Decentralised Targeting of Agricultural Credit: Private v. Political Intermediaries

Pushkar Maitra, Sandip Mitra, Dilip Mookherjee and Sujata Visaria

Work-in-Progress

June 2018
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But political decentralization is not a panacea:

Targeting for Development Programmes

- Many centralized development programs are targeted poorly due to lack of accountability and information of bureaucrats, motivating decentralization (Seabright 1996, WDR 2004)
- Commonly this involves delegating the formal selection role to local governments
- But political decentralization is not a panacea:
- These political distortions motivate search for alternative ways to decentralize: for example, appointment of private intermediaries
Role of Intermediaries

- What is the role of local intermediaries?
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  - Selection of beneficiaries
  - Subsequent engagement with beneficiaries (monitoring/assistance to beneficiaries)
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- Subsequent engagement with beneficiaries (monitoring/assistance to beneficiaries)

The literature has focused on the former, not much evidence relating to relative importance of selection and engagement roles
Agent-Intermediated Lending (AIL)

Introduction

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Our context: implementation of agricultural credit programmes

Compare two different methods of local intermediation

A local community-member (intermediary) recommends borrowers to an external lender

The intermediary (agent):

- Information: embedded in local community
- Incentive: commissions linked to repayments
- Role:
  - formal: selects borrowers depending on information and personal/political motives
  - informal: engagement (monitoring/assistance) with beneficiaries
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Key Questions

(a) Relative performance of private and political intermediary schemes (ATEs)

(b) Decomposition of ATE differences into respective roles of (formal) selection and (informal) engagement roles of local intermediaries

(c) Understanding underlying reasons for these differences
Two Versions of AIL

1. Trader-Agent-Intermediated Lending (TRAIL)
   - agent is a private trader/shopkeeper with considerable experience in lending within the community

2. Gram Panchayat-Agent-Intermediated Lending (GRAIL)
   - agent appointed by local government (village council) embedded within the community; knows, monitors and mobilizes voters
   - borrower selection could be affected by political motivations

In both schemes, only landless & marginal landowners (1.5 acres) could be beneficiaries, to limit cronyism, corruption/elite capture.
1. Trader-Agent-Intermediated Lending (TRAIL)
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   - but ... may have incentives to behave in a corrupt fashion, appoint cronies or those paying bribes, and exploit poor borrowers
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- In both schemes, only landless & marginal landowners (≤ 1.5 acres) could be beneficiaries, to limit cronyism, corruption/elite capture
Preview of Results

- TRAIL scheme outperforms GRAIL scheme in terms of borrower income
  - Potato Production effects were similar: 26% in TRAIL vs 23% in GRAIL
  - Potato Imputed Profits were significantly higher in TRAIL: 41% vs 3%
  - Overall Farm Value Added was significantly higher in TRAIL: 21% vs 2%
  - Both schemes achieved similar repayment rates (95%), though TRAIL loans had higher takeup
  - Targeting by TRAIL agents is superior to that by GRAIL agents; partly driven by differences in:
    - agent’s information/expertise
    - agent’s incentives (role of political incentives in GRAIL that do not appear in TRAIL)
  - Selection differences explain a small part of differences in impact on borrowers
  - Differences between TRAIL and GRAIL agents in both selection and engagement roles can mostly be explained by differences in their incentives (both economic (sales) and political (clientelism))
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Road Map

- Experimental Context & Design
- Empirical Results on Borrower Outcomes: ATEs
- Explanations
  - Understanding Selection Differences
  - Quantifying the Role of Selection Differences
  - Explaining differences in Conditional Treatment Effects (CTEs)
- Discussion & Conclusion
Related Literature

- **Targeting and Networks**: Selecting pivotal members of a community as a node for development interventions

- **Clientelism and Targeting**: Do appointed politically influential members use their discretion clientelistically to garner votes; how does this affect the effectiveness of the intervention?

- **Agent Intermediated Loans versus Group Loans**: Prior paper of ours (Maitra et al (2017)) which compared TRAIL with traditional group-based micro-lending, where selection differences accounted for at least 30-40% of ATE difference
Location

Intervention Districts
Experimental Setting

- Focus on potatoes, leading cash crop in West Bengal
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- Focus on potatoes, leading cash crop in West Bengal
- Two 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
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>Harvested quantity (kg)</td>
<td>141</td>
<td>1175</td>
<td>5301</td>
</tr>
<tr>
<td>Cost of production (Rs)</td>
<td>703</td>
<td>4396</td>
<td>12083</td>
</tr>
<tr>
<td>Price (Rs/kg)</td>
<td>30.71</td>
<td>10.30</td>
<td>4.67</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>
Table 3
Credit market characteristics before experiment.

<table>
<thead>
<tr>
<th></th>
<th>All Loans</th>
<th>Agricultural Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Household had borrowed</td>
<td>0.67</td>
<td>0.59</td>
</tr>
<tr>
<td>Total Borrowing^a</td>
<td>6352</td>
<td>(10421)</td>
</tr>
</tbody>
</table>

Proportion of Loans by Source^b

<table>
<thead>
<tr>
<th></th>
<th>All Loans</th>
<th>Agricultural Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traders/Money Lenders</td>
<td>0.63</td>
<td>0.66</td>
</tr>
<tr>
<td>Family and Friends</td>
<td>0.05</td>
<td>0.02</td>
</tr>
<tr>
<td>Cooperatives</td>
<td>0.24</td>
<td>0.25</td>
</tr>
<tr>
<td>Government Banks</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>MFI and Other Sources</td>
<td>0.03</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Annualized Interest Rate by Source (percent)

<table>
<thead>
<tr>
<th></th>
<th>All Loans</th>
<th>Agricultural Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traders/Money Lenders</td>
<td>24.93</td>
<td>(20.36)</td>
</tr>
<tr>
<td>Family and Friends</td>
<td>21.28</td>
<td>(14.12)</td>
</tr>
<tr>
<td>Cooperatives</td>
<td>15.51</td>
<td>(3.83)</td>
</tr>
<tr>
<td>Government Banks</td>
<td>11.33</td>
<td>(4.63)</td>
</tr>
<tr>
<td>MFI and Other Sources</td>
<td>37.26</td>
<td>(21.64)</td>
</tr>
</tbody>
</table>

Duration by Source (days)

<table>
<thead>
<tr>
<th></th>
<th>All Loans</th>
<th>Agricultural Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traders/Money Lenders</td>
<td>125.08</td>
<td>(34.05)</td>
</tr>
<tr>
<td>Family and Friends</td>
<td>164.08</td>
<td>(97.40)</td>
</tr>
<tr>
<td>Cooperatives</td>
<td>323.34</td>
<td>(90.97)</td>
</tr>
<tr>
<td>Government Banks</td>
<td>271.86</td>
<td>(121.04)</td>
</tr>
<tr>
<td>MFI and Other Sources</td>
<td>238.03</td>
<td>(144.12)</td>
</tr>
</tbody>
</table>

Proportion of Loans Collateralized by Source

<table>
<thead>
<tr>
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<th>All Loans</th>
<th>Agricultural Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traders/Money Lenders</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>Family and Friends</td>
<td>0.04</td>
<td>0.07</td>
</tr>
<tr>
<td>Cooperatives</td>
<td>0.79</td>
<td>0.78</td>
</tr>
<tr>
<td>Government Banks</td>
<td>0.81</td>
<td>0.83</td>
</tr>
<tr>
<td>MFI and Other Sources</td>
<td>0.01</td>
<td>0.01</td>
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The Agent-Intermediated Lending Scheme

- Agent recommends 30 landless or marginal landowners (owning \( \leq 1.5 \) acres of cultivable land)
  - subset of these are chosen randomly to receive offer of individual liability loans
- Agent plays no further (formal) role:
  - MFI sets loan terms, directly lends to and collects repayments from borrowers
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- Agent plays no further (formal) role:
  - MFI sets loan terms, directly lends to and collects repayments from borrowers
- But agent could be motivated to monitor or help borrowers informally
- No group meetings, savings requirements or gender restrictions
Common Loan Features

- Loan interest rate pegged at APR of 18%, well below average rates (25%) on informal credit
- Dynamic borrower incentives
  - start with small loans (Rs 2000 (~ $40), $\frac{1}{4}$ of average working capital used)
  - future credit access grows at 33% across cycles, subject to current repayment
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  - future credit access grows at 33% across cycles, subject to current repayment
- *Loan durations/timing: 4 months, match potato planting-harvesting-selling cycle
- *Insurance against covariate (price-yield) risks in potato cultivation
- *Doorstep banking, no bank accounts

(*: non-standard)
Agents and their Incentives

- **TRAIL**: agent is randomly drawn from list of established traders/shopkeepers
- **GRAIL**: local government council chooses the agent

- Agent's incentives:
  - forfeiture deposit (= 2.5% of first loan amount (Rs 50)) per borrower
  - commission = 75% of interest payments received from borrowers
  - termination if 50% of borrowers defaulted
  - paid holiday for family at a seaside resort provided they continue to engage at least 2 years in the scheme
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# Experimental Context: Agent Characteristics

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<thead>
<tr>
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<th>GRAIL (1)</th>
<th>TRAIL (2)</th>
<th>Difference (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupation: Cultivator</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>Occupation: Shop/business</td>
<td>0.292</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>Occupation: Government job</td>
<td>0.125</td>
<td>0.000</td>
<td>0.125*</td>
</tr>
<tr>
<td></td>
<td>(0.090)</td>
<td>(0.000)</td>
<td>(0.069)</td>
</tr>
<tr>
<td>Owned agricultural land</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>Educated above primary school</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>Weekly income (Rupees)</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>Village society member</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>Party hierarchy member</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>Panchayat member</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>Self/family ran for village head</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>
## Household Characteristics and Randomisation Check

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<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>0.996</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Design and Sample

- Experiment designed to estimate separately the effects of selection and conditional treatment effects (Karlan & Zinman 2010)
- In each scheme
  - In each village, the agent recommends 30 borrowers...
  - ...and the lender offers the loans to a *randomly chosen subset* of 10 individuals (Treatment, T)
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In each scheme

- In each village, the agent recommends 30 borrowers...
- ...and the lender offers the loans to a *randomly chosen subset* of 10 individuals (Treatment, T)
- We sample:
  - 10 recommended but not chosen to receive the loans: Control 1 (C1)
  - 30 of those not recommended: Control 2 (C2)
Average Treatment Effects

\[ y_{ivt} = \beta_0 + \beta_1 TRAIL_v + \beta_2 (TRAIL_v \times \text{Treatment}_{iv}) + \beta_3 (TRAIL_v \times \text{Control 1}_{iv}) + \beta_4 (GRAIL_v \times \text{Treatment}_{iv}) + \beta_5 (GRAIL_v \times \text{Control 1}_{iv}) + \gamma X_{iv} + T_t + \epsilon_{ivt} \]
Average Treatment Effects

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

- Conditional treatment effects (ITT estimates), conditional on selection:
  - Difference between T and C1:
    - 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 T and C1:
    - TRAIL: \( \beta_2 - \beta_3 \)
    - GRAIL: \( \beta_4 - \beta_5 \)
  - Selection effects: Difference between C1 and C2:
    - TRAIL: \( \beta_3 - \beta_1 \)
    - GRAIL: \( \beta_5 \)
Average Treatment Effects

\[ y_{ivt} = \beta_0 + \beta_1 TRAIL_{iv} + \beta_2 (TRAIL_{iv} \times Treatment_{iv}) + \beta_3 (TRAIL_{iv} \times Control_{1iv}) + \beta_4 (GRAIL_{iv} \times Treatment_{iv}) + \beta_5 (GRAIL_{iv} \times Control_{1iv}) + \gamma X_{iv} + T_t + \varepsilon_{ivt} \]

- Conditional treatment effects (ITT estimates), conditional on selection:
  - Difference between T and C1:
    - TRAIL: \( \beta_2 - \beta_3 \)
    - GRAIL: \( \beta_4 - \beta_5 \)
  - Selection effects: Difference between C1 and C2:
    - 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
RESULTS: Average Treatment Effects on Potato Acreage

<table>
<thead>
<tr>
<th>% Effects</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAIL</td>
<td>27.78</td>
</tr>
<tr>
<td>GRAIL</td>
<td>23.00</td>
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</table>

<table>
<thead>
<tr>
<th>Treatment Differences</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAIL–GRAIL</td>
<td>0.025</td>
</tr>
<tr>
<td>(0.041)</td>
<td></td>
</tr>
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</table>
RESULTS: Average Treatment Effects on Potato Output

<table>
<thead>
<tr>
<th>% Effects</th>
<th>TRAIL</th>
<th>26.24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GRAIL</td>
<td>23.50</td>
</tr>
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</table>

<table>
<thead>
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<th>Treatment Differences</th>
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</thead>
<tbody>
<tr>
<td>TRAIL–GRAIL</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
RESULTS: Average Treatment Effects on Potato Revenues

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAIL</td>
<td>27.2</td>
</tr>
<tr>
<td>GRAIL</td>
<td>18.5</td>
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</table>

<table>
<thead>
<tr>
<th>Treatment Differences</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAIL–GRAIL</td>
<td>1491.8</td>
</tr>
<tr>
<td>(1829.7)</td>
<td></td>
</tr>
</tbody>
</table>
RESULTS: Average Treatment Effects on Potato Production Cost

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Percent Effect</th>
<th>Treatment Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAIL</td>
<td>21.7</td>
<td>-110.6 (1067.70)</td>
</tr>
<tr>
<td>GRAIL</td>
<td>27.6</td>
<td></td>
</tr>
</tbody>
</table>

Lines denote 95% CI
Empirical Results

Average Treatment Effects: Potato Imputed Profit

% Effects

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAIL</td>
<td>40.83</td>
</tr>
<tr>
<td>GRAIL</td>
<td>3.52</td>
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</tbody>
</table>

Treatment Differences

<table>
<thead>
<tr>
<th>Treatment Difference</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAIL – GRAIL</td>
<td>1758.85* (939.64)</td>
</tr>
</tbody>
</table>
Average Treatment Effects: Farm Value Added

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% Effects</th>
<th>Treatment Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAIL</td>
<td>20.68</td>
<td>TRAIL–GRAIL</td>
</tr>
<tr>
<td>GRAIL</td>
<td>1.66</td>
<td>1962.38*</td>
</tr>
</tbody>
</table>

(1186.64)
Empirical Results

Loan Performance

Takeup

Estimated from a regression including cycle dummies. Sample restricted to households that were eligible to take the program loan in that cycle.

Differences in Means

TRAIL–GRAIL  0.131**
Empirical Results

Loan Performance

Continuation

Differences in Means

TRAIL−GRAIL  0.133***

Estimated from a regression including cycle dummies. Sample restricted to households that were eligible to receive the program loan in cycle 1.
Loan Performance

Repayment

Estimated from a regression including cycle dummies. Sample restricted to households that had taken the program loan in the cycle.

Differences in Means

TRAIL–GRAIL  0.015*
Questions

What explains the difference in ATEs?
Questions

- What explains the difference in ATEs?
  1. Do TRAIL and GRAIL agents select borrowers differently?
  2. Conditional on selection, do TRAIL and GRAIL generate different treatment effects?

- Relative role of selection and conditional treatment effects in overall ATE differences

- What explains (1) and (2)?
We estimate the ability of sample farmers
We estimate the ability of sample farmers

Examine how selection patterns by ability differ between the two schemes
Estimating and Understanding Selection Differences

- We estimate the ability of sample farmers
- Examine how selection patterns by ability differ between the two schemes
- Decompose ATE difference: role of selection differences
Estimating and Understanding Selection Differences

- We estimate the ability of sample farmers
- Examine how selection patterns by ability differ between the two schemes
- Decompose ATE difference: role of selection differences
- Examine role of agent motivation in explaining selection differences
How do we estimate “Ability”? 

- Output of farmer $h$ with ability $\theta_h$ located in village $v$ in year $t$ (conditional on success):
  \[ Y_{hvt} = \theta_h^{1-\gamma} \left[ \frac{1}{1 - \alpha} \right]^{1-\alpha} \]

- Probability of success:
  \[ p_{hvt} = P_{vt} \theta_h^{1-\nu} \]

- Competitive informal credit market with informed private lenders (with cost of capital $\rho_{vt}$), hence informal interest rate for household $h$ is $\frac{\rho_{vt}}{p_{hvt}}$
How do we estimate “Ability”?  

Continued

- Loan size or scale of cultivation $l = l_{hvt}$ maximizes

$$p_{hvt}(\theta_h)\theta_h^{1-\gamma}\left[1 - \frac{1}{1 - \alpha} l^{1-\alpha}\right] - \rho_{vt} l$$

- This implies:

$$\log l_{hvt}^C = \frac{1}{\alpha} \log A_h + \frac{1}{\alpha} [\log P_{vt} - \log \rho_{vt}]$$

- $A_h \equiv \theta_h^{2-\gamma-\nu}$, $\delta \equiv \frac{1-\gamma}{2-\gamma-\nu} \in (0, 1)$

- Household fixed effect in panel regression of scale of cultivation (or expected output value) can be interpreted as ability

- Idea is that more productive farmers devote greater acreage and produce higher output (similar to fixed effect version of Olley-Pakes (1996))
How do we estimate “Ability”?, contd.

- For C2 and C1 households, this delivers an ability estimate.
How do we estimate “Ability”?, contd.

- For C2 and C1 households, this delivers an ability estimate
- For T households, ability estimate is contaminated by treatment
How do we estimate “Ability”? contd.

- For C2 and C1 households, this delivers an ability estimate.
- For T households, ability estimate is contaminated by treatment.
- Invoke order-preserving assumption (Athey & Imbens 2006).
How do we estimate “Ability”? contd.

- For C2 and C1 households, this delivers an ability estimate
- For T households, ability estimate is contaminated by treatment
- Invoke order-preserving assumption (Athey & Imbens 2006)
- Match T & C1 households of equal rank and assign C1’s ability to T household
- Hence obtain estimated ability distribution for all sample households
Ability Classification

- Non-cultivators: Bin 1 (we can estimate only the upper bound of ability)
- Cultivators: Continuous ability estimates; in discrete version classified into
  - Below median ability: Bin 2
  - Above median ability: Bin 3
In both TRAIL and GRAIL schemes, selected households have higher ability than non-selected.
Ability estimates for the Selected (C1): TRAIL and GRAIL

TRAIL selected households have higher ability than GRAIL selected households.

K-S Test
p-value [bootstrap prop. sign.]

.061 [0.74]
Proportion of Households in Each Ability Bin. C1 households only
TRAIL and GRAIL
## Ability variation with Observable HH Characteristics

<table>
<thead>
<tr>
<th></th>
<th>OLS (1)</th>
<th>FE (2)</th>
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</thead>
<tbody>
<tr>
<td>Year 2</td>
<td>-0.318***</td>
<td>-0.323***</td>
</tr>
<tr>
<td></td>
<td>(0.042)</td>
<td>(0.042)</td>
</tr>
<tr>
<td>Year 3</td>
<td>-0.433***</td>
<td>-0.434***</td>
</tr>
<tr>
<td></td>
<td>(0.053)</td>
<td>(0.053)</td>
</tr>
<tr>
<td>Landholding</td>
<td>1.638***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.195)</td>
<td></td>
</tr>
<tr>
<td>Non Hindu</td>
<td>-0.840***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.206)</td>
<td></td>
</tr>
<tr>
<td>Low caste</td>
<td>-0.566***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.158)</td>
<td></td>
</tr>
<tr>
<td>Age of Oldest Male in Household</td>
<td>0.015***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td></td>
</tr>
<tr>
<td>Oldest Male has more than Primary Schooling</td>
<td>-0.244**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.107)</td>
<td></td>
</tr>
<tr>
<td>Oldest Male Cultivator</td>
<td>2.591***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.146)</td>
<td></td>
</tr>
<tr>
<td>Oldest Male Agricultural Labourer</td>
<td>-0.359***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.136)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-5.665***</td>
<td>-2.885***</td>
</tr>
<tr>
<td></td>
<td>(0.286)</td>
<td>(0.028)</td>
</tr>
</tbody>
</table>

R-squared 0.312 0.026
Sample Size 6,156 6,243
Number of Households 2,081

---

TRAILvGRAIL

June 2018
Discussion: TRAIL agents conduct superior selection

- In both TRAIL and GRAIL schemes: selected households are more able than non-selected households.
- Selected households in TRAIL scheme are more able than selected households in GRAIL scheme.
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- Suggests that TRAIL agents select better borrowers than GRAIL agents do.
- Why?
Understanding Selection Differences

- TRAIL and GRAIL differ with respect to
  - agent’s information about village residents
  - agent’s incentives

Information might depend on agent’s occupation. Traders may be better informed about farmer productivity. 96% of TRAIL agents are traders; 29% of GRAIL agents are traders.

Agent incentives could be:
- commissions (avoid defaults): common to all
- sales margins: salient for traders
- political motives: salient for GRAIL agents
Understanding Selection Differences

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Classification of Agents

- 3-group classification of agents:
  - TRAIL (Traders: N=24/24)
  - GRAILT (Traders: N=7/24)
  - GRAILO (Non-traders: N=17/24)
Classification of Agents

- 3-group classification of agents:
  - TRAIL (Traders: N=24/24)
  - GRAILT (Traders: N=7/24)
  - GRAILO (Non-traders: N=17/24)

- By comparing GRAILT and GRAILO with TRAIL, we can understand the relative importance of
  - expertise & procurement motive
  - political incentives
ATEs for TRAIL, GRAILT and GRAILO (Potato Value-added)

GRAINT and GRAILO both generate small and non-significant ATEs.

% Effects

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Effect (N=24)</th>
<th>Effect (N=7)</th>
<th>Effect (N=17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAIL</td>
<td>35.80</td>
<td>1.59</td>
<td>9.20</td>
</tr>
<tr>
<td>GRAILT (N=7)</td>
<td>1.59</td>
<td>1.59</td>
<td>9.20</td>
</tr>
<tr>
<td>GRAILO (N=17)</td>
<td>9.20</td>
<td>9.20</td>
<td>9.20</td>
</tr>
</tbody>
</table>

Treatment Differences

<table>
<thead>
<tr>
<th>Treatment Difference</th>
<th>Effect (1333.63)</th>
<th>Effect (1119.99)</th>
<th>Effect (1513.16)</th>
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</thead>
<tbody>
<tr>
<td>TRAIL–GRAILT</td>
<td>1968.69</td>
<td>1968.69</td>
<td>1968.69</td>
</tr>
<tr>
<td>TRAIL–GRAILO</td>
<td>1493.68</td>
<td>1493.68</td>
<td>1493.68</td>
</tr>
<tr>
<td>GRAILT–GRAILO</td>
<td>-475.01</td>
<td>-475.01</td>
<td>-475.01</td>
</tr>
</tbody>
</table>
Ability of the Selected: TRAIL, GRAILT and GRAILO

K-S Test (p-values)

- TRAIL–GRAILT: 0.616
- TRAIL–GRAILO: 0.016
- GRAILT–GRAILO: 0.174

Selection by TRAIL $\succ$ Selection by GRAILT $\succ$ Selection by GRAILO
What Drives Selection?

- Selection by TRAIL ➖ Selection by GRAILT ➖ Selection by GRAILO
What Drives Selection?

- Selection by TRAIL \(\succ\) Selection by GRAILT \(\succ\) Selection by GRAILO
  - Selection by TRAIL \(\succ\) Selection by GRAILT: role of political incentives
  - Selection by GRAILT \(\succ\) Selection by GRAIO: role of agent information/expertise
What Drives Selection?

- Selection by TRAIL \(\succ\) Selection by GRAILT \(\succ\) Selection by GRAILO
  - Selection by TRAIL \(\succ\) Selection by GRAILT: role of political incentives
  - Selection by GRAILT \(\succ\) Selection by GRAILO: role of agent information/expertise

- Examine political incentives in more detail
Political Incentives: Evidence

- At end of the study, we asked sample households to participate in a straw poll and indicate the political party they support.
- Since GRAIL agent is chosen by incumbent local government, support for incumbent party suggests support for GRAIL agent’s party.
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\[ y_{iv} = \beta_0 + \beta_1 \text{Treatment}_{iv} + \beta_2 \text{Control } 1_{iv} + \gamma \text{X}_{iv} + \varepsilon_{ivt} \text{ if } v=1 \]

where \( y_{iv} = 1 \) if household head voted for incumbent in straw poll; \( v = \text{TRAIL, GRAIL} \)
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where \( y_{iv} = 1 \) if household head voted for incumbent in straw poll; \( v = \text{TRAIL, GRAIL} \)

- Treatment effect: \( \beta_1 - \beta_2 \) indicates clientelism
- Selection effect: \( \beta_2 - \beta_0 \) indicates loyalism/cronyism

- Controls for age, education, occupation of oldest male, land owned, year dummies, price information intervention
### Effect of Treatment on Voting Patterns in Straw 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>0.024</td>
<td>0.078**</td>
<td>-0.041</td>
<td>0.161***</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.03)</td>
<td>(0.044)</td>
<td>(0.039)</td>
</tr>
<tr>
<td>Selection Effect</td>
<td>-0.065</td>
<td>0.083**</td>
<td>-0.065</td>
<td>0.083**</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.04)</td>
<td>(0.045)</td>
<td>(0.037)</td>
</tr>
<tr>
<td>Household Controls</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Observations</td>
<td>1,011</td>
<td>1,026</td>
<td>1,021</td>
<td>1,044</td>
</tr>
</tbody>
</table>
Discussion

- TRAIL: no evidence of political motives
- GRAIL: evidence of both clientelism and loyalism
Discussion

- TRAIL: no evidence of political motives
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- Are clients and loyals the same?
- We can examine heterogeneity of effects by ability

Straw poll
Discussion

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- Clientelism biases selection in favour of low ability
  - vote-buying/clientelism tends to be targeted to the poor (Stokes 2005; Bardhan & Mookherjee 2017)
Discussion

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- Loyalism biases selection in favour of high ability
Discussion

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- GRAIL: evidence of both clientelism and loyalism
- Are clients and loyals the same?
- We can examine heterogeneity of effects by ability

Clientelism biases selection in favour of low ability
  - vote-buying/clientelism tends to be targeted to the poor (Stokes 2005; Bardhan & Mookherjee 2017)

Loyalism biases selection in favour of high ability
  - maybe GRAIL agents have better information about loyals and so select better
  - maybe GRAIL agents’ loyals are high-ability farmers
Evidence points to better selection of borrowers in the TRAIL scheme than the GRAIL scheme.
Discussion

- Evidence points to better selection of borrowers in the TRAIL scheme than GRAIL scheme
- Driven partly by information, partly by political incentives
Discussion

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- To what extent is superior selection driving the ATE differences?
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- Driven partly by information, partly by political incentives
- To what extent is superior selection driving the ATE differences?
- Our previous work (MMMMV 2017) shows that TRAIL treatment effects increase in ability
Evidence points to better selection of borrowers in the TRAIL scheme than GRAIL scheme.

Driven partly by information, partly by political incentives.

To what extent is superior selection driving the ATE differences?

Our previous work (MMMMV 2017) shows that TRAIL treatment effects increase in ability.

We decompose the treatment effect differences into:

- contribution of selection differences
- contribution of conditional treatment effect (CTE) differences
## Decomposition of ATE Differences; TRAIL v. GRAIL

<table>
<thead>
<tr>
<th>Bin</th>
<th>TRAIL weights</th>
<th>GRAIL weights</th>
<th>TRAIL - GRAIL weights</th>
<th>TRAIL HTEs</th>
<th>GRAIL HTEs</th>
<th>TRAIL - GRAIL HTEs</th>
<th>TRAIL weights x TRAIL HTEs ( \times ) (3)</th>
<th>GRAIL weights x TRAIL HTEs ( \times ) (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bin 1</td>
<td>0.263</td>
<td>0.329</td>
<td>-0.066</td>
<td>1505.79</td>
<td>-737.92</td>
<td>2243.71</td>
<td>-99.38</td>
<td>738.18</td>
</tr>
<tr>
<td>Bin 2</td>
<td>0.356</td>
<td>0.349</td>
<td>0.007</td>
<td>1552.34</td>
<td>758.93</td>
<td>793.41</td>
<td>10.87</td>
<td>276.90</td>
</tr>
<tr>
<td>Bin 3</td>
<td>0.382</td>
<td>0.322</td>
<td>0.060</td>
<td>2638.28</td>
<td>1086.82</td>
<td>1551.47</td>
<td>158.30</td>
<td>499.57</td>
</tr>
<tr>
<td>ATE</td>
<td></td>
<td></td>
<td></td>
<td>2058.40</td>
<td>492.73</td>
<td>1565.67</td>
<td>69.78</td>
<td>1514.65</td>
</tr>
</tbody>
</table>

| Selection explains only 4% of ATE differences. |
| The bulk is explained by treatment effects conditional on selection. |
| Agent engagement seems far more important than selection in determining treatment effects. |
Possible Hypothesis for Differences in Agent Engagement Incentives

- Agent engagement can take the form of monitoring or help
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- Agent engagement can take the form of monitoring or help
- Monitoring reduces default risk, and may also reduce expected income of farmer
- Help raises mean income of farmer, and may also raise default risk
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- Agent engagement can take the form of monitoring or help
- Monitoring reduces default risk, and may also reduce expected income of farmer
- Help raises mean income of farmer, and may also raise default risk
- Default risk (hence value of monitoring) is decreasing in farmer ability (ability Bin 1 pays 4.4% higher interest rate compared to others, stat. significant at 10%)
- Effectiveness of help in increasing farmer income is increasing in farmer ability (complementarity between ability and help)
Agent Engagement Incentives, contd.

- commissions
- sales margins
- political gains
Agent Engagement Incentives, contd.

<table>
<thead>
<tr>
<th>commissions</th>
<th>sales margins</th>
<th>political gains</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAIL</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

commissions sales margins political gains

TRAIL ✓ ✓
Agent Engagement Incentives, contd.

<table>
<thead>
<tr>
<th>commissions</th>
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</tr>
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<tbody>
<tr>
<td>TRAIL</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>GRAILO</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Agent Engagement Incentives, contd.

<table>
<thead>
<tr>
<th></th>
<th>Commissions</th>
<th>Sales Margins</th>
<th>Political Gains</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAIL</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>GRAILO</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>GRAILT</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Focus mainly on TRAIL v. GRAILO agents, since 17/24 GRAIL agents are non-traders.

<table>
<thead>
<tr>
<th>non-traders</th>
<th>commissions</th>
<th>sales margins</th>
<th>political gains</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAIL</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>GRAILO</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

Implies:
- GRAILO agents will be motivated mainly to monitor (reduce default risk), and will allocate most of their monitoring to low ability agents TRAIL interactions.
- Owing to sales margin motive, and to selection of fewer low ability borrowers, TRAIL agent will have greater motivation to help rather than monitor, and will allocate most of their help to high ability agents GRAIL interactions.
Explaining Differences in Agent Engagement, contd.

- Focus mainly on TRAIL v. GRAILO agents, since 17/24 GRAIL agents are non-traders

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>non-traders</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRAIL</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>GRAILO</td>
<td></td>
<td>✓</td>
<td>✓</td>
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</tr>
</thead>
<tbody>
<tr>
<td>non-traders TRAIL</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>non-traders GRAILO</td>
<td>✓</td>
<td></td>
<td>✓</td>
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Owing to sales margin motive, and to selection of fewer low ability borrowers, TRAIL agent will have greater motivation to help rather than monitor, and will allocate most of their help to high ability agents.
Interactions with Agent. HTE

Conversations about Cultivation and Trade. TRAIL and GRAIL

Treatment effect differences

<table>
<thead>
<tr>
<th>Bin</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bin 1</td>
<td>-1.422</td>
</tr>
<tr>
<td>Bin 2</td>
<td>-0.281</td>
</tr>
<tr>
<td>Bin 3</td>
<td>0.196</td>
</tr>
</tbody>
</table>

Bootstrapped Confidence Interval with 2000 iterations.
Implications for Borrower Income (Cond.) Treatment Effects

Since TRAIL agent offers more help to higher ability borrowers, (and given complementarity between ability and help) we expect TRAIL CTE on borrower incomes to be rising in ability.
Implications for Borrower Income (Cond.) Treatment Effects

- Since TRAIL agent offers more help to higher ability borrowers, (and given complementarity between ability and help) we expect TRAIL CTE on borrower incomes to be rising in ability.

- GRAIL agent on the other hand focuses more on monitoring low ability borrowers, which could lower their mean incomes, hence GRAIL CTE could be negative esp for low ability borrowers.
Explanations

Understanding CTE Differences

Heterogeneous Treatment Effects on Value-added

TRAIL v. GRAIL

**Difference in Treatment Effects**
**TRAIL−GRAIL**

<table>
<thead>
<tr>
<th>Ability Bin 1</th>
<th>2243.71</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[160.73, 4419.19]</td>
</tr>
<tr>
<td>Ability Bin 2</td>
<td>793.41</td>
</tr>
<tr>
<td></td>
<td>[-1049.14, 2677.03]</td>
</tr>
<tr>
<td>Ability Bin 3</td>
<td>1551.47</td>
</tr>
<tr>
<td></td>
<td>[-1534.19, 489.41]</td>
</tr>
</tbody>
</table>

Bootstrapped Confidence Intervals with 2000 replications. Ability using Potato Acreage.

TRAIL: Conditional Treatment Effects on value-added mirror those on time spent talking to agent.
(Preliminary) IV estimates of Heterogenous Treatment Effects of Agent Engagement

- Estimate

\[
\log Y_{ivt} = \beta \log A_{ivt} + \gamma \log(1 + E_{ivt}) + \mu X_{ivt} + \epsilon_{ivt}
\]

where \(Y\) is Farm Value Added, \(A\) is area cultivated, \(E\) is agent engagement, and \(X_{ivt}\) is set of household, year, village controls

- Estimate separately for TRAIL and GRAIL (since effect of agent engagement could differ)

- Instrument \(A, E\) with treatment dummy, borrower ability, and interactions
# (Preliminary) IV estimates of Income Effects of Agent Engagement

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>OLS (1)</th>
<th>TRAIL IV (2)</th>
<th>IV (3)</th>
<th>OLS (4)</th>
<th>GRAIL IV (5)</th>
<th>IV (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Acres</td>
<td>0.032*** (0.002)</td>
<td>0.033*** (0.004)</td>
<td>0.031*** (0.004)</td>
<td>0.030*** (0.003)</td>
<td>0.033*** (0.004)</td>
<td>0.026*** (0.005)</td>
</tr>
<tr>
<td>Log (1 + engagement)</td>
<td>-0.009 (0.024)</td>
<td>0.345** (0.173)</td>
<td>0.318** (0.160)</td>
<td>-0.011* (0.006)</td>
<td>-0.092** (0.041)</td>
<td>-0.096** (0.048)</td>
</tr>
<tr>
<td>Additional Controls</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Sample Size</td>
<td>1,380</td>
<td>1,380</td>
<td>1,377</td>
<td>1,374</td>
<td>1,374</td>
<td>1,359</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.239</td>
<td>-0.044</td>
<td>0.063</td>
<td>0.076</td>
<td>0.063</td>
<td>0.083</td>
</tr>
<tr>
<td>Hanson J</td>
<td>2.318</td>
<td>0.461</td>
<td>0.257</td>
<td>0.387</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Stage F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log Acres</td>
<td>1471.98***</td>
<td>1059.43***</td>
<td>1517.42***</td>
<td>830.05***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log (1 + engg.)</td>
<td>3.95***</td>
<td>3.91***</td>
<td>3.32**</td>
<td>4.45***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cragg-Donald F</td>
<td>8.503</td>
<td>8.237</td>
<td>46.963</td>
<td>46.887</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- **(Preliminary)**
- Significance levels: *p < 0.1, **p < 0.05, ***p < 0.01
Summary of Findings

- TRAIL ATE > GRAIL ATE for potato profits & farm value-added
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- This difference is partly due to superior borrower selection by TRAIL agent
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- This difference is partly due to superior borrower selection by TRAIL agent
- Explanations:
  - Superior expertise of traders
  - GRAIL agents’ political (clientelistic) incentives bias them toward low ability farmers
- There are substantial differences in conditional treatment effects
  - Local intermediaries’ engagement thus appears quantitatively more important than formal selection role
Conjectures about Causes of CTE Differences

- CTE differences reflect interactions between agents and borrowers
- Agent engagement varies between TRAIL and GRAIL owing to differences in incentives

GRAIL agents tend to primarily monitor (esp. low ability) borrowers to lower default risk; TRAIL agent to help (esp. high ability) agents to generate higher potato output and sales.

Hence GRAIL income CTEs tend to be smaller than TRAIL.

Key differences in agent incentives:
- stronger sales motive in TRAIL
- absence of political motives
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**Original Question:** Value of appointing local intermediaries; private versus political intermediaries

- We provide evidence that local intermediaries’ specialized information can improve selection.
- Local agents’ subsequent engagement with selected beneficiaries appears more important than formal selection function.
- Agent incentives can explain differences in both selection and engagement roles between private and political intermediaries.
- TRAIL agents’ economic incentives are more closely aligned with raising incomes of (esp. high productivity) borrowers.
- GRAIL agents are motivated mainly to lower default risk (esp. of low productivity borrowers), accentuated by political incentives.
Heterogeneous Treatment Effects on Potato Value-added. By Agent Type
TRAIL, GRAILT and GRAILO

**Difference in Treatment Effects**

<table>
<thead>
<tr>
<th></th>
<th>Ability Bin 1</th>
<th>Ability Bin 2</th>
<th>Ability Bin 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAIL–GRAILT</td>
<td>1624.148</td>
<td>648.212</td>
<td>2332.902</td>
</tr>
<tr>
<td>TRAIL–GRAILO</td>
<td>2493.514</td>
<td>833.523</td>
<td>1459.857</td>
</tr>
<tr>
<td>GRAILTL–GRAILO</td>
<td>869.365</td>
<td>185.311</td>
<td>-873.045</td>
</tr>
</tbody>
</table>

*Bootstrapped CI with 2000 iterations does not include 0. Ability using Potato Acreage.*

**MMMV (Work-in-Progress)**

June 2018
Interactions with Agent. ATE

Conversations about Cultivation and Trade. TRAIL, GRAILT and GRAILO

Difference p-value:
TRAIL v GRAILT = 0.86
TRAIL v GRAILO = 0.06
GRAILT v GRAILO = 0.08
Interactions with Agent. HTE
Conversations about Cultivation and Trade. TRAIL, GRAILT and GRAILO
Proportion of C1 Households in Each Ability Bin
TRAIL, GRAILT and GRAILO
Middlemen margins are 64-83\% of farmgate prices (Mitra et al. 2018)
### Effect of Treatment on Voting Patterns in Straw Poll

<table>
<thead>
<tr>
<th>Treatment Effect</th>
<th>TRAIL (1)</th>
<th>GRAIL (2)</th>
<th>Selection Effect</th>
<th>TRAIL (3)</th>
<th>GRAIL (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.024</td>
<td>0.078**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.05)</td>
<td>(0.03)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selection Effect</td>
<td>-0.065</td>
<td>0.083**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.04)</td>
<td>(0.04)</td>
<td></td>
<td></td>
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**Treatment Effects:**

<table>
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<th>TRAIL (1)</th>
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<th>TRAIL (3)</th>
<th>GRAIL (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bin 1</td>
<td>0.09</td>
<td>0.13†</td>
<td>-0.13**</td>
<td>0.02</td>
<td>(0.06)</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.07)</td>
<td>(0.06)</td>
<td>(0.06)</td>
<td></td>
</tr>
<tr>
<td>Bin 2</td>
<td>-0.07</td>
<td>0.03</td>
<td>-0.03</td>
<td>0.12†</td>
<td>(0.07)</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.07)</td>
<td>(0.07)</td>
<td>(0.07)</td>
<td></td>
</tr>
<tr>
<td>Bin 3</td>
<td>0.06</td>
<td>0.01</td>
<td>-0.03</td>
<td>0.11†</td>
<td>(0.06)</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.07)</td>
<td>(0.07)</td>
<td>(0.07)</td>
<td></td>
</tr>
</tbody>
</table>

Observations: 1,011 1,026 1,021 1,044

†: The bootstrapped CI (with 2000 iterations) do not include 0.
Interactions with Agent. ATE
Conversations about Cultivation and Trade. TRAIL vs GRAIL

Marginal cost of TRAIL agent’s time > Marginal cost of GRAIL agent’s time
Interactions with Agent. HTE
Conversations about Cultivation and Trade. TRAIL

![Graph showing treatment effects across ability bins.]
Interactions with Agent. HTE
Conversations about Cultivation and Trade. GRAIL