Impacts of Subsidized Hybrid Seed on Indicators of Economic Well-Being among Smallholder Maize Growers in Zambia

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1. INTRODUCTION

Empirical evidence suggests that the hybrid maize seed component of Zambia’s input subsidy program led to modest increases in maize production and incomes among smallholder maize growers, reducing their severity of poverty and relative deprivation (income inequality).

2. SUBSIDIES IN ZAMBIA

The Zambian government has dramatically scaled up its input subsidy program over the last decade, from 2,640 MT of hybrid maize seed in 2002/03 to 8,730 MT in 2012/13. The seed subsidy rate has ranged from 50% to 60%. An average of 40% of total government agricultural sector spending is devoted to agricultural input subsidies each year.

3. HYPOTHESES

The hypothesis that an additional kilogram of subsidized hybrid maize seed (i) allocated to a smallholder farm household raises its use of hybrid maize seed (j), which in turn:

- Raises its maize production and total household income
- Reduces its severity of poverty and relative deprivation

(Income inequality) compared to other households.

4. CONCEPTUAL FRAMEWORK & OUTCOMES

5. DATA

The data are from the second and third waves of the Kafue Valley Survey (KVS), a nationally representative panel survey of smallholder farm households in Zambia. The KVS was conducted by the Zambia Central Statistical Office (ZCSO) and Ministry of Agriculture and Cooperatives (MACO) in collaboration with USAID’s Food Security Research (FSR) Project (2005–2009).

A total of 6,322 households were interviewed in the first wave of the survey, which covered the 2006/2007 agricultural year. Maize seed details were not recorded, so the first wave of the survey was not used here. The second wave of the survey covered the 2008/2009 agricultural year and 1,368 households were successfully re-interviewed. Of these, 4,396 were reinterviewed in the third wave of the survey, which covered the 2009/10 agricultural year. The balanced panel of 5,236 households that grew maize in the latter two survey waves is used in the econometric analysis.

6. ESTIMATION STRATEGY

The two terms in Eq. 2 are estimated separately and then multiplied to obtain the average partial effect of subsidized seed on an outcome:

\[ \Delta y_i = \Delta y \cdot \Delta q \]

Panel data methods (the fixed effects estimator, FE, or the correlated random effects approach, CRE) are used to control for time invariant heterogeneity:

\[ \Delta y = \gamma \cdot (\Delta q \cdot \Delta d) \]

A non-separable agricultural household model motivates our conceptual framework. Demand for hybrid maize (i) and household outcomes (j) are affected by endogenous prices (household characteristics) and observed prices as well as market and agro-ecological conditions (i, j).

Subsidized seed (j) is treated as a spot fixed factor because households cannot freely choose the quantity that they receive. Income inequality for household $i$ is measured as the Stark-Taylor (1986) index of relative deprivation (IRD): \[ IRD_i = \frac{1}{2} \sum_{j} (F_j - P_j) \]

where $F_j$ is the average income of households with income greater than household $i$, and $P_j$ is the properties of households with income greater than household $i$.

7. DESCRIPTIVE RESULTS

Table 1 shows the distribution of total maize production and total maize income across four income quintiles (quintiles 1-4).

8. ECONOMETRIC RESULTS

An additional kg of subsidized seed (j) raises hybrid seed use (i) by 0.42 kg on average, or 5.6%.

- This effect is less than 1% due to crowding out: subsidized seed displaces some commercial hybrid seed purchases (Mason & Ricker-Gilchrist, 2015).

9. CONCLUSIONS & POLICY IMPLICATIONS

Empirical evidence suggests that the hybrid maize seed component of Zambia’s input subsidy program led to modest increases in maize production and incomes among smallholder maize growers, reducing their severity of poverty and relative deprivation (income inequality).

Simple calculations suggest that the benefits (increased household income) of the seed subsidy outweigh the costs.

- The private benefit-cost ratio (BCR) ranges from 2.7 to 5.46 depending on if the former one is the most or least expensive available through the program.
- The social BCR ranges from 1.09 to 2.18 excluding unsubsidized administrative costs.

Effects to improve targeting and reduce displacement of commercial hybrid maize seed purchases by subsidized seed could increase the impacts of the seed component of Zambia’s input subsidy program on smallholder farmers’ economic well-being.

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