The Impacts of Agricultural Insurance on Cotton Production and Incomes in Burkina Faso and Mali

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Logic of Insurance as a Development Tool

- Decades of evidence that risk
  - *Makes people poor* by reducing incomes & destroying assets; and,
  - *Keeps people poor*, by discouraging investment & distorting patterns of asset accumulation)
- The development impacts of risk reduction through insurance should therefore be significant:
  - By protecting households against the worst consequences of adverse climatic shocks, index insurance should in principal allow households to prudentially invest more in risky, but high returning agricultural activities.
  - That is, if insurance has *ex post* protection effects, then it should also have *ex ante* investment effects

Today's Talk

- Examine evidence on the *ex ante* of insurance in the West African cotton sector
- Two-trigger area yield contract introduced in Mali and then in Burkina as part a randomized controlled trial
- In Mali, we see substantial ex ante impacts, in line with study in Ghana by Karlan Osei, Osei & Udry
- In Burkina we do not find these effects, a result that shows sensitivity of insurance programs to implementation failures

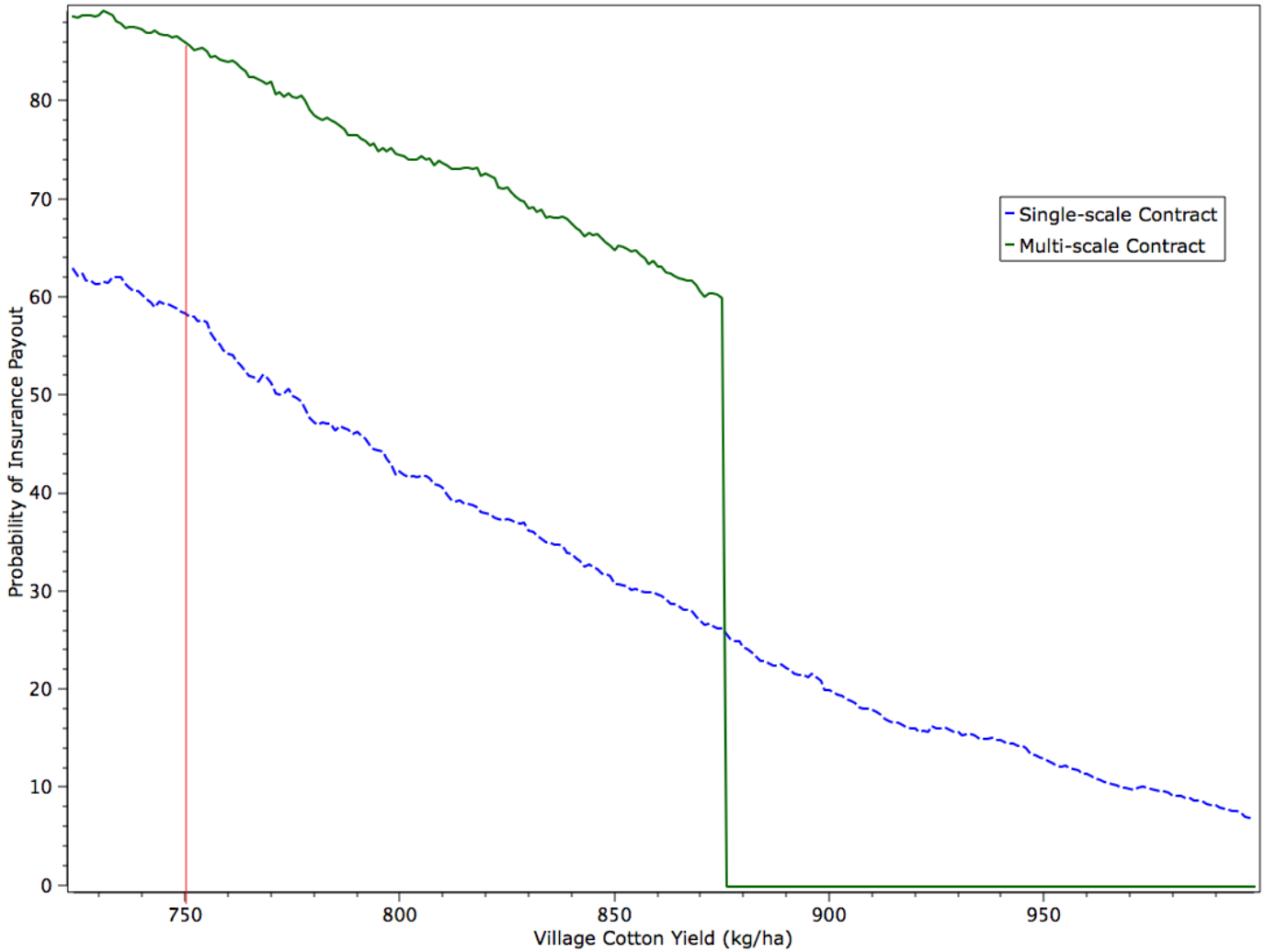
Index Insurance in Mali (& Burkina Faso)

- Farmers pursue a diversified production strategy of growing their own food plus some cotton
- Value chain credit via group loans, but consequences of default are substantial (informal collateral)
- Joint liability itself discourages investment as the more a farmer produces, the more likely that some of his output will be 'taxed' away to pay for others in the group
- Farmers report growing less cotton then they otherwise would, or by reducing financial risk exposure by investing less in the crop
- Result is that risk keeps these farmers poorer than they need be given the economic opportunities available to them

Two Trigger Area Yield Contract

- Area yield contracts can in principle offer strong insurance value (compared to weather-based insurance)
- But over what geographic should yields be calculated?
  - A small area (e.g., the individual farmer's field in the extreme) creates a moral hazard problem
  - A too large area (e.g,, average yields for an entire department or even country) lessens the quality of the insurance
- So might two triggers be better than one?
  - Primary trigger set a small area (e.g., village)
  - A higher level "audit" trigger can control moral hazard
- Results are encouraging:

Two Trigger Area Yield Contract



Mali: Descriptive Statistics

	N	Control	Treatment
Pre-intervention outcomes			
Cotton area 2010 (hectares)	586	2.19	2.44
		[1.33]	[1.77]
Cotton harvest 2010 (kg)	584	2316.6	2291.2
		[1741.3]	[1939.4]
Cotton yield 2010 (kg/ha)	584	1053.1	914.6***
		[422.9]	[342.7]
Area in foodgrains (hectares)	**970**	**4.02**	**3.09**
		[5.10]	**[2.89]**
Household characteristics			
Household head age	962	54.9	55.1
		[14.23]	[14.19]
Household head years of schooling	**916**	0.87	0.76
		[2.06]	[1.54]
Household head is ethnically Bambara	981	0.61	0.65
		[0.49]	[0.48]

Mali: Descriptive Statistics

	N	Control	Treatment
Post intervention outcomes			
Amount Borrowed ('000 CFA)	966	301.740	339.998
		[237.712]	[285.427]
Cotton Area Cultivated (hectares)	954	2.53	2.92*
		[1.68]	[2.15]
Area in Foodgrains (hectares)	970	3.76	4.04
		[2.46]	[2.83]
Expenditures on cotton seed & fertilizer (kCFA)	950	139.951	165.876*
		[102.243]	[126.805]
Cotton Harvest (kg)	941	2567.7	2761.7
		[2015.6]	[2247.8]

Mali: Flies in the Research Ointment

	Treated Cooperatives (Original Classification)		*Control Cooperatives (Original Classification)*
	Not Reclassified	Reclassified	
Percent Farmers Saying Offered Insurance	82%[1]	23%	25%[2]
Percent Farmers Saying Insured	30%[1]	8%	9%[2]

[1] Means of not-reclassified and reclassified are different at the x% significance level

[2] Cannot reject the hypothesis that means of reclassified and original Control are the same

Mali: Impact Results

- Standard Instrumental Variable LATE Identification strategy
- Look at results using original and reclassified households
- Also similar results if control for baseline production characteristics (using smaller sample on which have full baseline information)

Mali: Impact Results

Purchased insurance:					
	Loans (kCFA)	Area (ha)	Grain Area (ha)	Inputs (kCFA)	Harvest (kg)
Insured	102.875	1.339**	0.639	97.847***	944.8
	(65.251)	(0.612)	(0.645)	(36.449)	(585.4)
Constant	74.002	0.148	1.379***	18.737	33.1
	(66.104)	(0.442)	(0.660)	(26.057)	(644.9)
N	894	883	897	878	871
R2 (adj)	0.123	0.100	0.243	0.046	0.157
Believe insured:					
	Loans (kCFA)	Area (ha)	Grain Area (ha)	Inputs (kCFA)	Harvest (kg)
Individual believes insured	138.944	1.569*	1.096	121.010**	837.7
	(89.144)	(0.852)	(0.908)	(52.570)	(775.325)
Constant	90.367	0.367	1.522**	35.294	178.6
	(65.346)	(0.456)	0.646	(26.680)	(672.7)
N	885	875	888	870	863
R2 (adj)	0.111	0.066	0.236	-0.042	0.164

Mali: Impact Results

- The magnitude of these impacts indicate that insurance could increase cotton production (and incomes by some 30%
- Public expenditure was minimal beyond R&D as it comprised only of partial subsidies on a contract that had a market price of 10,000 CFA/hectare
- High implied rate of return if we evaluate it using same metrics found in other anti-poverty programs

Burkina: Research Design

- Research area: 40 villages in Houndé (main cotton region)
- Contract structure same as Mali, except that low and high payoff levels
- Insurance decision is endogenous
- Main randomization: insurance offered to 40 farmer groups vs. 40 farmer groups as control
- To increase take-up & use as an instrument: **encouragement design**
  - Randomized premium subsidies (0%, 25%, 50%, 75% to 10 farmer groups each)
    - Need take-up!
    - Lower price = higher take-up $\rightarrow$ predict demand exogenously

Burkina: Research Design

	Premium subsidy level				
GPC bought the insurance	**0%**	**25%**	**50%**	**75%**	All
No	8	5	7	2	22
Yes	2	5	3	8	18
Total	10	10	10	10	40

- Instrumentation worked
- High take-up = 45% the first year (2014)
- However: implementation issues = late sales (sowing time) $\rightarrow$ impossible for farmers to adjust input

Burkina Impact Results: Cotton

	Cotton surface	Cotton NPK/ha (fertilizer)	Cotton total input (FCFA/ha)	Cotton production	Cotton yields
insured	-0.0541	0.0259	-1893.4	-536.2	-27.05
	(-0.16)	(0.14)	(-0.47)	(-1.18)	(-0.39)
=1 if cultivated	-0.151	0.157	9014.5***	110.6	30.21
OGM in 2013	(-1.01)	(1.61)	(3.75)	(0.70)	(0.90)
Constant	0.396**	0.0339	-6071.9***	851.2***	126.7***
	(2.25)	(0.39)	(-2.91)	(4.19)	(3.77)
Observations	928	928	928	928	928

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- Same (IV/LATE) impact estimator as with Mali
- But, unlike Mali, no impacts
- Delayed sales paramount

Burkina Impact Results: Other Investment

	Investment fence	Investment dam	Investment irrigation	Investment total	Log investment
insured	2470.9**	3318.6	2034.9*	7824.4*	1.703***
	(2.08)	(0.87)	(1.90)	(1.69)	(2.92)
=1 if cultivated	1228.4**	3038.6	656.3	4923.3**	0.640***
OGM in 2013	(2.13)	(1.63)	(0.85)	(2.37)	(2.97)
Constant	-1265.8**	-577.3	-1058.2	-2901.2	-0.328*
	(-2.02)	(-0.47)	(-1.33)	(-1.64)	(-1.73)
Observations	928	928	928	928	928

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- Also see impacts on animal stocks
- Sesame cultivation (0.17 hectare increase in this profitable, but shorter cycle activity)

2016 Qualitative Follow-up

- 2015 crop year had severe droughts in some areas, triggering insurcance pyaments
- Again, implementation issues as some farmers had to reimburse input credits before obtaining insurance payments–did so at substantial cost:
  - asset depletion (distress sales of food & livestock),
  - debts,
  - social conflict & collapse of groups... and then impacts of insurance payments
- Yet same farmers report that when payouts did finally occur, largely rectified the situation

Conclusions

- Seen that index insurance can work
  - Index insurance can provide real protection to consumption & assets
  - Risk reduction dividend works in Mali
  - Subsidies to speed adoption along can generate high returns if goal is increase the level and stability of cotton families' incomes
  - Likewise generates a benefit to the cotton industry itself which makes money on throughput
- But for full impacts to occur, timing is key. Was difficult to stay on schedule with all the moving parts
- There are other issues around pricing and demand

Thank you!