Do medium-scale farms improve market access conditions for Zambian smallholders?

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• **Changing land dynamics**
  • Vast majority of rural Africans are still smallholders (e.g., farms less than 5 hectares)
  • Rapid increase in “medium-scale” or “emergent” farmers (5-100 ha) (Jayne et al., 2016)
    • Kenya – 20% of operated land
    • Ghana – 32%
    • Tanzania – 37%
    • **Zambia – 53%**
  • Much discussion on how/whether the rise of MS farms marginalizes smaller farms
  • Could there be benefits to smaller farms?
    • Scale economies for LSTs → Lower transaction costs
    • Competition
    • Higher farm-gate prices

**Background – Data – Conceptual framework – Approach – Results - Conclusion**
Larger farms attract larger scale traders (LSTs)

Maize marketing activity by farm size categories

<table>
<thead>
<tr>
<th>Farm category (defined by area cultivated)</th>
<th>Share of farmers</th>
<th>Share of group that sell maize</th>
<th>Share of sellers that sell to private sector</th>
<th>Share of sellers to private sector who sell to LST</th>
</tr>
</thead>
<tbody>
<tr>
<td>“A”- farm &lt;5 ha</td>
<td>95%</td>
<td>43%</td>
<td>50%</td>
<td>14%</td>
</tr>
<tr>
<td>“B”- 5 – 10 ha</td>
<td>4%</td>
<td>84%</td>
<td>44%</td>
<td>35%</td>
</tr>
<tr>
<td>“C”- 10 – 20 ha</td>
<td>1%</td>
<td>89%</td>
<td>53%</td>
<td>61%</td>
</tr>
</tbody>
</table>


District-level simple regression:

\[(Share\ of\ sales\ to\ LSTs)_t = 0.039 + 0.323^{***} \times (Share\ of\ land\ on\ farms\ >\ 5ha)_{t-1}\]

[Standard errors] [0.029] [0.119]

Mean=0.155;
About 7% are 0;
About 5% >0.4

Background – Data – Conceptual framework – Approach – Results - Conclusion
Context & Questions

- Are smallholder farm maize sales to LSTs higher in areas with more medium-scale farms?
  - Sales to small scale traders?

- Do LSTs offer higher prices to farmers than other private traders, holding other factors constant?

- “Spillover” effects suggest the rise of MSFs could mean market access and better prices for all farmers.

Background – Data – Conceptual framework – Approach – Results - Conclusion
Data

- **Rural Agricultural Livelihoods Surveys (RALS)**
  - Indaba Agricultural Policy Research Institute (IAPRI)
  - Central Statistical Office (CSO)
  - Ministry of Agriculture & Livestock (MAL)
  - Data for maize sales & other farm/community characteristics
  - **8,838** households in 2012; **7,933** in 2015

- **Crop Forecast Surveys**
  - CSO/MAL
  - Measuring farmland concentration at district level
  - **13,265** households in 2012; **13,350** in 2015

Background – Data – Conceptual framework – Approach – Results - Conclusion
Increase in MSFs → higher share of land under cultivation on farms >5ha

Geographic concentration of surpluses → possible scale economies in trading → Attracting traders, esp. LSTs & even SSTs & satellite traders.

Which pathway applies or dominates is an empirical question

Exercising monopsony power to crowd out smaller traders

Other potential problems:
- Smaller farms may not be able to consistently meet quality standards
- Land pressure on smaller farms → decreased fallow; unused tracts

Other potential benefits:
- Compared to FRA (government buyer), payment is timely & (rising) prices can change quickly with market

Lower farm-gate prices received by sellers

Lower unit transaction costs & Greater competition

Higher farm-gate prices received by all sellers (large & small farms)

See companion paper (Sitko, Burke & Jayne, JDS 2018)

Background – Data – Conceptual framework – Approach – Results - Conclusion
Defining a large-scale trader (LST)

• For transaction-specific data we must rely on farmers to tell us:
  • Does the trader purchase greater volumes of grain than the average trader in the area?
  • Does the trader personally come to villages to buy grain or does he/she operate buying points and hire agents to buy on their behalf?
  • Does the trader have a company name or is the trader buying grain as an individual?

• Buyers are coded as “LST” if all three indications suggest they are large scale
Multi-Stage Model

- Probit models
  - Selling
  - Selling to private market
  - Selling to LSTs

- Lognormal model for quantity sold to
  - SST
  - LST

Population of farms with less than 5 ha cultivated
N=15,087
Multi-Stage Model

- Probit models
- Selling
- Selling to private market
- Selling to LSTs

- Lognormal model for quantity sold to
  - SST
  - LST

- Key variables are district share of land under cultivation “B” & “C” farms in district

Background – Data – Conceptual framework – Approach – Results – Conclusion
Price regression models

- Estimate price regressions using data from the 2,683 transactions with traders (SSTs & LSTs) to investigate the “ceteris paribus” price difference.

- A note on “ceteris paribus”
  - Careful about “controlling for the mechanism”
  - E.g., controlling for transaction specific characteristics (why would a seller choose an LST over SST if transport costs – and everything else – are constant?)
  - Takeaway point – Robustness across several specifications – is a useful part of this (and MSM) analysis

Background – Data – Conceptual framework – Approach – Results - Conclusion
### MSM results

**Partial effect estimates of MSM of maize market participation for “A farms”**

<table>
<thead>
<tr>
<th>Term</th>
<th>Coefficient (Standard Error)</th>
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<th>Coefficient (Standard Error)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \frac{\partial Pr(sell)}{\partial x} ) private</td>
<td>0.2287*** (0.074)</td>
<td>0.2277** (0.107)</td>
<td>1,778.5*** (513.2)</td>
<td>-2,487.2 (2,362.5)</td>
<td>376.9*** (96.7)</td>
<td>68.47 (66.0)</td>
<td></td>
</tr>
<tr>
<td>( \frac{\partial Pr(sell to LST)}{\partial x} ) private</td>
<td>0.1048 (0.101)</td>
<td>0.107 (0.153)</td>
<td>0.1955 (0.138)</td>
<td>942.07* (548.3)</td>
<td>4,410.09 (3,165.3)</td>
<td>747.1*** (125.8)</td>
<td>433.4*** (94.4)</td>
</tr>
<tr>
<td>( \frac{\partial E(Q_{sold} \mid sell=1, sell to private=1, sell to SST)}{\partial x} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \frac{\partial E(Q_{sold} \mid sell=1, sell to private=1, sell to LST)}{\partial x} )</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>( \frac{\partial E(sales to SST \mid sell=1, sell to private=1, sell to LST)}{\partial x} )</td>
<td></td>
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</tbody>
</table>

**Model (i) – Farmland concentration or variables as explanatory variables**

**Model (ii) – Controlling for household characteristics, weather & climate, transaction costs characteristics**

**Model (iii) – Controlling for household characteristics; weather & climate; transaction costs characteristics; provincil time & province-time effects**

**Sources:** Household sales data from the Rural Agricultural Livelihood Surveys (2012, 2015); District farmland concentration variables from the Crop Forecast Surveys (2012; 2015)

**Notes:** Bootstrapped standard errors from 200 replications in parentheses, *, **, *** indicates statistical significance at the 1, 5 and 10% levels respectively.
## Price regression results

<table>
<thead>
<tr>
<th>Lognormal maize price regressions from Zambia’s 2012 &amp; 2015 marketing seasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(real price)$^a$=</td>
</tr>
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</tr>
<tr>
<td>Sale was to LST (1=yes)</td>
</tr>
<tr>
<td>(0.01)</td>
</tr>
<tr>
<td>ln(km to sale)</td>
</tr>
<tr>
<td>(0.00)</td>
</tr>
<tr>
<td>Month &amp; year of sale</td>
</tr>
<tr>
<td>ln(quantity sold) (tonnes)</td>
</tr>
<tr>
<td>(0.01)</td>
</tr>
<tr>
<td>District fixed effects</td>
</tr>
<tr>
<td>Constant</td>
</tr>
<tr>
<td>(0.01)</td>
</tr>
<tr>
<td>Observations</td>
</tr>
<tr>
<td>R-squared</td>
</tr>
</tbody>
</table>

Source: IAPRI Rural Agricultural Livelihoods Surveys (2012 & 2015). $^a$-Prices are deflated to a common base using a monthly consumer price index for Zambia published by the IMF and available at data.imf.org
Conclusions

- The increasing number of medium-scale farms are inducing large-scale private investments in grain trading.

- Rise of MSFs associated with a greater likelihood that small farms
  - Sell maize
  - Sell to private traders
  - Sell to one or more LSTs

- Average sales to LSTs (and SSTs) from farms<5ha increases, ceteris paribus (marginal effect on “unconditional” expected values are positive & significant)

- Depending on controls, we estimate prices paid by LSTs to farmers are 2.9% - 7.5% higher than SSTs

- At least with respect to the evolution of grain marketing channels, the rise of MSFs seems, on balance, to also benefit even the smallest farms.
Thank you

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