

Food and Agriculture Organization of the United Nations

**Social Protection**

**From Protection to Production**

# Risk-mediated effects of cash transfers on modern inputs use

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WIDER Development Conference - Public economics for development
5-6 July 2017.Maputo, Mozambique

# Agenda

- Motivation
- Zambia's unconditional cash transfer program
- Empirical strategy
- Results

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# Motivation - risk-induced poverty traps

- **Adoption of modern inputs** – commercial seeds and fertilizers – is one important pathway to increase farm output and productivity
- Farmers' **risk aversion** combined with lack of formal insurance markets to cover from **output risk** may hinder adoption of new production techniques
- Farmers forgo riskier but more profitable production choices in favour of **low-risk-low-return solutions**, getting trapped in persistent poverty
- We investigate the potential of **unconditional cash transfers** to help poor farmers break these poverty traps by inducing riskier production decisions through higher demand for modern inputs.

# Motivation - risk-induced poverty traps

- Complete risk markets=> maximization of expected profits without concern for risk=> **consumption smoothing**
- Incomplete risk markets => farmers balance risk and return => ex ante **income smoothing**
- One mechanism that eases insurance markets constraints allowing farm households to smooth consumption and avoid income smoothing is income support through **unconditional cash transfers**

# Motivation - breaking out of the trap

- **Wealth effect** (Hennessy, 1998)

If DARA holds

+ UCT => + Wealth => - Risk aversion => + Inputs =>

+ Production

- **Risk-mediated wealth effect** (Serra et al., 2011)

If DARA holds

+ UCT => + Wealth => - Risk aversion => + Inputs **iff** input is risk-increasing

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# Empirical strategy

- *Farmer's problem and FOC-s*

$$\max_{x_1,x_2} E[u(W)] = \max_{x_1,x_2} E[u(W_0 + py - w_1x_1 - w_2x_2 + G)]$$

$x_1, x_2$=demand for commercial seeds and fertiliz
$w_1, w_2$=prices of seeds and fertilizer
G = cash transfer

$$E[Y]_{x_i} - w_i - 0.5 * R * V[Y]_{x_i} = 0 \quad => \quad E[MI_i] = 0.5 * R * V[Y]_{x_i}$$

$E[Y]_{x_i}$=marginal product for input *i*
$V[Y]_{x_i}$=marginal risk for input *i*

$$\frac{dx_i}{dG} = \frac{1}{2E[U(W)]_{x_ix_i}} * \frac{dR}{dG} * V[Y]_{x_i}$$

$\frac{dx_i}{dG}$ =CT-induced demand for input *i*
$\frac{dR}{dG}$= CT-induced change in risk aversion

**=>** $\frac{dx_i}{dG} > 0$ iff $V[Y]_{x_i} > 0$

# Empirical strategy

- *Just-Pope production function to get* get $\frac{\partial V(y)}{\partial x_i}$

$$y = f(x_1, x_2, \boldsymbol{Z}, \boldsymbol{\alpha}) + h(x_1, x_2, \boldsymbol{Z}, \boldsymbol{\beta})\varepsilon \qquad (1)$$

- *3SLS estimation of risk aversion coefficient to get* $\frac{dR}{dG}$

$$\begin{aligned} \hat{E}[MI_1] &= \gamma_0 + \gamma_1 \hat{V}[Y]_{x_1} + \gamma_2 G + \gamma_3 \hat{V}[Y]_{x_1} G + e_1 \\ \hat{E}[MI_2] &= \delta_0 + \delta_1 \hat{V}[Y]_{x_2} + \delta_2 G + \delta_3 \hat{V}[Y]_{x_2} G + e_2 \end{aligned} \qquad (2)$$

- *3SLS estimation of input demand to get* $\frac{dx_i}{dG}$

$$\begin{aligned} x_1 &= \pi_0 + \pi_1 x_2 + \pi_2 Y + \pi_3 \boldsymbol{Z} + \pi_4 w_1 + \pi_5 G + \zeta_1 \\ x_2 &= \varphi_0 + \varphi_1 x_1 + \varphi_2 Y + \varphi_3 \boldsymbol{Z} + \varphi_4 w_2 + \varphi_5 G + \zeta_2 \end{aligned} \qquad (3)$$

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# Program and data

- **Child Grant Program** (2010): alleviating poverty among the poorest and block its intergenerational transmission
- Beneficiaries received **60 new ZMK a month.** Equivalent to 21 int. dollars or 25 % of monthly consumption expenditure
- **Pilot evaluation** implemented in 3 districts with highest rates of mortality and morbidity among children under 5
- Categorical **targeting mechanism**, reaching any household with a child under 5
- Impact evaluation designed as a **longitudinal RCT**
- Randomization successful

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# Results - Just-Pope production function

- Both seeds and fertilizers increase (mean) output.
- An increase in the use of seeds is associated with a statistically significant increase in output variability.
- We don't find evidence in favor of risk-increasing properties of fertilizers

| | Mean output | | Variance of output | |
|---|---|---|---|---|
| | $\frac{\partial E(Y)}{\partial x_i}$ | t-stat | $\frac{\partial V(Y)}{\partial x_i}$ | t-stat |
| | | | | |
| **Exp. for seeds** | 6.962 | [1.599] | 1.36e+07** | [2.042] |
| **Exp. for fertilizers** | 6.858*** | [3.385] | 1.00E+06 | [0.384] |
| **Observations** | 1688 | | 2298 | |

# Results – Cash induced change in risk aversion

- Zambian farmers in our sample exhibit risk aversion with an average Arrow-Pratt absolute coefficient of 0.007
- The coefficient of the interaction between the output variance and the program dummy points to a reduction of the degree of risk aversion in the treated group

| | Seeds | | Fertilizers | |
|---|---|---|---|---|
| | Coeff. | t-stat | Coeff. | t-stat |
| | | | | |
| **0.5*V[y]** | 3.59e-03** | [2.314] | 3.59e-03** | [2.314] |
| **0.5*V[y]*G** | -4.41e-03* | [-1.758] | -4.41e-03* | [-1.758] |
| **G** | 2.83e+04* | [1.750] | 2.06E+03 | [1.618] |
| **Observations** | 2298 | | 2298 | |

# Results – Cash induced change in input demand

- In terms of elasticities these coefficients amount to an increase in seeds and fertilizer demand of 87.3% and 49.2%, respectively.
- The increase in fertilizer demand is barely significant

| | **Seeds** | | **Fertilizers** | |
|---|---|---|---|---|
| | Coeff. | t-stat | Coeff. | t-stat |
| | | | | |
| **Treatment** | 11074.994*** | [4.085] | 5618.530* | [1.801] |
| **Observations** | 2298 | | 2298 | |

# Conclusions

- CTs useful tool to alleviate risk market failures and induce higher-risk higher-return production choices.
- For seeds we find that beneficiary farmers engage in riskier behavior by increasing demand, arguably, as a result of the cash-transfer-induced reduction in risk aversion.
- The surge in seeds purchases results in an increase in output variability.
- While in the case of fertilizers we find weak evidence of increased use caused by the program in line with the finding that fertilizer use does not increase output risk significantly.

# Thank you