupying central positions in local networks as intervention nodes, to promote take-up and diffusion of loans or new technology (Banerjee et al. (2013), Chandrasekhar et al. (2018))

Which network? TRAIL/GRAIL can be thought of as selecting nodes of different (economic, political) networks

Our findings indicate need to understand endogenous impacts on nature of interactions between given pairs, not just who is linked to whom
Experimental Context & Design

Empirical Results on Outcomes: Average Treatment Effects (ATEs)

Explaining ATE Differences:
- Selection; Role of Clientelism
- Conditional Treatment Effects; Role of Agent Engagement
Experimental Setting

- Focus on potatoes, leading cash crop in West Bengal
- Two leading potato-growing districts: Hugli and West Medinipur
  - TRAIL: 24 villages
  - GRAIL: 24 villages
- Experiment lasted eight 4-month cycles over the period: Sept 2010 - July 2013
Experimental Setting

- Focus on potatoes, leading cash crop in West Bengal
- Two leading potato-growing districts: Hugli and West Medinipur
  - TRAIL: 24 villages
  - GRAIL: 24 villages
- Experiment lasted eight 4-month cycles over the period: Sept 2010 - July 2013
- Data: Farm survey of 50 households per village, each cycle:
  - 10 treated (Treatment)
  - 10 recommended, not treated farmers (Control 1)
  - 30 non-recommended, with landholding ≤ 1.5 acres (Control 2)
Loan Features

- Low interest rate 18% APR (compared to informal interest rates 21-29%, average 25%)
- 4 month duration, timing coincided with potato crop cycle
- Individual liability; no groups, meetings or savings requirements; doorstep service
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- Low interest rate 18% APR (compared to informal interest rates 21-29%, average 25%)
- 4 month duration, timing coincided with potato crop cycle
- Individual liability; no groups, meetings or savings requirements; doorstep service
- 8 cycles (October 2010-July 2013)
- Dynamic repayment incentives: start with small loans (Rs 2000), fast growth of credit access conditioned on past repayments; termination following repayment less than 50% due
- Partial insurance against village level potato price/yield risk
# Household Characteristics and Randomisation Check

<table>
<thead>
<tr>
<th></th>
<th>TRAIL (1)</th>
<th>GRAIL (2)</th>
<th>TRAIL-GRAIL (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head: More than Primary School</td>
<td>0.407</td>
<td>0.420</td>
<td>-0.013</td>
</tr>
<tr>
<td></td>
<td>0.015</td>
<td>0.015</td>
<td></td>
</tr>
<tr>
<td>Head: Cultivator</td>
<td>0.441</td>
<td>0.415</td>
<td>0.026</td>
</tr>
<tr>
<td></td>
<td>0.015</td>
<td>0.015</td>
<td></td>
</tr>
<tr>
<td>Head: Labourer</td>
<td>0.340</td>
<td>0.343</td>
<td>-0.003</td>
</tr>
<tr>
<td></td>
<td>0.015</td>
<td>0.015</td>
<td></td>
</tr>
<tr>
<td>Area of house and homestead (Acres)</td>
<td>0.052</td>
<td>0.052</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>0.001</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Separate toilet in house</td>
<td>0.564</td>
<td>0.608</td>
<td>-0.044</td>
</tr>
<tr>
<td></td>
<td>0.015</td>
<td>0.015</td>
<td></td>
</tr>
<tr>
<td>Landholding (Acres)</td>
<td>0.456</td>
<td>0.443</td>
<td>0.013</td>
</tr>
<tr>
<td></td>
<td>0.013</td>
<td>0.013</td>
<td></td>
</tr>
<tr>
<td>Own a motorized vehicle</td>
<td>0.124</td>
<td>0.126</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>0.010</td>
<td>0.010</td>
<td></td>
</tr>
<tr>
<td>Own a Savings Bank Account</td>
<td>0.447</td>
<td>0.475</td>
<td>-0.028</td>
</tr>
<tr>
<td></td>
<td>0.015</td>
<td>0.015</td>
<td></td>
</tr>
<tr>
<td>F-test of joint significance (p-value)</td>
<td></td>
<td></td>
<td>0.996</td>
</tr>
</tbody>
</table>
Baseline: Selected Crop Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Sesame (1)</th>
<th>Paddy (2)</th>
<th>Potatoes (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivate the crop (%)</td>
<td>0.49</td>
<td>0.69</td>
<td>0.64</td>
</tr>
<tr>
<td>Acreage (acres)</td>
<td>0.45</td>
<td>0.69</td>
<td>0.49</td>
</tr>
<tr>
<td>Production Cost</td>
<td>335</td>
<td>2985</td>
<td>7556</td>
</tr>
<tr>
<td>Revenue (Rs)</td>
<td>3423</td>
<td>8095</td>
<td>21298</td>
</tr>
<tr>
<td>Value added (Rs)</td>
<td>2720</td>
<td>3787</td>
<td>9215</td>
</tr>
<tr>
<td>Value added per acre (Rs/acre)</td>
<td>6348</td>
<td>6568</td>
<td>17779</td>
</tr>
</tbody>
</table>

Large trader middleman margins in potato (at least 30-40% of wholesale price)
## Baseline Credit Details (Crop Loans)

<table>
<thead>
<tr>
<th>Source</th>
<th>Proportion Loans</th>
<th>Interest APR</th>
<th>Duration Days</th>
<th>Proportion Collateralized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traders/Lenders</td>
<td>0.66</td>
<td>25</td>
<td>122</td>
<td>0.01</td>
</tr>
<tr>
<td>Family/Friends</td>
<td>0.02</td>
<td>23</td>
<td>183</td>
<td>0.07</td>
</tr>
<tr>
<td>MFI</td>
<td>0.02</td>
<td>34</td>
<td>272</td>
<td>0.01</td>
</tr>
<tr>
<td>Cooperatives</td>
<td>0.25</td>
<td>16</td>
<td>327</td>
<td>0.78</td>
</tr>
<tr>
<td>Banks</td>
<td>0.05</td>
<td>12</td>
<td>324</td>
<td>0.83</td>
</tr>
</tbody>
</table>

Lenders earn negligible profits (their cost of capital = 20-24%)
## Agent Characteristics

<table>
<thead>
<tr>
<th></th>
<th>GRAIL (1)</th>
<th>TRAIL (2)</th>
<th>Difference (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Occupation: Cultivator</strong></td>
<td>0.375</td>
<td>0.042</td>
<td>0.33***</td>
</tr>
<tr>
<td></td>
<td>(0.101)</td>
<td>(0.042)</td>
<td>(0.109)</td>
</tr>
<tr>
<td><strong>Occupation: Shop/business</strong></td>
<td>0.208</td>
<td>0.958</td>
<td>-0.667***</td>
</tr>
<tr>
<td></td>
<td>(0.095)</td>
<td>(0.042)</td>
<td>(0.104)</td>
</tr>
<tr>
<td><strong>Occupation: Other</strong></td>
<td>0.417</td>
<td>0.000</td>
<td>0.125*</td>
</tr>
<tr>
<td></td>
<td>(0.690)</td>
<td>(0.000)</td>
<td>(0.690)</td>
</tr>
<tr>
<td><strong>Owned agricultural land</strong></td>
<td>2.63</td>
<td>3.29</td>
<td>-0.667**</td>
</tr>
<tr>
<td></td>
<td>(0.198)</td>
<td>(0.244)</td>
<td>(0.314)</td>
</tr>
<tr>
<td><strong>Educated above primary school</strong></td>
<td>0.958</td>
<td>0.792</td>
<td>0.167*</td>
</tr>
<tr>
<td></td>
<td>(0.042)</td>
<td>(0.085)</td>
<td>(0.094)</td>
</tr>
<tr>
<td><strong>Weekly income (Rupees)</strong></td>
<td>1102.895</td>
<td>1668.75</td>
<td>-565.855</td>
</tr>
<tr>
<td></td>
<td>(138.99)</td>
<td>(278.16)</td>
<td>(336.78)</td>
</tr>
<tr>
<td><strong>Village society member</strong></td>
<td>0.292</td>
<td>0.083</td>
<td>0.208*</td>
</tr>
<tr>
<td></td>
<td>(0.095)</td>
<td>(0.058)</td>
<td>(0.111)</td>
</tr>
<tr>
<td><strong>Party hierarchy member</strong></td>
<td>0.167</td>
<td>0.000</td>
<td>0.167**</td>
</tr>
<tr>
<td></td>
<td>(0.078)</td>
<td>(0.00)</td>
<td>(0.079)</td>
</tr>
<tr>
<td><strong>Panchayat member</strong></td>
<td>0.125</td>
<td>0.000</td>
<td>0.125*</td>
</tr>
<tr>
<td></td>
<td>(0.069)</td>
<td>(0.00)</td>
<td>(0.069)</td>
</tr>
<tr>
<td><strong>Self/family ran for village head</strong></td>
<td>0.083</td>
<td>0.000</td>
<td>0.083</td>
</tr>
<tr>
<td></td>
<td>(0.058)</td>
<td>(0.00)</td>
<td>(0.058)</td>
</tr>
</tbody>
</table>
### Agent-Farmer Relationships: Control 1 Farmers, Baseline

<table>
<thead>
<tr>
<th></th>
<th>Mean TRAIL (1)</th>
<th>Mean GRAIL (2)</th>
<th>Difference (3=1–2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Had economic relationship with agent (loans, crop sales, input purchases, employment)</td>
<td>0.490</td>
<td>0.247</td>
<td>0.243***</td>
</tr>
<tr>
<td>Agent was one of the 2 most important economic relationships</td>
<td>0.133</td>
<td>0.029</td>
<td>0.104***</td>
</tr>
<tr>
<td>Agent and hh same caste/religion</td>
<td>0.470</td>
<td>0.627</td>
<td>-0.158***</td>
</tr>
<tr>
<td>Household knew agent</td>
<td>0.910</td>
<td>0.924</td>
<td>-0.013</td>
</tr>
<tr>
<td>Household met agent at least once a week</td>
<td>0.982</td>
<td>0.987</td>
<td>-0.005</td>
</tr>
<tr>
<td>Agent invited household on special occasions</td>
<td>0.335</td>
<td>0.286</td>
<td>0.049**</td>
</tr>
</tbody>
</table>
Average Treatment Effects

\[ y_{ivt} = \beta_0 + \beta_1 \text{TRAIL}_v + \beta_2 (\text{TRAIL}_v \times \text{Treatment}_{iv}) + \beta_3 (\text{TRAIL}_v \times \text{Control 1}_{iv}) + \beta_4 (\text{GRAIL}_v \times \text{Treatment}_{iv}) + \beta_5 (\text{GRAIL}_v \times \text{Control 1}_{iv}) + \gamma \mathbf{X}_{iv} + T_t + \varepsilon_{ivt} \]

- Conditional treatment effects (ITT estimates), *conditional on selection*: Difference between Treatment and Control 1:
  - **TRAIL**: \( \beta_2 - \beta_3 \)
  - **GRAIL**: \( \beta_4 - \beta_5 \)
Average Treatment Effects

\[ y_{ivt} = \beta_0 + \beta_1 \text{TRAIL}_v + \beta_2 (\text{TRAIL}_v \times \text{Treatment}_{iv}) + \beta_3 (\text{TRAIL}_v \times \text{Control 1}_{iv}) + \beta_4 (\text{GRAIL}_v \times \text{Treatment}_{iv}) + \beta_5 (\text{GRAIL}_v \times \text{Control 1}_{iv}) + \gamma X_{iv} + T_t + \varepsilon_{ivt} \]

- Conditional treatment effects (ITT estimates), conditional on selection:
  - Difference between Treatment and Control 1:
    - TRAIL: \( \beta_2 - \beta_3 \)
    - GRAIL: \( \beta_4 - \beta_5 \)
  - Selection effects: Difference between Control 1 and Control 2:
    - TRAIL: \( \beta_3 - \beta_1 \)
    - GRAIL: \( \beta_5 \)
Average Treatment Effects

\[ y_{ivt} = \beta_0 + \beta_1 \text{TRAIL}_v + \beta_2 (\text{TRAIL}_v \times \text{Treatment}_{iv}) + \beta_3 (\text{TRAIL}_v \times \text{Control } 1_{iv}) \]
\[ + \beta_4 (\text{GRAIL}_v \times \text{Treatment}_{iv}) + \beta_5 (\text{GRAIL}_v \times \text{Control } 1_{iv}) \]
\[ + \gamma X_{iv} + T_t + \varepsilon_{ivt} \]

- Conditional treatment effects (ITT estimates), \textit{conditional on selection}: Difference between Treatment and Control 1:
  - TRAIL: \( \beta_2 - \beta_3 \)
  - GRAIL: \( \beta_4 - \beta_5 \)
- Selection effects: Difference between Control 1 and Control 2:
  - TRAIL: \( \beta_3 - \beta_1 \)
  - GRAIL: \( \beta_5 \)
- Controls for age, education, occupation of oldest male, land owned, year dummies, price information intervention
- Standard errors clustered at the hamlet level to account for spatial correlation
Average Treatment Effects: Amount Borrowed

Empirical Results
Empirical Results

Average Treatment Effects: Potato Cultivation, Income

- **Potato Acreage**
- **Potato Output**
- **Potato Value Added**
- **Farm Value Added**
Empirical Results

Takeup, Default Rates

Difference (TRAIL–GRAIL): 0.065*** (Continuation); 0.000 (Default)

Panel B: Regression Results

<table>
<thead>
<tr>
<th></th>
<th>Continuation (1)</th>
<th>Default (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRAIL</td>
<td>-0.066 ***</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.010)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.08</td>
<td>0.06</td>
</tr>
<tr>
<td>Sample Size</td>
<td>2667</td>
<td>2422</td>
</tr>
</tbody>
</table>
Assume farmers vary in ability $\theta$ drawn from some distribution

TFP $A$ rising, unit cost $c$ falling in $\theta$

Farmer $i$ in village $v$, year $t$ selects scale of (potato) cultivation/loan size $l = l_{ivt}^{c}$ to maximize

$$P_{vt}A_{i}\frac{l^{1-\alpha}}{1-\alpha} - \rho_{vt}c_{i}l - F$$

($A_{i}$: TFP, $c_{i}$: unit cost; $P_{vt}$: village yield shock, $\rho_{vt}$ cost of informal credit, $F$ fixed cost)
Estimating, Understanding Role of Selection Differences

- Assume farmers vary in ability $\theta$ drawn from some distribution
- TFP $A$ rising, unit cost $c$ falling in $\theta$
- Farmer $i$ in village $v$, year $t$ selects scale of (potato) cultivation/loan size $l = l_{ivt}^c$ to maximize

$$P_{vt}A_i \frac{l^{1-\alpha}}{1-\alpha} - \rho_{vt} c_i l - F$$

($A_i$: TFP, $c_i$: unit cost; $P_{vt}$: village yield shock, $\rho_{vt}$ cost of informal credit, $F$ fixed cost)

$$\log l_{ivt}^c = \frac{1}{\alpha} \log \frac{A_i}{c_i} + \frac{1}{\alpha} [P_{vt} - \rho_{vt}]$$

(provided $\theta_i \geq \theta_{vt}$; similar expression for log output)
Assume farmers vary in ability \( \theta \) drawn from some distribution

- TFP \( A \) rising, unit cost \( c \) falling in \( \theta \)

Farmer \( i \) in village \( v \), year \( t \) selects scale of (potato) cultivation/loan size \( l = l_{ivt}^c \) to maximize

\[
P_{vt}A_i \frac{l^{1-\alpha}}{1-\alpha} - \rho_{vt} c_i l - F
\]

\( (A_i: \text{TFP}, c_i: \text{unit cost}; P_{vt}: \text{village yield shock}, \rho_{vt}: \text{cost of informal credit}, F: \text{fixed cost}) \)

\[
\log l_{ivt}^c = \frac{1}{\alpha} \log \frac{A_i}{c_i} + \frac{1}{\alpha} [P_{vt} - \rho_{vt}]
\]

(provided \( \theta_i \geq \theta_{vt} \); similar expression for log output)

- Ability measure: Farmer fixed effect in farm panel regression for scale of potato cultivation/output with village-year dummies

- 30% of control group did not grow potatoes: can only get upper bound
Ability Heterogeneity

- Inter-quartile (75-25) range: log area cultivated 3-4:1, corresponds to 1.5-2:1 for $\frac{A}{c}$ assuming $\alpha \geq 0.5$

- Only small fraction of this variation can be predicted on the basis of observable HH characteristics: regression R-sq is 0.18, rises to 0.2 in LASSO

- Potentially explains why formal lenders external to the village find it difficult to target more productive farmers

- And why local community members may be better informed than external lenders
Ability of Selected v. Non-Selected: TRAIL and GRAIL

<table>
<thead>
<tr>
<th></th>
<th>Cumulative Probability</th>
<th>Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAIL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRAIL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**K-S Test**

- TRAIL: \(0.005 \ [0.87]\)
- GRAIL: \(0.011 \ [0.83]\)
Comparing Selection (C1) between TRAIL and GRAIL

K-S Test

p-value
[bootstrap prop. sign.]

.061 [0.74]
Conditional Treatment Effects

- We cannot use the same method to estimate ability of Treated farmers, since their cultivation scale, TFP and costs of farmers would be affected by treatment.

- **Order-Preserving Assumption (OPA):** rank order of area cultivated or output is unaffected by treatments (analogous to Athey-Imbens (2006)).
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We can then rank Treated farmers by cultivation scale/output: assign to Treated farmers the counterfactual productivity estimate for the farmer at the same rank in the Control 1 productivity distribution.
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- We can then rank Treated farmers by cultivation scale/output: assign to Treated farmers the counterfactual productivity estimate for the farmer at the same rank in the Control 1 productivity distribution.

- For 30% of farmers who did not cultivate potatoes, we only have upper bound of productivity estimate. Pool them into Bin 1.

- For potato cultivators we have a continuous estimate. Classify into Bins 2 and 3: below and above median among cultivators.
Explaining Selection Differences: Role of Clientelism

- An important reason for superior selection in TRAIL: more non-cultivators (Bin 1) were selected by GRAIL agent
- Possible role of political clientelism? Incentive of GRAIL agent to ‘buy votes’, esp. from poorer households?
- We test by examining CTEs on how households voted in a straw poll we conducted in 2013 at the end of the experiment:
  - Were Treated households more likely to vote for the incumbent party compared with Control 1 households in the same ability bin?
    - Answer is yes; selection effect also positive but these were in concentrated in Bins 2 and 3 (select loyalists who are more able; and swing voters who are less able)
  - Voting Effects
    - Swing voter effect appears in more competitive constituencies
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- Swing voter effect appears in more competitive constituencies.
Role of Selection in Explaining ATE Differences

- How important is selection in explaining ATE differences between TRAIL and GRAIL?

- As against possible differences in Conditional Treatment Effects (CTEs)?

- The experiment may have changed the way agents engaged with borrowers, resulting in changes in productivity and costs for a farmer with the same underlying ability.

- CTE differences were large, for each bin

- Decomposition exercise: calculate role of selection versus CTE effects
Explaining CTE Differences: Trader-Farmer Contracting Model

- The paper develops a theoretical model of borrower-trader interactions via interlinked credit-cum-marketing contracts, to explain CTE differences.

- Traders can engage with borrower either to:
  - monitor in order to reduce default risk
  - or help in order to lower input costs, raise crop price via business advice
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Monitoring lowers risk, and lowers productivity (raises costs)

Help raises productivity/crop price, lowers costs

TRAIL agent has no incentive to monitor; positive incentive to help, higher for treated farmers (motivated by prospect of higher crop sales through the agent, raising middleman profits)

GRAIL agent has incentive to monitor (to reduce default risk) esp. poorer borrowers; no incentive/capacity to help
Testing the Model

- We test predictions of the model:
  - Default rates for Bin 1 fall in GRAIL, compared with TRAIL (higher monitoring of Bin 1 in GRAIL)
  - CTEs on Agent-Farmer Interactions
  - Higher CTEs on Unit Cost Reduction in TRAIL
Summary

- Higher ATEs on potato/farm income in TRAIL, negligible effects in GRAIL
- Evidence of selection of less productive farmers in GRAIL, possibly owing to clientelism
- But most of the ATE difference is driven by differences in conditional treatment effects
- Suggests important (informal) role played by agent engagement with borrowers (monitoring/help)
- Better performance of TRAIL w.r.t. selection and engagement, possibly explained by absence of political motives, and better aligned economic incentives (equity-holder rather than debt)
## Treatment Effects on Voting Patterns in Poll

<table>
<thead>
<tr>
<th></th>
<th>TRAIL (1)</th>
<th>GRAIL (2)</th>
<th>TRAIL (3)</th>
<th>GRAIL (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment Effect</td>
<td>0.0241</td>
<td>0.0782**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0496)</td>
<td>(0.0340)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Effect: Bin 1</td>
<td>0.0915</td>
<td>0.130†</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0868)</td>
<td>(0.0697)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Effect: Bin 2</td>
<td>-0.0741</td>
<td>0.0309</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0805)</td>
<td>(0.0702)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Effect: Bin 3</td>
<td>0.0568</td>
<td>0.0135</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0564)</td>
<td>(0.0743)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selection Effect</td>
<td>-0.0649</td>
<td>0.0825**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0447)</td>
<td>(0.0369)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selection Effect: Bin 1</td>
<td>-0.133</td>
<td>0.0217</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0610)</td>
<td>(0.0580)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selection Effect: Bin 2</td>
<td>-0.0291</td>
<td>0.117†</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0738)</td>
<td>(0.0664)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selection Effect: Bin 3</td>
<td>-0.0343</td>
<td>0.105†</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0594)</td>
<td>(0.0718)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample Size</td>
<td>1,011</td>
<td>1,026</td>
<td>1,021</td>
<td>1,044</td>
</tr>
</tbody>
</table>
Evidence: Informal Interest Rates, Control Group
Evidence: TRAIL, GRAIL Default Rates
Evidence: CTEs on Agent Engagement Reported by Borrower
## Evidence: CTEs on Unit Costs (Rs/acre)

<table>
<thead>
<tr>
<th></th>
<th>TRAIL</th>
<th>GRAIL</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATE</td>
<td>-2908*** (1015)</td>
<td>554 (1098)</td>
<td>3462** (1499)</td>
</tr>
<tr>
<td>CTE Bin 1</td>
<td>-1701 (5217)</td>
<td>6788† (2949)</td>
<td>-8469 (5981)</td>
</tr>
<tr>
<td>CTE Bin 2</td>
<td>-2320 (1624)</td>
<td>-1881 (1708)</td>
<td>-439 (2374)</td>
</tr>
<tr>
<td>CTE Bin 3</td>
<td>-3737† (1334)</td>
<td>1552 (1561)</td>
<td>-5290† (2061)</td>
</tr>
</tbody>
</table>
Ability Variation with Observable Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landholding</td>
<td>1.559***</td>
<td>(0.491)</td>
</tr>
<tr>
<td>Non Hindu</td>
<td>-0.999**</td>
<td>(0.429)</td>
</tr>
<tr>
<td>Low caste</td>
<td>-1.005***</td>
<td>(0.278)</td>
</tr>
<tr>
<td>Female-Headed Household</td>
<td>-1.443**</td>
<td>(0.568)</td>
</tr>
<tr>
<td>Age of Oldest Male</td>
<td>-0.004</td>
<td>(0.011)</td>
</tr>
<tr>
<td>Oldest Male Completed Primary School</td>
<td>0.146</td>
<td>(0.287)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.469</td>
<td>(0.672)</td>
</tr>
</tbody>
</table>

Sample Size 464
R-squared 0.184
Conditional Treatment Effects: Farm Value Added

![Conditional Treatment Effects Diagram]

TRAIL and GRAIL comparisons for different bins.
## Decomposition of ATE Differences: TRAIL v. GRAIL

<table>
<thead>
<tr>
<th>Bin</th>
<th>$w_{TR}$</th>
<th>$w_{GR}$</th>
<th>Diff</th>
<th>TRAIL TE</th>
<th>GRAIL TE</th>
<th>TRAIL - GRAIL</th>
<th>$(w_{TR} - w_{GR}) \times TRAIL$</th>
<th>$w_{GR} \times (TRAIL - GRAIL)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bin 1</td>
<td>0.27</td>
<td>0.34</td>
<td>-0.07</td>
<td>1040.4</td>
<td>30.4</td>
<td>1010.1</td>
<td>-74.1</td>
<td>348.2</td>
</tr>
<tr>
<td>Bin 2</td>
<td>0.33</td>
<td>0.33</td>
<td>0.00</td>
<td>1561.2</td>
<td>551.2</td>
<td>1010.0</td>
<td>-4.5</td>
<td>335.2</td>
</tr>
<tr>
<td>Bin 3</td>
<td>0.40</td>
<td>0.32</td>
<td>0.07</td>
<td>2834.1</td>
<td>1291.4</td>
<td>1542.6</td>
<td>209.8</td>
<td>498.9</td>
</tr>
</tbody>
</table>

| ATE   | 2059.2   | 492.4    | 1566.8 |

| % of ATE due to Selection | 8.38 |
| % of ATE due to CTE       | 75.46 |