Do input subsidies reduce poverty among smallholder farm households?
Evidence from Zambia

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Zambia & Malawi – large ISPs for decade+ but rural poverty rates high & virtually unchanged

Sources: CSO (2009, 2011), MACO (various years), MAL (various years). Note: Rural poverty rates based on the national poverty line.
Research question

What are the effects of fertilizer received through Zambia’s subsidy program on smallholder incomes and poverty?

Previous research gives us reasons to expect (or not) income & poverty effects

- HHs w/ more land get more (>2 ha: 27% of HHs, 55% of sub. fert.)
- ↑ total fertilizer use but < 1 kg/kg
- Small ↑ maize area, yields, output
- Smaller ↑ other crop yields, output
- Small ↓ real maize prices
- Effects on rural/ag wages?

Does this translate into higher real incomes and lower poverty?

(Sources: Mason & Ricker-Gilbert 2013; Mason & Jayne 2013; Mason et al. 2013, 2014; Ricker-Gilbert et al. 2013)
Previous studies: ISPs & incomes/poverty

**Zambia**
- Mason & Smale (2013) – subsidized hybrid maize seed
  - incomes & poverty but by small magnitudes
- 1st paper on effects of sub. fertilizer on incomes/poverty

**Other SSA countries** (**poverty; others income only**)
- **Nigeria**: Awotide et al. (2013)**
- **Mozambique**: Carter et al. (2014)

Farmer Input Support Program (FISP)

- **Objective**: “improve the supply and delivery of agricultural inputs to small-scale farmers … in order to increase household food security and incomes” (MAL)
- 2004-2013: 49% of ag sector Poverty Reduction Programme spending
- “The overall intention of [FISP] was to improve incomes, hence reduce poverty…” (Minister of Agriculture & Livestock, 27 June 2013)
FISP (cont’d)

During the SS years
- 400 kg fertilizer + 20 kg hybrid maize seed
- 50-60% subsidy
- No vouchers, little private sector involvement

Main eligibility criteria:
- Coop member
- Small-scale farmer (cultivate < 5 ha)
- Ability to cultivate ≥ 1 ha
- Ability to pay farmer contribution

Data

Two nationally-representative surveys of smallholders:

1. Supplemental Survey (SS, panel)
   - 2002/03 & 2006/07 agricultural years
   - 4,286 HHs in balanced panel; no evidence of attrition bias
   - Descriptive & econometric analysis

2. Rural Agricultural Livelihoods Survey (RALS, cross-section)
   - 2010/11 agricultural year
   - 8,839 HHs
   - Descriptives only
### Methods

- Conceptual framework adapted from Otsuka et al. (1992)

\[ y_{i,t} = \beta_0 + \beta_1 FISP_{i,t} + \beta_2 + p_{i,t-1} \beta_3 + k_{i,t} \beta_4 + l_{i,t} \beta_5 + z_{i,t} \beta_6 + c_i + u_{i,t} \]

- Income / poverty \((y)\) of HH \(i\) in year \(t\) is a function of:
  - Kg of subsidized fertilizer acquired \((FISP)\) – qty varied
  - Factor prices \((w)\) & expected \((t-1)\) crop prices \((p)\)
  - Land & other farm assets \((k)\)
  - HH labor supply, proxies for labor quality & mgmt ability \((l)\)
  - Other shifters \((z)\)

- Panel data methods (FE, CRE) – corr\((X_{i,t}, c_i)\)
- IV / control function approach – corr\((FISP_{i,t}, u_{i,t})\)
  - Past election results in the HH’s constituency
    - F=14.34; fail to reject over-ID restrictions

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### Outcome variables & estimators

1. **Real income** (total, crop, other; levels & logs) – HH and per adult equivalent – FE, CRE Tobit
   - Income net of fertilizer costs

2. **Poverty incidence** (binary) – FE, CRE probit/logit
   - US$1.25 per capita per day

3. **Poverty severity** (proportion) – FE, CRE fractional response probit/logit
Smallholder poverty rates – US$1.25/day

Note: Conversions to US$ based on 2005 PPP exchange rate and adjusted for inflation (World Bank World Development Indicators).

Bivariate: FISP recipients statistically significantly better off in all dimensions

- Incomes roughly double
- Poverty incidence 11 pp lower
- Poverty severity 17 pp lower

Do these results hold up when we control for other factors?

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**Multivariate**: large, + income effects (via crop income) but no effect on poverty incidence

<table>
<thead>
<tr>
<th>Outcome variable</th>
<th>Estimated Δ per 200-kg increase in FISP fertilizer</th>
<th>Sig.</th>
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</thead>
<tbody>
<tr>
<td><strong>Net HH income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>ZMW 1,140 (7.7%)</td>
<td>***</td>
</tr>
<tr>
<td>Crop</td>
<td>ZMW 662 (10.1%)</td>
<td>***</td>
</tr>
<tr>
<td>Other</td>
<td>ZMW 476 (1.8%)</td>
<td></td>
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<tr>
<td><strong>Net HH income/AE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>ZMW 224 (6.9%)</td>
<td>***</td>
</tr>
<tr>
<td>Crop</td>
<td>ZMW 114 (9.5%)</td>
<td>***</td>
</tr>
<tr>
<td>Other</td>
<td>ZMW 109 (1.0%)</td>
<td></td>
</tr>
<tr>
<td><strong>Poverty metrics (US$1.25/day)</strong></td>
<td>Level (% Δ vis-à-vis mean)</td>
<td></td>
</tr>
<tr>
<td>Incidence</td>
<td>-0.1 pp (0.1%)</td>
<td></td>
</tr>
<tr>
<td>Severity</td>
<td>-3.6 pp (6.7%)</td>
<td>***</td>
</tr>
</tbody>
</table>

Notes: *** p<0.01, ** p<0.05, * p<0.10. Income is in real terms (2011/12=100). Poverty incidence & severity estimates are for the logit specifications; probit results are similar. Results are for IV/CF specification where statistical evidence of endogeneity.

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**Why** the large, + income effects but no effects on poverty incidence?

- Large % of FISP goes to (relatively) better off HHs
  - 2006/07:
    - Richest 20% got 61% of FISP
    - Poorest 40% got 7%
    - Still poverty severity b/c vast majority (92%) poor
- Poverty is deep and severe
  - Income effects (US$0.13/capita/day) not large enough to lift > poverty line

**Note**: effects on retail maize prices minimal (Ricker-Gilbert et al. 2013) → don’t expect major indirect effects on poverty through food prices. But wages?

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Policy implications I: How to improve poverty impact of FISP?

1. Better target poorer smallholders
   a. Revise eligibility requirements to be pro-poor
      - Coop membership and farmer FISP payment > 20% of income for 60% of smallholders (Burke et al., 2012)
   b. Reduce scope for relatively better-off HHs to capture most of the benefits
      - Limit to HHs cultivating < 2 ha of land (78% of the poor)
      - Combat diversion

2. Increase the effects on production & incomes
   a. Reduce crowding out of commercial fertilizer
   b. Raise maize-fertilizer response rates

Policy implications II: If poverty reduction is the objective, is FISP the best option?

- Social cash transfers
- Investments in ag R&D, rural infrastructure, health, and education
- Need Zambia-specific empirical evidence!

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Thank you for your attention! Questions?

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