Investment, Insurance and Weather Shocks Evidence from a Lab Experiment in Cambodia

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Outline

Outline

Why do we care?

We must connect the dots between climate change, water scarcity, energy shortages, global health, food security and women empowerment. Solutions to one problem must be solutions for all.
Ban Ki-moon

We do we care?

- Poor people confronted to shocks
- Their livelihoods depend on market and climatic conditions, natural resources and volatile climate
- The effects exacerbated by lack of adequate insurance markets
- Poverty traps prevent poor people from using improved technologies

Outline

Related Literature

- Farm investment lower if credit and insurance are missing (e.g., Karlan et al., 2014)
- Insurance reduces detrimental coping strategies (e.g., Janzen and Carter, 2013)
- Insurance improves investment in risky but more remunerative tools (e.g., Hill and Viceisza, 2012)

Related Literature

- Index-based insurance
- Index underwrites a weather risk, highly correlated with yields
- Farmers get automatic payment
- No services of insurance claims assessors
- Reduced costs of information
- Reduced moral hazard and adverse selection

Related Literature

- Why still low uptake (Cole et al., 2013)?
- Belief about the probability of a shock
- Ability to understand the insurance product
- Liquidity constraints
- Trust
- Basis risk

This paper:

Impact of Index-based insurance on investment in presence of weather shocks

- Under risk
- Under ambiguity
- For different initial wealth
- When insurance is subsidized
- In presence of basis risk

Why Cambodia?

- One of the most disaster-prone country in Southeast Asia (Kreft et al., 2014)
- Estimations suggest increase in extreme weather events
- Rain-fed agriculture
- Climate changes drive food insecurity (Bylander, 2015)

Outline

Methods

- Laboratory experiment
- Saint-Paul institute, Takeo, Cambodia
- February-March, 2016
- Undergraduate students/farmers
- 11 sessions, 215 subjects

Experimental protocol

- Simple game (physical implementation)
- 4 treatments
- Manipulation of:
  - Presence of insurance
  - Presence of basis risk (1%, 10%)
  - Presence of subsidy
- Two variants:
  - Initial wealth
  - Risk *vs* ambiguity

▸ The game

Hypotheses

1. Risk averse farmers increase inputs' choice when an insurance is available holding wealth and weather constant
2. Ambiguity affects the number inputs' purchased
   - Under ambiguity individuals use heuristic tools
3. Wealth (and subsidy) affects inputs' choice
4. Basis risk introduces a further uncertainty with a resulting effect on the number of inputs purchased

Table: Treatments: number of subjects

		Between subjects				
		Poor		Rich		
		Risk	Ambiguity	Risk	Ambiguity	Total
Within subjects	T1	64	60	43	48	215
	T2	64	60	43	48	215
	T3, 1%	40	36	19	27	122
	T3, 10%	24	24	24	21	93
	T4	40	36	43	48	167
	T5	24	24			48

Note: Subjects have undergone either T3,1% or T3,10%.

T5 has been conducted on a randomly drown set of subjects who have not undergone treatment T4.

Procedures

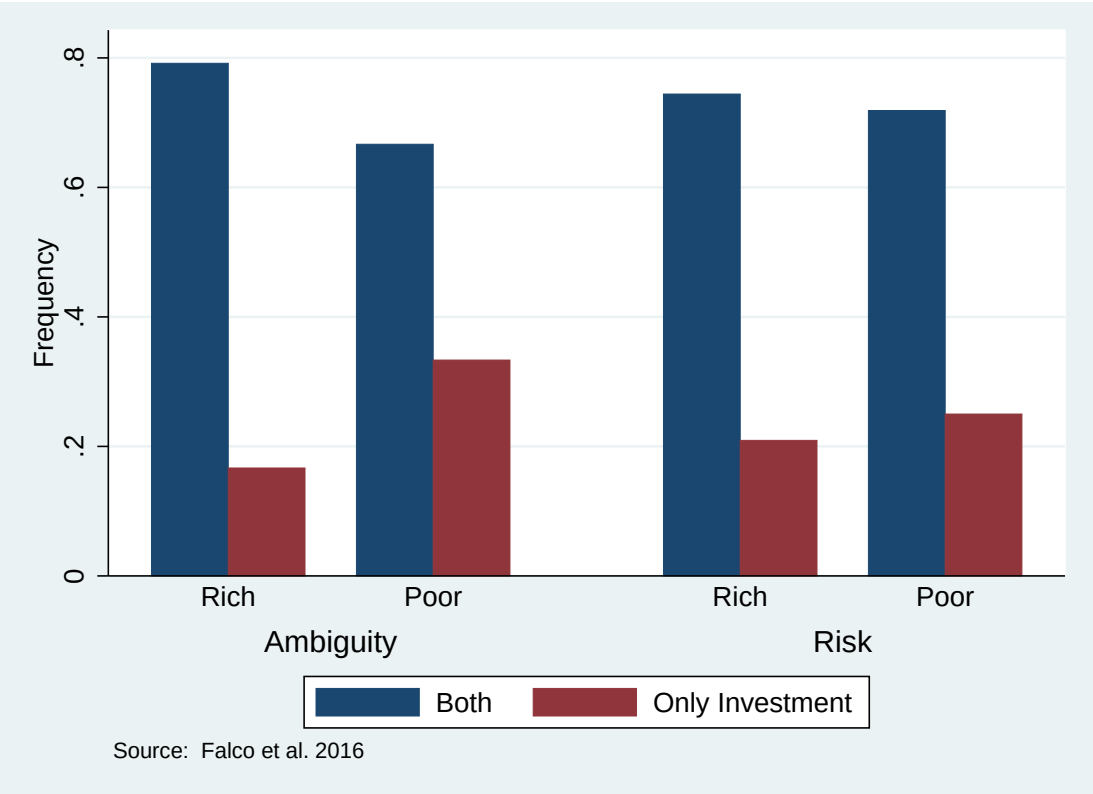
- Subjects randomly assigned to poor/rich and risk/ambiguity
- Seated at spaced intervals
- Within-subjects design
- Reversed order (12 orders)
- Instruction in Khmer
- Experiment lasted on average 90 minutes
- Average payment: 2 dollars

Outline

Results

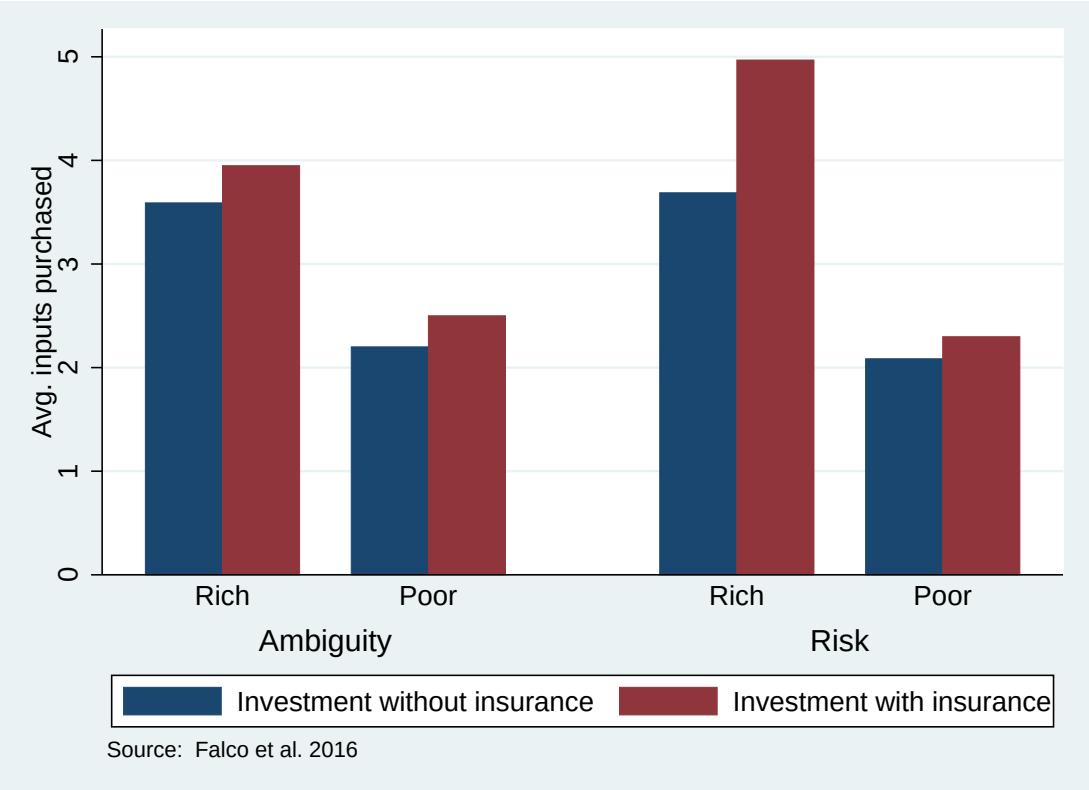
- Main results
  - Substitution or Complementarity
  - Effect of Insurance on Investment
  - Effect of Subsidy
- Determinants of Insurance Purchase

Main Results: Substitutes or Complements?



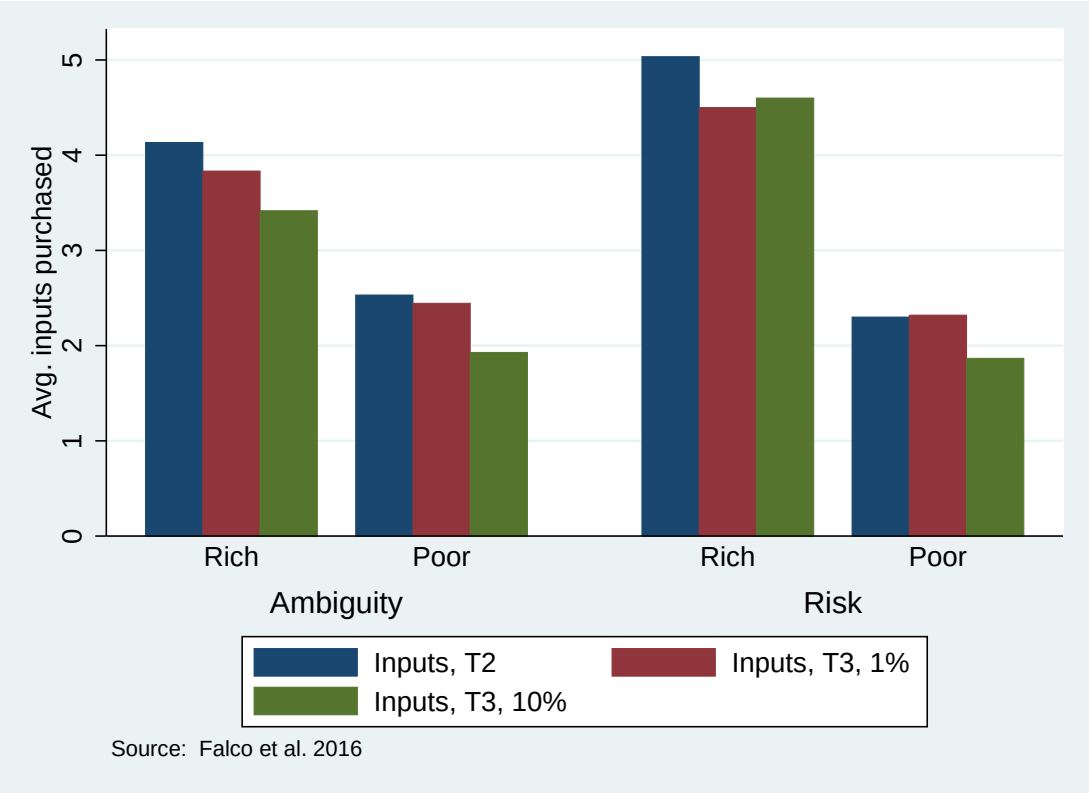
Result 1 *Under ambiguity the frequency of poor who choose to invest only in risky inputs and do not buy an insurance is significantly greater than that of the rich suggesting that, under ambiguity, the poor experience a slight substitution effect.*

Main results: Effect of Insurance on Inputs



Result 2 *The presence of a market for insurance increases, on average, the investment in inputs. However, this effect is significant only for the rich and only under risk.*

Main results: Effect of Insurance on Inputs



Result 2.1 *The presence of basis risk reduces the amount of inputs purchased.*

Main results: Subsidy

Figure: Investment in risky inputs. Only poor

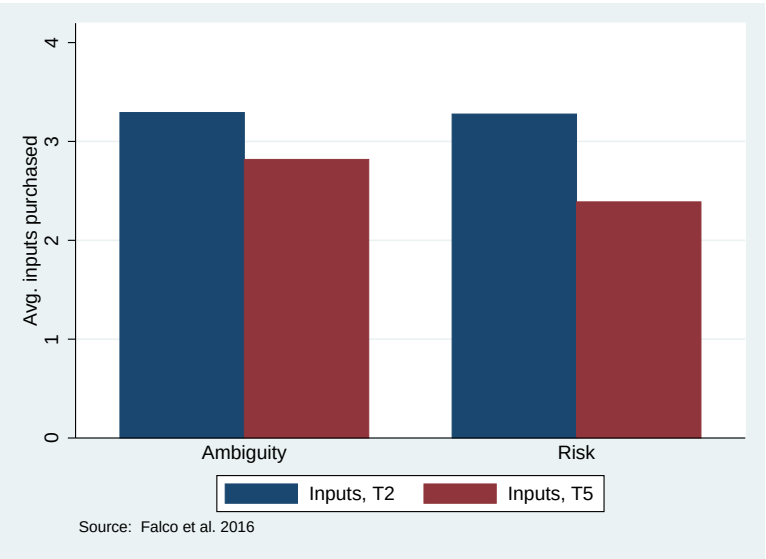
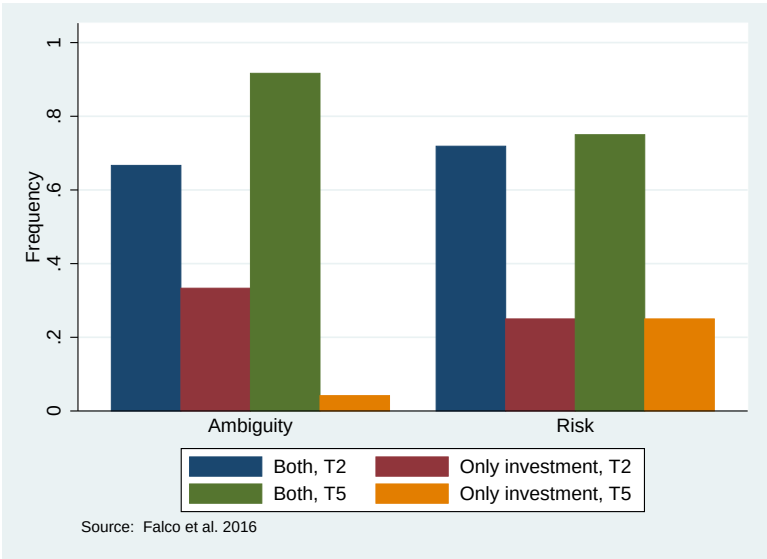


Figure: Complementarity: purchase both. Only poor



Result 3 *The presence of a subsidy significantly decreases the average number of inputs purchased by the poor. However, under ambiguity, it significantly reduces the substitution effect.*

Determinants of Insurance Purchase

Table: Determinants of insurance purchase

	Ambiguity		Risk	
	(1) Insurance, T2	(2) Insurance, T3	(3) Insurance, T2	(4) Insurance, T3
Drought	0.115	0.092	-0.057	0.099
	(0.093)	(0.089)	(0.103)	(0.076)
Flood	0.381 ***	-0.269	0.016	0.166*
	(0.136)	(0.242)	(0.153)	(0.094)
Rain	0.323 ***	0.020	-0.324	-0.316
	(0.104)	(0.306)	(0.335)	(0.291)
Crop	-0.081	0.112	0.163	-0.074
	(0.108)	(0.083)	(0.104)	(0.098)
Risk aversion	-0.002	-0.022	0.017	-0.044 *
	(0.028)	(0.023)	(0.027)	(0.023)
Borrow money	0.113	0.095	-0.006	-0.139 *
	(0.102)	(0.101)	(0.094)	(0.075)
Poor	-0.167 *	0.020	0.058	0.018
	(0.090)	(0.082)	(0.092)	(0.085)
Impatient	0.080	-0.018	-0.081	-0.083
	(0.097)	(0.102)	(0.093)	(0.076)
Trust	0.072	-0.011	-0.081	-0.016
	(0.115)	(0.108)	(0.185)	(0.157)
Final grade	-0.003	-0.008	-0.005	0.005 *
	(0.007)	(0.007)	(0.003)	(0.003)
R^2	0.124	0.105	0.070	0.193
Obs.	105	105	98	99

Standard errors in parentheses

Outline

Conclusions

- A market for insurance increases, on average, investment in profitable but risky inputs
  - ...only for the rich
  - ...only when the probability of a shock is known
- Under ambiguity poor people experience a slight substitution effect that disappears when a subsidy is available to cover the cost of the insurance
  - ...however in a complete market discourages investment
- Under ambiguity people rely on heuristic tools

Thank you!

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The game

- Initial endowment: $y_i^{r,p}$
- The player decides how many inputs to purchase
- Every input costs i ECU
- Sunk cost (k) to keep initial endowment operative
- The initial endowment produces a fixed amount (f)
- The return from inputs (r) depends on the realization of the shock (p)
- r if a shock does not occur, 0 if a shock occurs
- Probability based on Cambodian historical data of climate change
- Payoffs insure: $y_i^{r,p} > k + ni$

The player's income given by:

$$y_f^{r,p} = y_i^{r,p} - k - ni + p(0) + (1-p)[(1+r)ni + f] \qquad (1)$$

The game

In T2 actuarially fair insurance has unit cost $m > 0$ (out-of-pocket):

$$y_f^{r,p} = y_i^{r,p} - k - ni - m + p(0) + (1-p)(r * ni + ni + f) \quad (2)$$

- Holding the number of inputs constant, equal difference between the expected values of income with and without insurance
- However, insurance reduces the variance
- In $T3$ there is a probability of error equal to 99% or 90%

Go back