

How Does Risk Management Influence Production Decisions? Evidence from a Field Experiment

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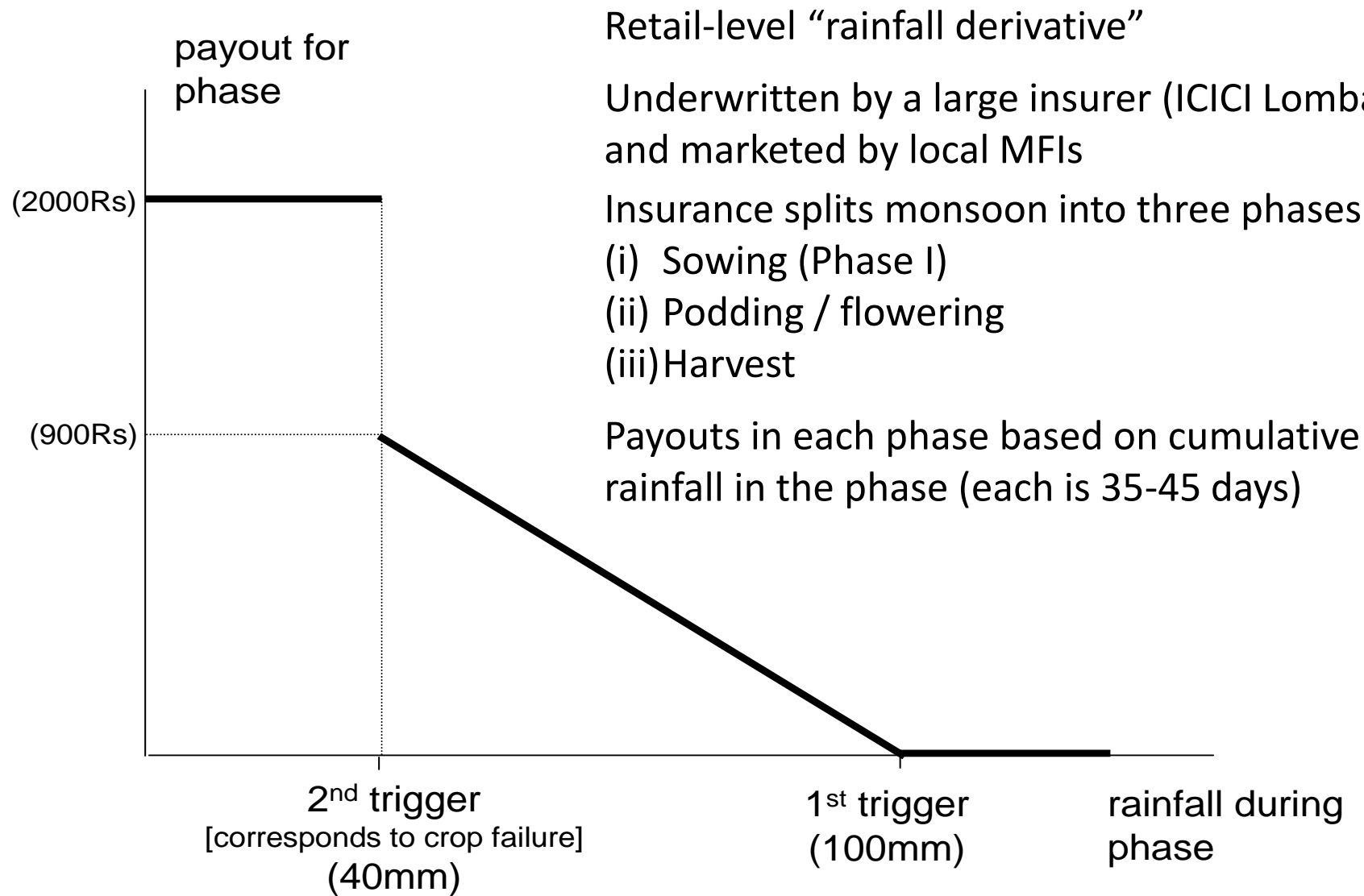
Underinsurance and Underinvestment

- Estimates of marginal rates of return on investment in developing countries are generally very high (Duflo, Kremer and Robinson, 2008; Suri, 2010; McKenzie et al. 2009)
- **One possible explanation:** high expected returns are compensation for uninsured production risk.
- Some evidence of costly “income smoothing” (Morduch, 1995, Chetty and Looney, 2006; Binswanger and Rosenzweig, 1992).
- In the finance literature, firms reduce investment in low returns activities when firms expect to be financially constrained (Froot and Stein, 1998).

The Experiment

- Sample: ca. 1,500 households from 2 districts of drought-prone areas of Andhra Pradesh. Two-thirds are part of earlier 2004 & 2006 surveys. Remainder from study villages + nearby villages.
- Randomization design:
 - Half of the farmers (chosen randomly) were given 10 Phase-I weather insurance policies that would cover all inputs cost (seed, FYM, fertilizer and labor) for a hectare of main cash crop in the district.

Insurance Design (Example contract)



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 - Other half of farmers receive coupon for approximate expected value of the policy (Rs 350) to be redeemable after harvest, when payouts (if any) are due. We do this to control for any wealth effect.
 - Farmers also received up to three vouchers for fertilizer bags, with randomized discounts. (Not discussed in detail here).

The Experiment



ఇక్రిశాట్ - బేసిక్స్ పరిశోధన పాల్గొనే రైతుల స్కాచ్ కార్డు

సీరియల్ నెంబరు:

ఆర్థిక ప్రాత్యాహం

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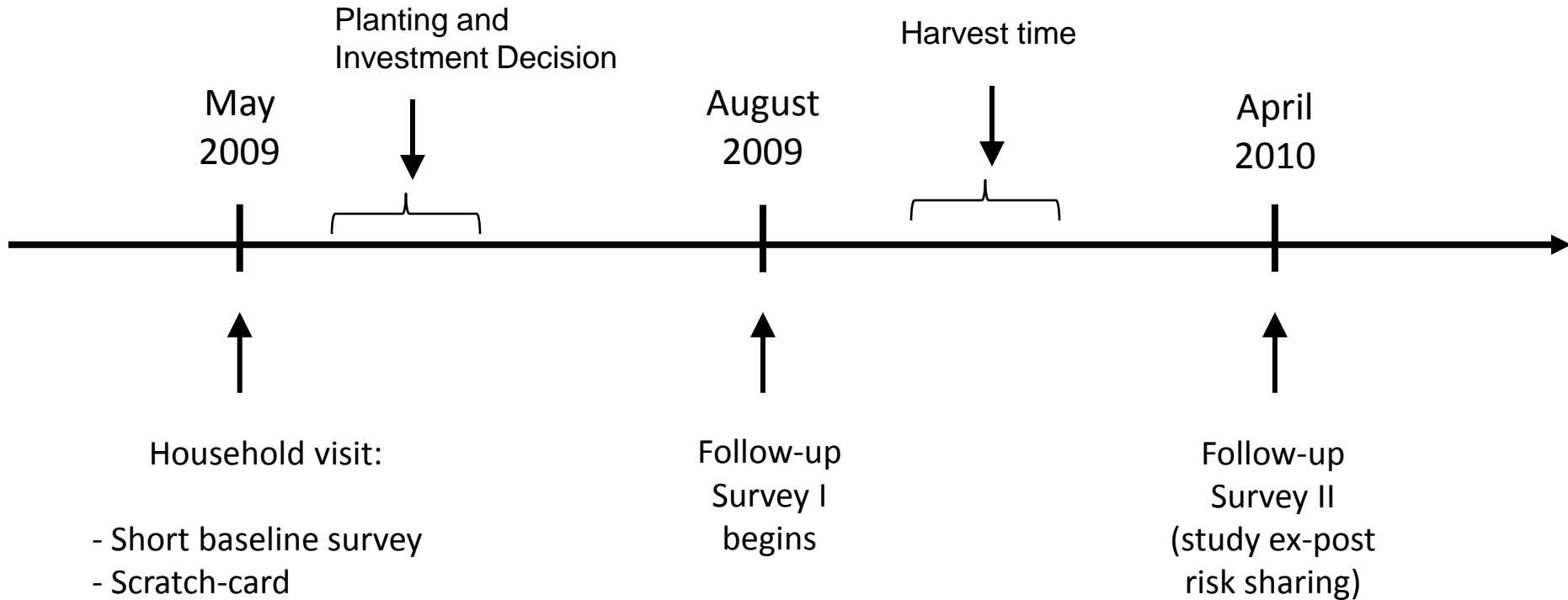
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Timeline



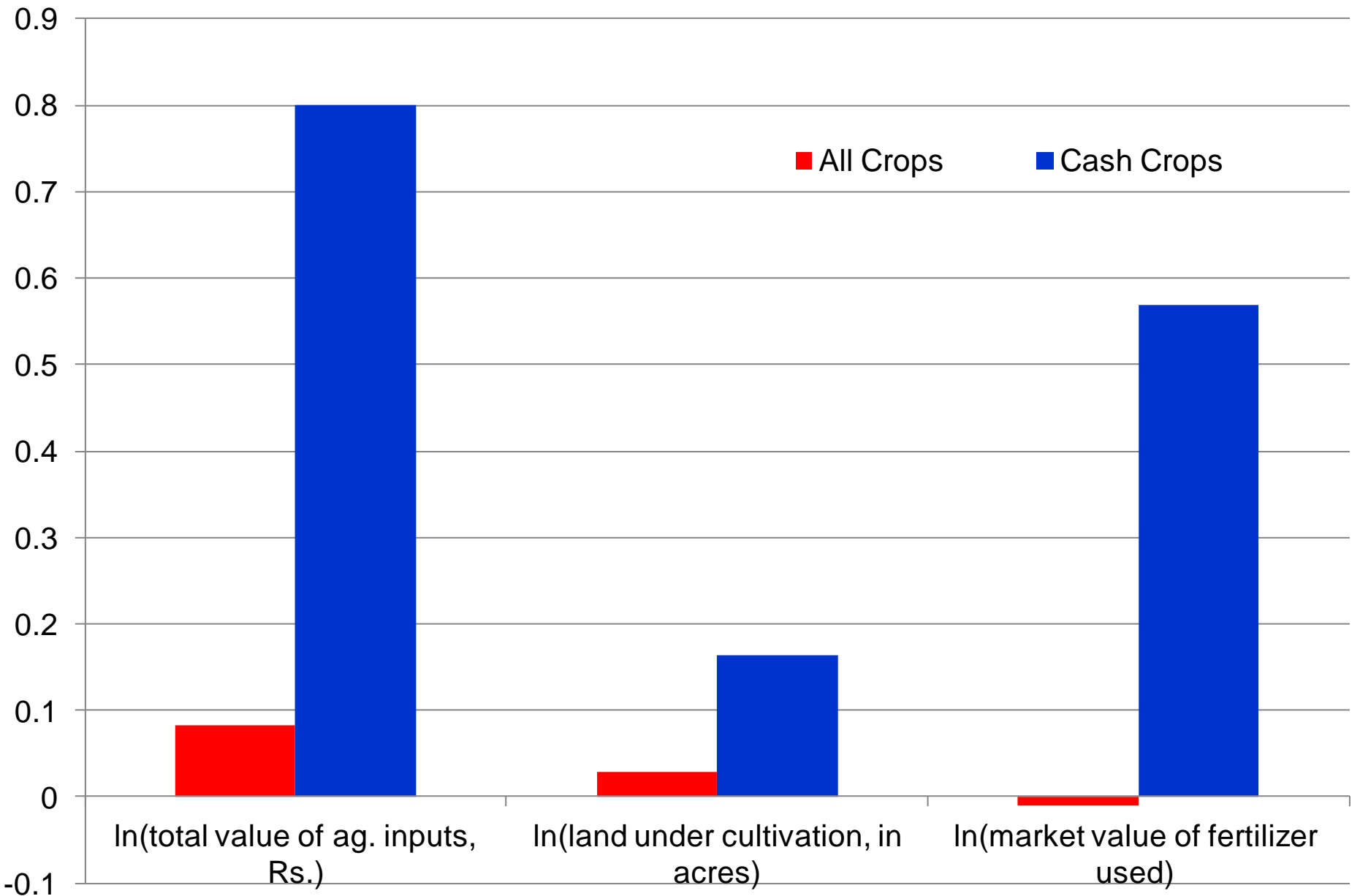
Hypotheses

- Farmers underinvest in inputs due to rainfall risk
 - Randomly assign insurance at the start of the monsoon
 - Effects on total investment?
 - Substitution between cash crops and subsistence crops?

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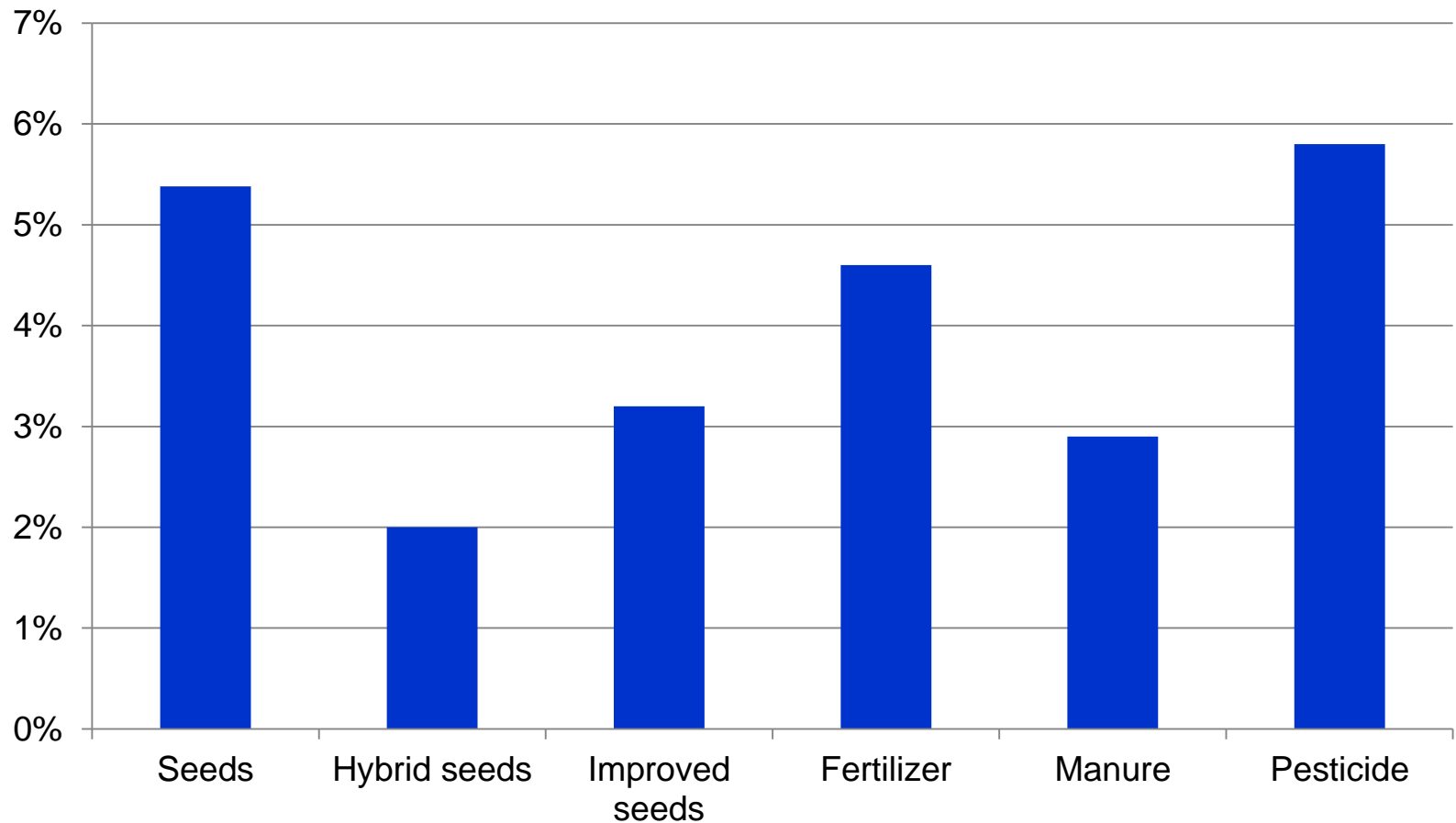
- Farmers underinvest in inputs due to rainfall risk
 - Randomly assign insurance at the start of the monsoon
 - Effects on total investment?
 - Substitution between cash crops and subsistence crops?
- Two approaches to testing these hypotheses
 - Qualitative Evaluation
 - Ask farmers before planting, if they adopt costly risk-coping strategies
 - Ask insured farmers after planting, if they changed behavior
 - Experimental evaluation

Basic results: Difference in investment rates



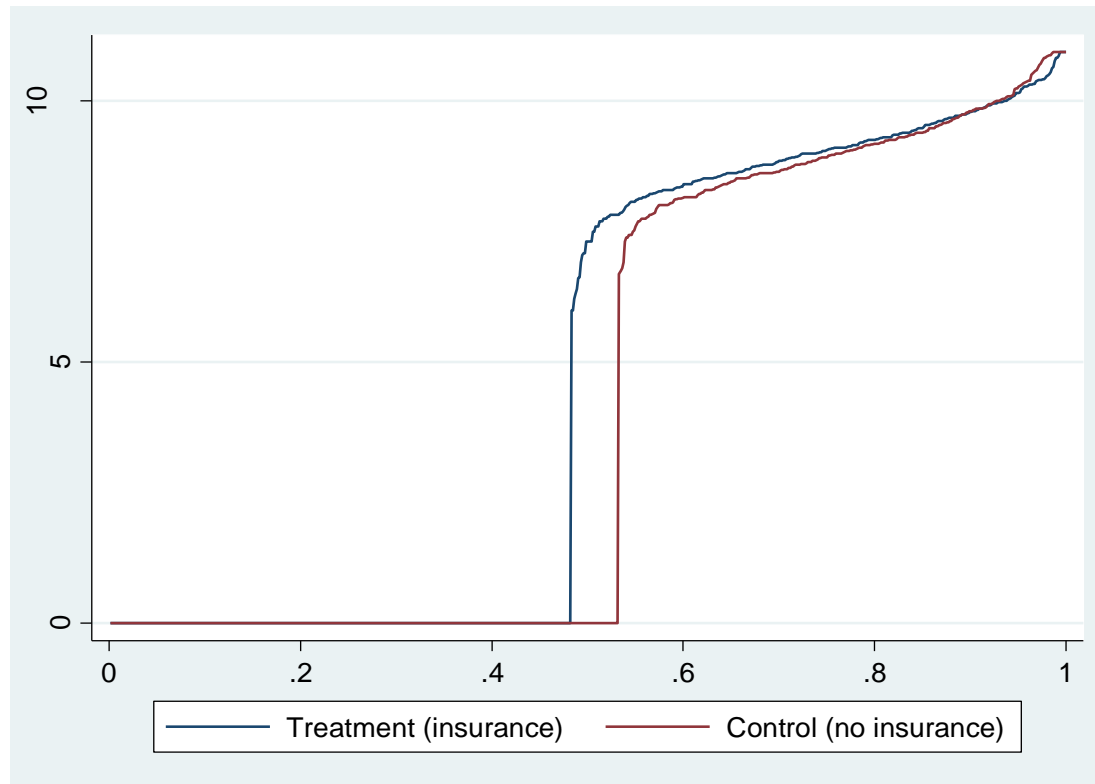
Input usage in individual categories

Graph presents point estimates in fraction of farmers reporting positive usage of the input listed in the production of cash crops.



Cumulative distribution of cash crop investment

- Figure: cumulative distribution of log investment in cash crops by treatment status [insurance vs no-insurance].
- Treatment effect is non-linear. Primary effect is on extensive margin.



Timing

Figure: Fraction of farmers who had planted cash crops by different points during 2009 monsoon season: difference between treatment and control group.

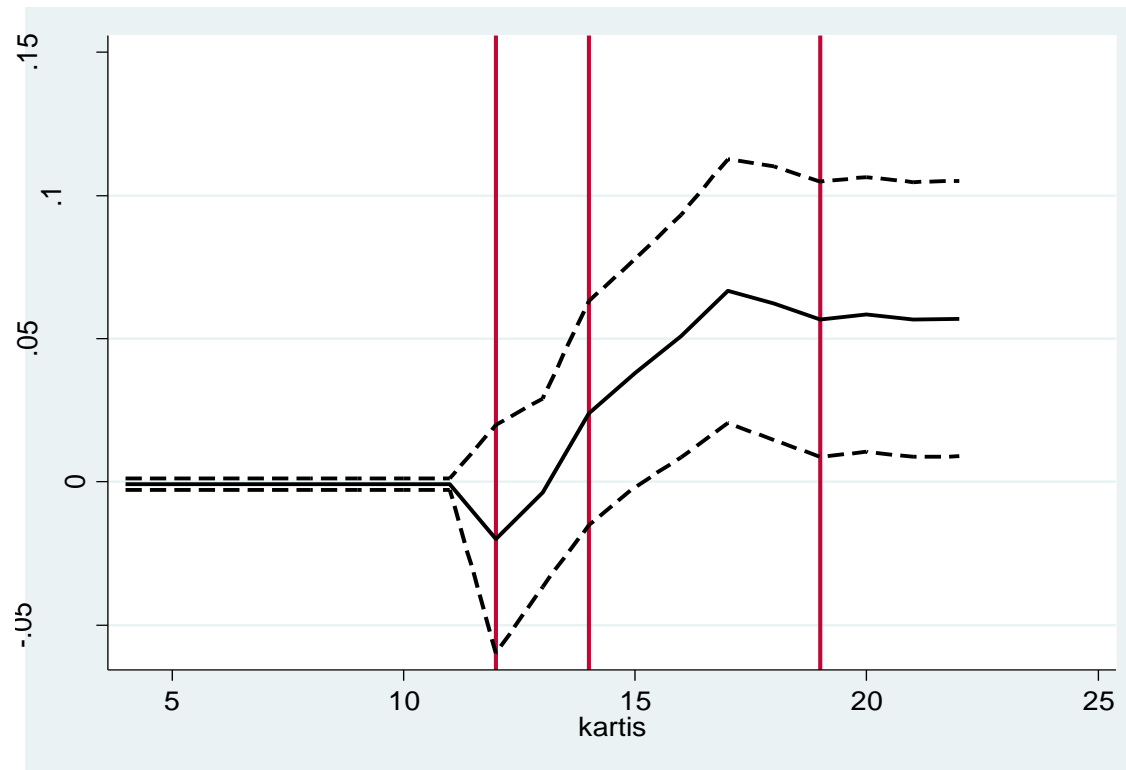
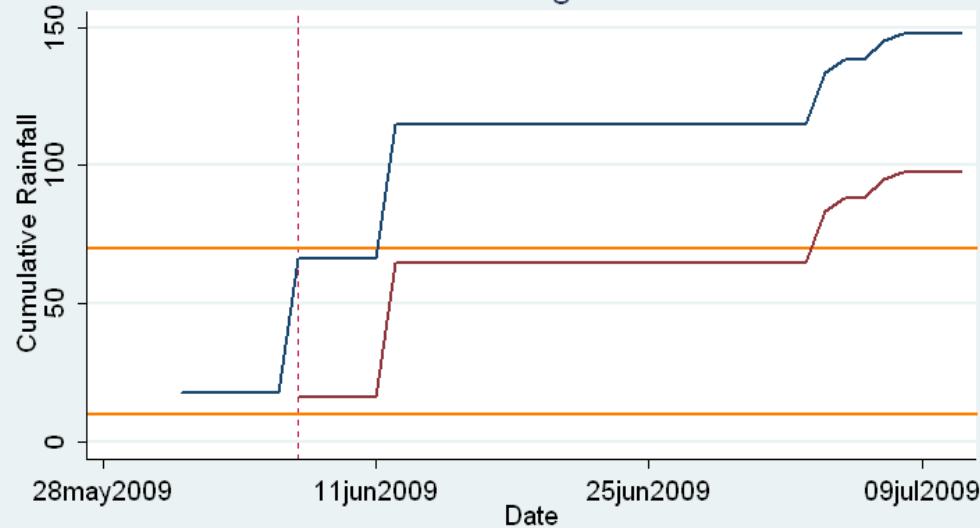


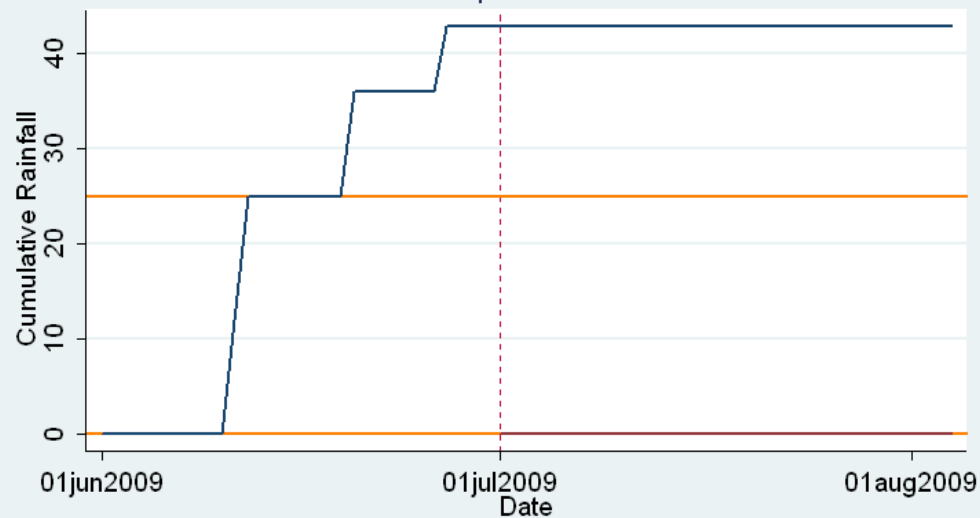
Figure note: Left and middle vertical lines show period during which field experiment was implemented. Right vertical line shows Kartis in which period of insurance coverage ended.

Ex-ante or Ex-post behavior?

Mehboobnagar : IMD



Hindupur : INGEN



— Cum Rainfall from Jun 1 — Cum Rainfall from start of policy

Horizontal lines indicate strike and exit.
Dashed vertical line indicates the date when the Phase 1 policy starts.
The graph ends when the policy ends, which is 35 days after the start date.

Farmer investment is continuous:
Farmers wait for first rains to plant

Insurance reduces risk but also increases wealth as season evolves

So increased investment in cash crops may represent pure risk mitigation and higher ability to re-invest if crops fail

Mahbubnagar: Early on, farmers could have known significant payout was very unlikely

Hindupur: Probability of large payout increasing over time

Interaction effects

- Production response may depend on wealth, or experience with insurance product and perceptions about production risk
- Among treated farmers:
 - Those that perceived cash crops as riskier were more likely to change behavior as a result of insurance
 - But richer farmer were also *more* likely to change behavior
 - The actual payout to be received did not influence change in behavior, pointing to ex-ante changes, rather than ex-post.

Summary of findings

- Evidence that access to hedging instruments influences real investment for our sample of small farmers / firms.
- Main margin: substitution from less risky to more risky investments (subsistence crops to cash crops).
- Effect size concentrated in the median, but it appears large: increase of Rs. 1500 investment in cash crops when provided with Rs. 350 in insurance.

Future Work: Ex-post smoothing

- In 2009, India experienced its worst monsoon since 1972. From June to mid-August, when planting takes place, rains in our survey areas were 29%+ below average.
- Significant payouts on the insurance policies distributed by us as part of these experiments.
 - Maximum payouts: Rs 10,000 (US 210), paid to about 250 farmers .
 - This amount of funds is significant. Equals twice the average amount of savings (and four times the median level of savings), or roughly one fourth household revenue.
- Questions: (i) How did households smooth this shock? (ii) funds used for later investments after received? (iii) Test consumption smoothing.
 - Using second follow-up survey for analysis.