Barriers to Household Risk Management: Evidence from India

Shawn Cole
(HBS)

Xavier Gine
(World Bank)

Jeremy Tobacman
(Wharton)

Petia Topalova
(IMF)

Robert Townsend
(MIT)

James Vickery
(NY Fed)

Presentation by Xavier Gine

Index Insurance 4 Innovation Initiative

Scientific Committee Meeting, Rome

January 15, 2010

Views expressed in this presentation are my own, and do not reflect the opinions of the IMF, World Bank, Federal Reserve Bank of New York or the Federal Reserve System.

Introduction

- Theory suggests households should diversify idiosyncratic risk.

- Yet, most individuals (and countries) hold idiosyncratic risk even when publicly observable / exogenous:

  - e.g. exposure to house price risk, local weather fluctuations, commodity prices, regional income growth etc.

  - Sometimes hedging markets have simply not developed, in other cases they exist but are not widely used.

  Shiller (1998): *"It is odd that there appear to have been no practical proposals for establishing a set of markets to hedge the biggest risks to standards of living"*

Introduction

- **Research Question**: Why don't more households participate in formal markets when available?

- We study participation in a retail-level rainfall insurance product offered to rural Indian households.
  - Test theories of insurance demand, using a series of randomized evaluations in Andhra Pradesh and Gujarat

- Setting where diversification benefits appear particularly high:
  - Nearly 90% of households in our study areas cite rainfall shocks as most important risk faced by the household.
  - However, local rainfall shocks are nearly uncorrelated with systematic risk factors, such as stock returns, etc.

Motivation (cont...)

- Is low take-up a puzzle?
  - Households use a range of ex-ante and ex-post mechanisms to smooth consumption and labor
    - Saving, intra-household transfers, grow safer crops etc.
  - Some evidence (e.g. Morduch, 1995) that these are:
    - Insufficient, especially for poor households.
    - Costly, in the sense that they trade-off risk for lower return.
    - Poor hedges against shocks that are aggregate to all households in a village, such as a drought.

- Demand for weather insurance if the product can be used to hedge risk more cost effectively.

Very Simple Calibration

- One-period, static set-up

- Household with CRRA preferences

- Household wealth faces a zero-mean random shock S, against which it can purchase partial insurance

- Consider two insurance policies:
  - Linear function of S, when S is negative
  - Step-Linear function of S, pays when S is below some threshold $S_0 < 0$

- (Conservatively) match parameters to data
  - Wealth Rs. 50,000
  - Normal shock S: mean zero, standard deviation Rs. 10,000
  - Expected value of insurance policy is 30%

- Should household purchase Rs. 100 policy?

Should households buy at least one policy?

Benefits of insurance in terms as a function of risk aversion
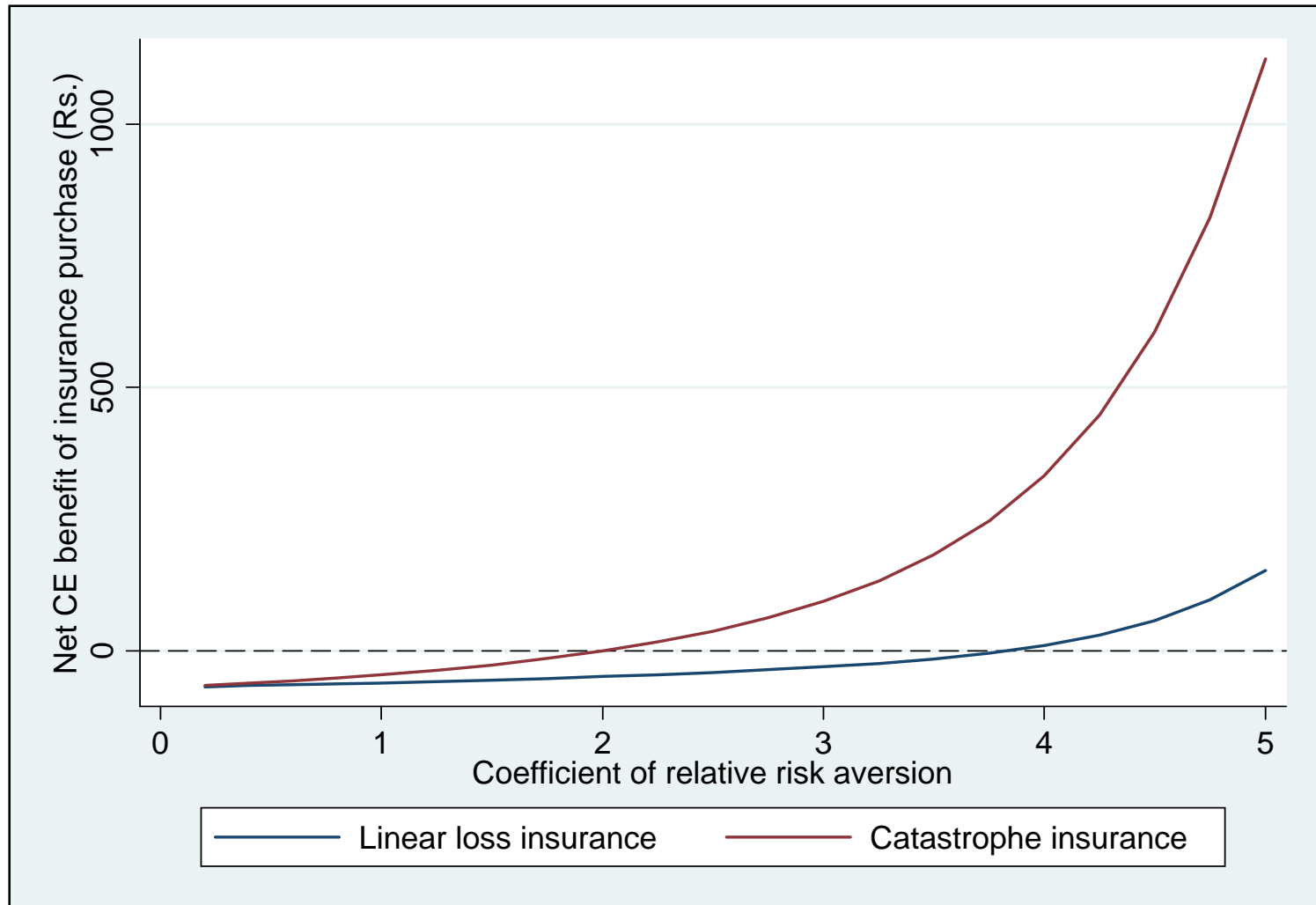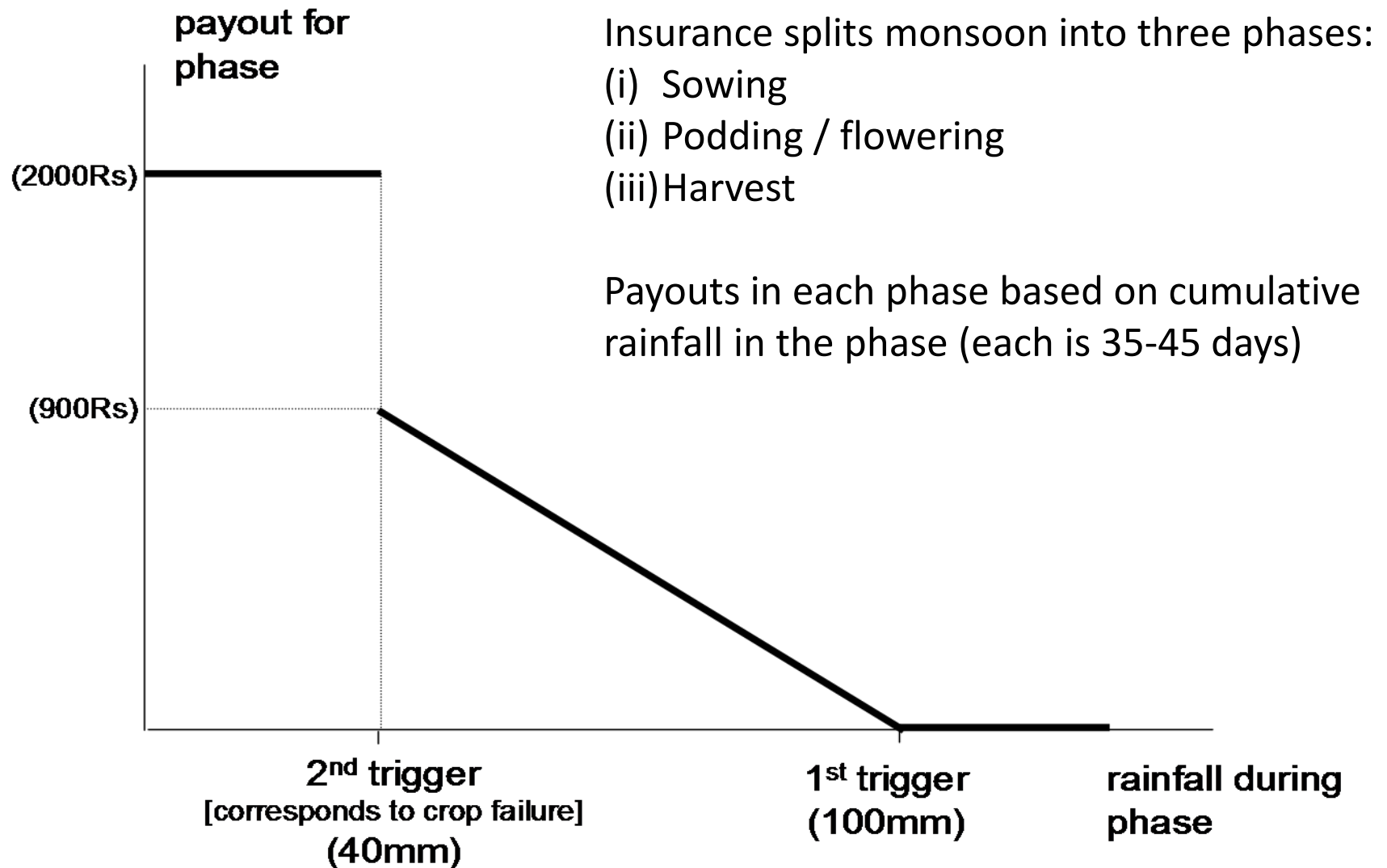
Outline

- Product Description and Aggregate Take-up rates

- Setting, Sample, and Research Design

- Determinants of adoption

- Conclusion and Future Research

Product Description

- Financial derivative on rainfall
  - Payouts based on rain measured at local rainfall station, relative to different thresholds
  - Designed to correlate payouts on rainfall to yields
  - Sold within 20km of station by local MFIs
  - Monsoon split into three phases (sowing, podding/flowering and harvest). Separate policies for each phase.

- First sold in 2003, in Andhra Pradesh. Now available in many Indian states.
  - Originally designed by World Bank and ICICI Lombard (Indian general insurer, who also underwrites policies).

Insurance Design (Example, Phase II: Narayanpet)

Insurance splits monsoon into three phases:
(i)   Sowing
(ii) Podding / flowering
(iii) Harvest

Payouts in each phase based on cumulative rainfall in the phase (each is 35-45 days)

Policy Terms

					Expected payout	
Panel A: ICICI Policies						
Year	District / Type	Premium	Payout slope	Limit	Rs.	% of premium
Andhra Pradesh						
2006	Anantapur	340	10	1,000	113	33%
2006	Atmakur	280	10	1,000	n.a.	n.a.
2006	Hindupur	295	10	1,000	n.a.	n.a.
2006	Kondagal	290	10	1,000	n.a.	n.a.
2006	Mahabubnagar	270	10	1,000	115	43%

				Expected payout	
Panel B: IFFCO-Tokio Policies					
		Premium	Normal Rain	Rs.	% of premium
Gujarat					
2007	Ahmedabad	44	607.4	25	57%
2007	Anand	72	783.6	n.a.	n.a.
2007	Patan	86	389.9	43	50%

Advantages and limitations of the product

- Key benefits
  - No moral hazard
  - No adverse selection (expect perhaps temporal)
  - Historical rainfall data can be used to set prices
  - Insurable in international risk markets
  - Divisible (policies as cheap as $1.50) and easy to purchase
  - Automatic claim calculation and fast settlement

Advantages and limitations of the product

- ## Key limitations
    - Basis Risk (rainfall at farm, and consumption, imperfectly correlated with rainfall at the rain gauge).
    - Expensive, in part due to low scale. Payout 30-40% of premium.
    - Product may be complicated to understand and evaluate.
    - May crowd out informal insurance (or have negative general equilibrium effects)

- Currently designed as "catastrophe" insurance: Pays in 1 of 8 phases, but max payout is triggered 1 in 100 phases.

Aggregate patterns of take-up (Andhra Pradesh)

	Study Area			Entire State		
	N. Villages where insurance sold	Share of HHs Purchasing insurance	Total number of contracts	N. Villages where insurance sold	Share of HHs Purchasing insurance	Total number of contracts
	(1)	(2)	(3)	(7)	(8)	(9)
2003	2	15.2%	92	17	11.4%	194
2004	25	4.0%	282	43	7.4%	318
2005	12	5.4%	641	422	6.6%	3,214
2006	37	2.9%	564	538	7.6%	6,039

- Rainfall insurance is still in its infancy, and yet to receive widespread acceptance amongst farmers.

Persistence in Take-Up

Andhra Pradesh				Gujarat			
2004		2005		2006		2007	
76.3% Did Not		76.13%	Did not	80.4%	Did Not	73.12%	Did not
		23.87%	Bought			26.88%	Bought
23.7% Bought		79.86%	Did not	19.6%	Bought	59.79%	Did not
		20.14%	Bought			40.21%	Bought

Persistence in Take-Up

Andhra Pradesh				Gujarat		
2004	2005	2006	Percent	2006	2007	Percent
No	No	No	50.1%	No	No	58.8%
No	No	Yes	15.6%	No	Yes	21.6%
No	Yes	No	1.1%	Yes	No	11.7%
No	Yes	Yes	0.5%	Yes	Yes	7.9%
Yes	No	No	12.7%			
Yes	No	Yes	6.2%			
Yes	Yes	No	2.7%			
Yes	Yes	Yes	2.1%			

Correlates of Take-Up

	Univariate		Multivariate	
	Andhra Pradesh	Gujarat	Andhra Pradesh	Gujarat
	(1)	(2)	(5)	(6)
Risk aversion	-0.219***	-0.283***	-0.123**	-0.098*
	(0.055)	(0.055)	(0.056)	(0.056)
Expect Good Rain	0.008	-0.169***	-0.006	-0.110***
	(0.014)	(0.036)	(0.015)	(0.034)
Share land irrigated	0.070**	0.178**	-0.015	0.083
	(0.033)	(0.073)	(0.038)	(0.065)
Log of wealth	0.024*	0.156***	-0.032*	0.182***
	(0.013)	(0.033)	(0.018)	(0.037)

Correlates of Take-Up

	Univariate		Multivariate	
	Andhra Pradesh	Gujarat	Andhra Pradesh	Gujarat
	(1)	(2)	(5)	(6)
Familiarity with insurance and BASIX				
Average Payout in Previous Years	0.121***		0.000	
	(0.037)		(0.000)	
Financial literacy		0.036**		0.009
		(0.018)		(0.018)
Probability skills		0.049***		0.035**
		(0.018)		(0.017)
Insurance skills (normalized)	0.074***	0.014	0.055***	-0.045**
	(0.014)	(0.019)	(0.018)	(0.019)
Household has some type of insurance (1=Yes)	0.143***	0.294***	0.120***	0.218***
	(0.037)	(0.038)	(0.038)	(0.039)
Does not know insurance provider (1=Yes)	-0.169***		-0.131***	
	(0.031)		-0.035	

Survey: Reasons for insurance non-purchase

Table 10: Stated Reasons for Insurance Non-Adoption

	Andhra Pradesh		Gujarat
	2004	2006	2006
Insufficient funds to buy insurance	27.1%	80.8%	27.9%
It is not good value (low payout / high premiums)	16.4%	7.85%	15.0%
Do not trust insurance provider	2.34%	5.23%	n.a.
It does not pay out when I suffer a loss	17.8%	2.91%	n.a.
Do not understand insurance	21.0%	2.33%	10.9%
Do not need insurance	2.80%	0.58%	25.2%
No castor, groundnut	6.07%	n.a.	n.a.
Other	6.54%	0.29%	32.7%

Field experiments

- Design of treatments guided by potential barriers to adoption:

- Neoclassical
  - Price (relative to actuarial value)
  - Transaction Costs
  - Liquidity constraints

- Non-standard
  - Financial literacy / complexity
  - Trust (a la Guiso, Sapienza and Zingales, 2007)
  - Framing and marketing effects

Field Experiments: Settings

- ## Andhra Pradesh
  - 1,052 households from 37 villages in two [districts](#)
  - 700 of 1,054 households randomly selected for marketing
  - Policies offered through BASIX, well run microfinance lender
  - Mostly landowners
  - Interventions conducted by ICRISAT and BASIX

- ## Gujarat
  - 1,997 households for "flyer" treatments (from 30 villages treated in 06)
  - 1,400 households for "video" treatments (from 20 new villages)
  - Households members of SEWA, a local NGO
  - Includes farmers and landless laborers
  - Interventions conducted by SEWA staff

- ## Treatments randomly assigned at individual level

Experiment: Price (Gujarat)

- Financial services expensive to provide in poor areas
  - Efficiency wages, fixed transaction costs (regulatory) for small ticket sizes, etc.

- Gujarat, expected payout 50-57% of premium

- Insurance Premium ranges from Rs. 44-Rs. 86

- Intervention: Randomly assign discounts to households

- Offer discount of Rs. 5, 15, or 30 for first policy purchased

Experiment: Price (Gujarat)

▪ Demand and Returns to Insurance

	Ahmedabad		Patan		Anand	
	"Return"	Take-Up	"Return"	Take-Up	"Return"	Take-Up
Discount						
5	0.64	25%	0.54	0.22	n/a	0.36
15	0.87	37%	0.61	0.22	n/a	0.37
30	1.81	47%	0.78	0.30	n/a	0.44

- In regression, price significant at 1% level
- Price elasticity of demand approximately 80%

- Calculate expected return of policy using historical data
- 53% of households decline policy with expected 81% return over four months

Experiment: Liquidity Constraints (AP)

- Motivation: insurance purchase occurs prior to onset of monsoon

  - Concurrent to purchases of seeds, fertilizer, etc.

  - Household may be credit-constrained

- Households typically receive small compensation for time required to sit through two-hour household survey

- Randomly offer "high reward" of Rs. 100 or "low reward" of Rs. 25 (recall premium 295-340)

Experiment: Liquidity Constraints (AP)

Treatments

	(1)	(2)	(3)
Visit (1=Yes)	0.177***	0.132***	0.121***
	(0.040)	(0.045)	(0.045)
Endorsed by LSA (1=Yes)	0.063*	0.065	0.062
	(0.038)	(0.042)	(0.042)
Education module (1=Yes)	-0.018	-0.023	-0.021
	-0.031	-0.035	-0.035
High reward (1=Yes)	0.347***	0.338***	0.325***
	(0.031)	(0.036)	(0.037)
Village endorsed (1=Yes) x Visit (1=Yes)	-0.014	0.062	0.067
	(0.038)	(0.051)	(0.051)

- Increases purchase by 35 percentage points (t-stat 10)
- Caveat: reciprocity

Non-standard barriers to adoption

Experiment: Trust

- Motivation
  - In contrast to credit, insurance requires substantial trust
  - Many households never entered into any non-credit contract
  - ICICI Lombard may not be familiar to households
  - Cf. Guiso et al. (2008); trust limits stock market participation

- Intervention
  - Employee of local microfinance institution (BASIX) employee, known to villagers, accompanies insurance sales team
  - Endorses the sales agent

- Result
  - Positive effect of 6.3 percentage points
  - Driven entirely by households that are familiar with BASIX
  - Amongst this group, increases takeup by 18.3%.

Experiment: Financial Literacy

- Motivation
  - Farmers may not be very familiar with insurance
  - Contract payouts based on mm rainfall
  - Farmers familiar with soil moisture
  - Education 'at point of sale' may be most effective

- Intervention
  - Education [module](#) for 350 of 700 households
  - Related rainfall to mm

- Result
  - No effect on take-up: can rule out an effect size of 4 percentage points or greater

- Caveat
  - Module relatively short (added 3 minutes to visit)

Experiment: "Classic" framing effects

- ## Motivation
  - Johnson et al. (1993) find large framing effects in hypothetical insurance demand questions
  - Induce variation in take-up for impact evaluation

- ## Treatment (via flyers and video)

- ## Intervention 1: "Asian Disease" framing
  - This policy would have paid out in 2 of the past 10 years
  - This policy would not have paid out in 8 of the past 10 years

- ## Intervention 2: Vulnerability Frame
  - Protect yourself against catastrophe
  - Ensure that you have enough to provide for your family

- ## Results
  - Cannot reject hypothesis of no effect

Experiment: Group identity and risk-sharing

- Motivation
  - Other groups may (attempt to) claim insurance payouts
    - Family members
    - Members of community
  - May purchase insurance to benefit self, or to protect others

- Treatment
  - Emphasize individual protection vs. group (protect your friends and family)
  - Change language in flyers to emphasize religion

Gujarat Design: Religion cue in flyer

- "Farmers used to worry about whether the rains would come. After all, only God can control the rain. But weather insurance provides protection and security."

- "Ramjibhai used to worry about whether the rains would come. After all, only God can control the rain. But weather insurance provides protection and security."

- "Hamikhan used to worry about whether the rains would come. After all, only God can control the rain. But weather insurance provides protection and security."

Gujarat Results: Flyer Effects

	All	Muslim	Hindu
Muslim treatment (1=Yes)	0.044	0.174*	0.037
	(0.028)	(0.096)	(0.032)
Hindu treatment (1=Yes)	0.025	0.164*	0.010
	(0.028)	(0.097)	(0.031)
Group treatment (1=Yes)	0.060**	0.253**	0.049
	(0.030)	(0.108)	(0.035)
Muslim x Group	-0.099**	-0.244	-0.094**
	(0.042)	(0.149)	(0.047)
Hindu x Group	-0.037	-0.415***	-0.023
	(0.041)	(0.145)	(0.047)
Village fixed effects	Yes	Yes	Yes
Mean of dependent variable	0.237	0.173	0.269
Observations	2389	127	1997

- Impact:
  - Small main effect for group x no religion
  - "Hindu * Group" reduces purchase among Muslims
  - "Muslim*Group" reduces purchase among Hindus

31

Summary

Factor	AP	Gujarat
Price (20% discount)	--	Yes
Reputation of Seller	Yes	--
Liquidity (33% of premium)	Yes	--
Education	No	--
Salience (House Visit)	Yes	Yes (non-exp)
Subtle Psychological Cues	--	Mixed

Discussion

- Risk markets are developing, slowly
  - Weather-index insurance in over a dozen developing countries
    - Often with support of World Bank
  - Housing price risk in the U.S.

- Evidence from two separate sets of field experiments suggest:
  - Adoption of innovative products may be slow
  - Price and liquidity constraints matter
  - Trust does as well

Discussion: Some Unanswered Questions

- ## Unit demand puzzle
  - 90 percent of households purchase only one unit of insurance.
  - Maximum payout per policy is roughly Rs 1,000, hedging 2-5% of agricultural production

- ## Does the policy *benefit* the purchaser? Five year impact evaluation underway

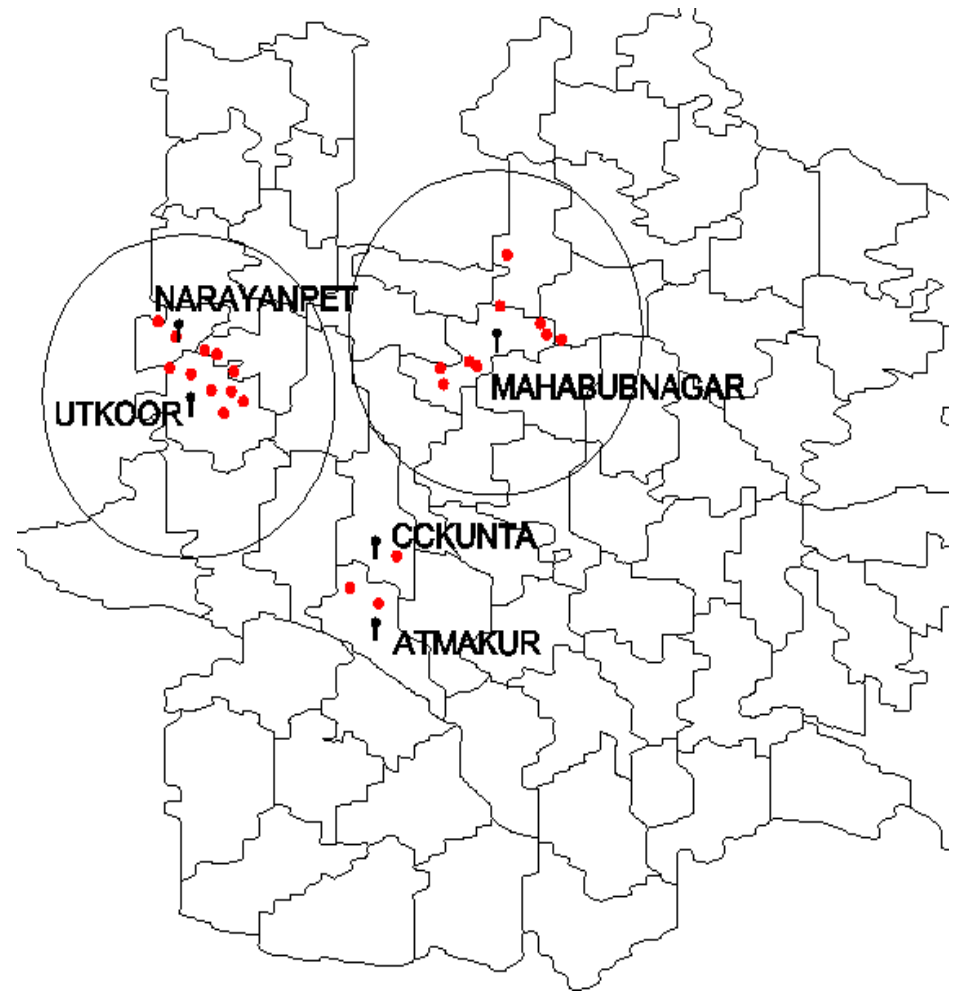- ## Dynamics of demand for insurance

New Projects

- **Identifying ex-ante benefits to insurance**
  - In Andhra Pradesh in 2009-2010, 1500 households
    - 50% of households 10 insurance policies
    - 50% of households actuarial value in cash, payable at maturity of insurance policies
  - Measure:
    - Intensive and extensive cropping decisions
    - Use of HYV-seed
    - Use of fertilizer
  - Cross with discounts on fertilizer to give 'metric' for value of insurance

- **Measure effects of large payouts**
  - In 2009-2010, a large fraction of insured households received Rs. 10,000, roughly equivalent to 1/4th of annual agricultural income
  - Study:
    - Consumption smoothing, informal risk pooling, investment and returns to investment

New Projects

- **Identifying the role of Financial Literacy**
  - In India and Kenya
    - Provide financial literacy via comics / videos / oral pitch
    - Product will most likely be bundle of credit with insurance
    - Choice of coverage left to farmer

  - Measure:
    - Financial Literacy
    - Uptake of Insurance + coverage
    - Information dissemination and uptake among networks

  - Cross with discounts on insurance premium to give 'metric' for value of financial literacy

FINE

Sampling in AP

Radius of circle = 20km

Educational Module

Effect of Rainfall on Soil Moisture
Black Soil: At Start of Monsoon

RAINFALL   SOIL MOISTURE

27mm
(1.1 inches)

40mm
(equal to 1.6
inches)

107mm
(4.2
inches)