Addressing the “Wicked Problem” of Input Subsidy Programs in Africa: A Review

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Outline

- Input subsidies, then and now
- Is this a “Wicked Problem”? 
- Conceptual and empirical Issues
- Targeting effectiveness
- Crowding out 
- Impacts on productivity and other things
- Discussion
Input Subsidies, then and now

- A major feature of ag policy in Africa in the 1970s and 1980s
  - Universal subsidies available to all farmers

- Phased out in the 1990s as part of structural adjustment

- Re-emerged across SSA in recent years
  - This time considered "smart subsidies"
  - Target recipient households who meet certain criteria.
Currently, 7 countries (Nigeria, Ethiopia, Kenya, Zambia, Malawi, Tanzania, and Ghana) account for roughly 2.1 million tons of fertilizer distributed through government fertilizer promotion programs.

These programs cost approx. USD $2 billion.

Substantial share of government budgets

(e.g. In 2009 Malawi’s program cost $221 million = 13.5% of budget = 5.5% of GDP)
According to the FAO, Africa accounted for less than 3% of world fertilizer consumption in 2007.
Input Subsidies, then and now

- 1st African Fertilizer Summit (Abuja, June ‘06)

  goal: increase the level of fertilizer use from the current average of 8 kg/ha to an average of 50 kg/ha by 2015; How? Smart subsidies are key.

  but…other public investments had larger long-run returns in Asia (e.g. Fan et al. 2007. Is emphasis on fertilizer misplaced?
Basic Tension

- Are these programs effective?
- Do they generate a positive return?
- Are they being targeted effectively?
- Have past mistakes been corrected?

- Outside critics = hypocritical meddlers?
Phrase originally used by Rittel in the 1960s to describe a social problem that is difficult or impossible to solve because of incomplete, contradictory, and changing requirements.

No definitive conditions or tests to resolve problems, and even lack of basic agreement about what constitutes the real problem.

For every wicked problem there is always more than one possible explanation or pathway to resolution, with each depending on the “core beliefs” of those involved. Wicked problems resist resolution by an appeal to the facts.
Conceptual challenges

- Program/treatment definition
  - Receipt of voucher vs. Receipt of fertilizer vs. use of fertilizer.

- General vs. partial equilibrium effects
  - Direct and indirect (price, wage) effects
  - Counterfactual
  - Spillovers and externalities

- Dynamic and “learning by doing” impacts
Empirical challenges

- Outcome variables of interest
  - Fertilizer demand
  - Agricultural production
  - Land/labor allocation/use
  - Household income/poverty

- Crop response confounders
  - Soil, rainfall
  - Labor input/management ability

- Causality and validity
  - Non-random targeting/selection
  - External vs. internal validity
Targeting effectiveness

Smart, maybe (???), but is targeting successful?

- What are programs objectives? Poverty vs. productivity
- Subsidies should be efficient & support private sector
- Maize/fertilizer ratios:
  - Tend to exhibit diminishing returns
  - So who should get the subsidies?

Evidence

- Malawi: poor and female headed received less
- Tanzania: political elite received more
- Ghana: more to districts where ruling party lost election
- Zambia: more to districts where ruling party won
- Nigeria: poorer farmers more likely to participate
Crowding out

- if households who wouldn’t otherwise buy commercial fertilizer acquire subsidized fertilizer, then
  
  1 ton subsidized fert. = 1 ton new fert.

- Evidence
  - Malawi: 1 kg subsidy displaces 0.22 kg purchased
  - Zambia: 1 kg subsidy displaces 0.47 kg purchased
  - Kenya: 1 kg displaces 0.65 kg in high potential areas
  - Nigeria: no displacement, some evidence of crowding in.
Impacts on productivity, etc.

Maize productivity

- Malawi: avg. gain 447kg/ha (hybrid) 249kg/ha (local)
- Malawi: 1 kg fertilizer $\Rightarrow$ 1.56 kg maize in current year
- Malawi: 1 kg fertilizer in each of previous 3 years $\Rightarrow$ 3.14 kg maize in current year
- Zambia: 1.88 kg. Maize/ sub. fert. response rate in current

Land allocation and diversification

- Malawi: more maize, less cassava

Externalities

- Malawi: no area expansion for maize, and some intensification that could reduce forest pressure
Conclusions – a wicked problem

- **Targeting**
  - Most targeted programs fail to reach resource poor
  - Politics affect who gets subsidy.
  - Need to define program objective.

- **Crowding out/in**
  - Evidence of commercial fertilizer crowding out in Eastern/Southern Africa
  - Some crowding-in in Nigeria
  - Focus subsidies in area where private sector is less active and towards those less likely to buy commercial fertilizer.

- **Maize productivity**
  - Malawi & Zambia – small statistically significant impact to maize production

- **Land allocation and diversification**
  - Malawi – more maize, less cassava, less diversification

- **Externalities**
  - Malawi – no area expansion for maize, and some intensification that could reduce forest pressure
\[ Y_{it} = f( Z_{it}, X_{it}, \varepsilon_{it} ) \]

Is \( Z \) number of vouchers, kilograms of subsidized fertilizer purchased, kilograms of subsidized fertilizer applied to maize?

- If number of vouchers, how to account for sharing of fertilizer?
- If kilograms of fertilizer, is that really measuring the effect of the gov’t program?
Y_{it} = f(Z_{it}, X_{it}, \varepsilon_{it})

- Advantage if household panel data available.
- IV estimation: challenge of finding a good instrument.
  - Modeling subsidized seed and fertilizer = multiple instruments
  - Are you studying a population of interest?