Do Index-Insured Loans Spur Technology Adoption? Evidence from a Randomized Control Trial in Northern Ghana

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Stetson University, The Catholic University of America, The Ohio State University, The Ohio State University, Ohio University, World Bank

Motivation

- Poor farmers are unable to obtain credit needed to invest in improved production technologies
- Catastrophic weather risk undermines efficiency of agricultural credit markets
- Joint liability lending with a combination of weather-based index insurance (insured loans) should encourage technology adoption.

Objective and Contributions

- **Objective:**
  - To investigate whether index-based drought insurance (IBDI) coupled with agricultural loans encourages technology adoption.
  - To test if there are differential impacts of micro- versus meso-insured products on adoption.
- **Contribution:**
  - Complement the RCT literature on agricultural insurance and agricultural investment decisions of farmers.
  - Contribute to policy discussions on way forward for encouraging agricultural insurance and technology adoption.

Data

- 258 farmer groups with 779, 777, and 777 farmers in each of the three panels.
- Main outcome variables:
  - Binary use of five types of inputs (compound fertilizer, straight fertilizer, herbicide broad spectrum, herbicide selective, and hybrid seeds)
  - Land cultivated for maize (acres) and maize yields (kg/acre)
- Data collected on covariates at the individual, household, and community levels: income, risk perception, credit history.
- Area covered: Northern, Upper East, and Upper West
- Administrative involvement: 14 Rural and Community Banks in area covered and Ghanaian Agricultural Insurance Association

Research Design and Methodology

- Randomly assigned treatments across farmer groups.
  - **Control Group** (Uninsured loans): invited to apply for conventional uninsured agricultural production loans.
  - **Treatment 1** (Micro-insured loans): invited to apply for micro-insured loans, i.e., loans bundled with an index insurance policy for which the FBO was the beneficiary.
  - **Treatment 2** (Meso-insured loans): invited to apply for meso-insured loans, i.e., loans bundled with an index insurance policy for which the bank received any payouts on the condition that payouts be credited towards FBO's outstanding debt.

Hypotheses

- *H1: Access to insured loans increases the adoption of advanced production technologies*
- *H2: Micro-insured loans have a greater effect on technology adoption than meso-insured loans*

Empirical Estimation

- First, we test the empirical validity of our hypotheses by utilizing the following fixed effects (FE) model:

$$Y_{igt} = \alpha + \beta' \boldsymbol{T1_{gt}} + \theta' \boldsymbol{T2_{gt}} + \boldsymbol{\gamma' R_t} + v_{ig} + \varepsilon_{igt}.$$

  - *i, g,* and *t* index individual, FBO, and survey rounds; Y_{igt} is a binary variable indicating the use of each of the advanced agricultural inputs; $\boldsymbol{T1_{gt}}$ and $\boldsymbol{T2_{gt}}$ are vectors of binary variables indicating FBOs that had access to micro-insured loans and meso-insured loans; $\boldsymbol{R_t}$ is a vector of dummy variables indicating follow-up rounds 1 and 2; v_{ig} is the farmer fixed effect; and ε_{igt} is an error term.
  - β and θ measure the intent to treat (ITT) effects of access to insured loans on technology adoption.
    - They contain β_1 and β_2 that capture the impact of micro-insured loans between baseline and follow-up rounds 1 and 2; and θ_1 and θ_2 that capture the impact of meso-insured loans between baseline and follow-up rounds 1 and 2.
  - Second, we will assess the impact of insured loans on both land under cultivation to maize (in acres) and maize yields (in kilogram per acre) using continuous land cultivated and yield variables as outcome variables in the equation.

Results

- Some evidence that micro-insured loans may increase adoption of compound fertilizer and selective herbicides
- Did not stand with multiple hypotheses testing
- No evidence of an impact of meso-insured loans
- No evidence of increased land cultivated with maize nor increase yields.
- These results are parallel to Karlan et al. (2011) who also find inconclusive impacts of crop-price indemnified loans on inputs and negative impacts on production

	Compound Fertilizer	Straight Fertilizer	Broad Herbicide	Selective Herbicide	Hybrid Seeds
T1*Follow-up1	0.004	0.051	-0.055	0.073	-0.023
q Anderson p-value	(0.913)	(0.788)	(0.788)	(0.788)	(0.788)
T1 *Follow-up2	0.089**	0.011	0.063	0.085*	0.031
q Anderson p-value	(0.147)	(0.874)	(0.623)	(0.294)	(0.623)
T2 *Follow-up1	0.000	0.039	-0.012	0.016	-0.013
q Anderson p-value	(0.998)	(0.998)	(0.998)	(0.998)	(0.998)
T2 *Follow-up2	0.023	0.043	0.088	0.036	0.045
q Anderson p-value	(0.625)	(0.625)	(0.625)	(0.625)	(0.625)

Discussion & Policy Implications

- This is a rather complex problem that may not be solved by one-(or two) dimensional approach.
- A holistic approach that combines better designed contracts with lower basis risk, increasing understanding of contract designs and trust, access to high quality inputs, and providing government subsidy maybe needed.
- Further complimentary work should be conducted to identify what additional conditions are necessary to elicit more robust technology investment responses from insured loan borrowers.
- Greater participation of various players in the value chain: input dealers, marketers, extension agents, storage facility, and other aggregators, may be needed to generate higher return on credit-financed agricultural investments.

References

- Miranda & Gonzalez-Vega, 2011, Barnett, Barrett, & Skees, 2008