Impact of Weather Insurances on Small Scale Farmers: a Natural Experiment

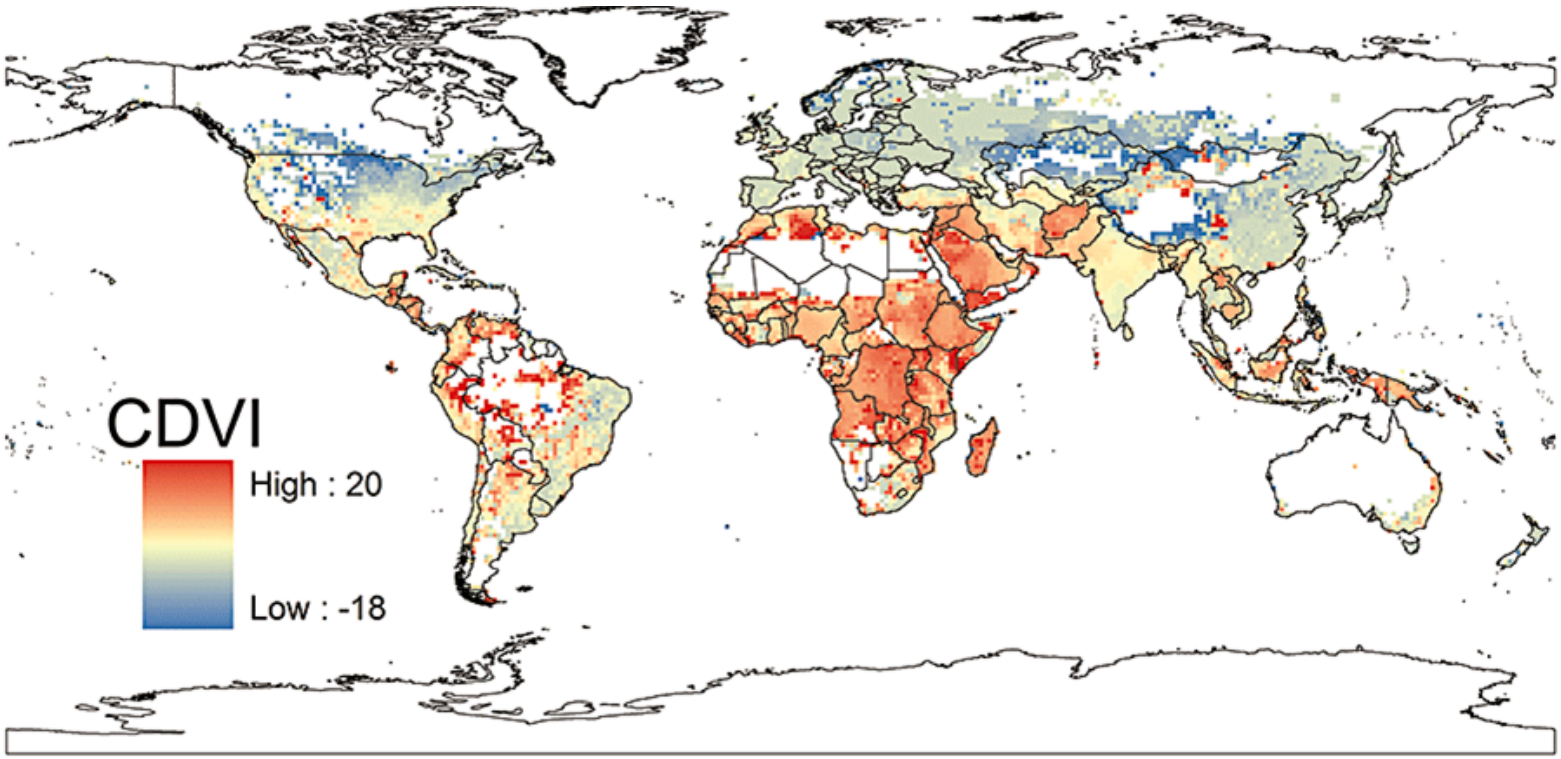
S. Dietrich[1] M. Ibanez[1]

[1] Courant Center Poverty, Equity and Growth
University of Göttingen

Microinsurance Conference, 2012

Background

Fig. 1: Geographic Disparities in the predicted Impacts of climate Change on human Populations



Global Ecology and Biogeography
Volume 20, Issue 4, pages 532-544, 17 FEB 2011 DOI: 10.1111/j.1466-8238.2010.00632.x

Research Motivation

Research Question:

- Impact of crop insurances on coping strategies and capital use of small scale farmers

Research Contribution:

- Impact evaluation in a quasi experimental setting
- Analysis in a period of adverse climatic shocks

Literature

- limited evidence on impacts of crop insurance

Insurance Scheme

Type: yield insurance against climatic shocks in Colombia

Subsidy: up to 60% of premium subsidized by public fund

Administration:

- Losses individually monitored
- Indemnity if yield below 70% of historic yield

Why a traditional insurance scheme?

Data

Target Group:

- Tobacco farmers in Santander, Colombia

Why Tobacco farmers?

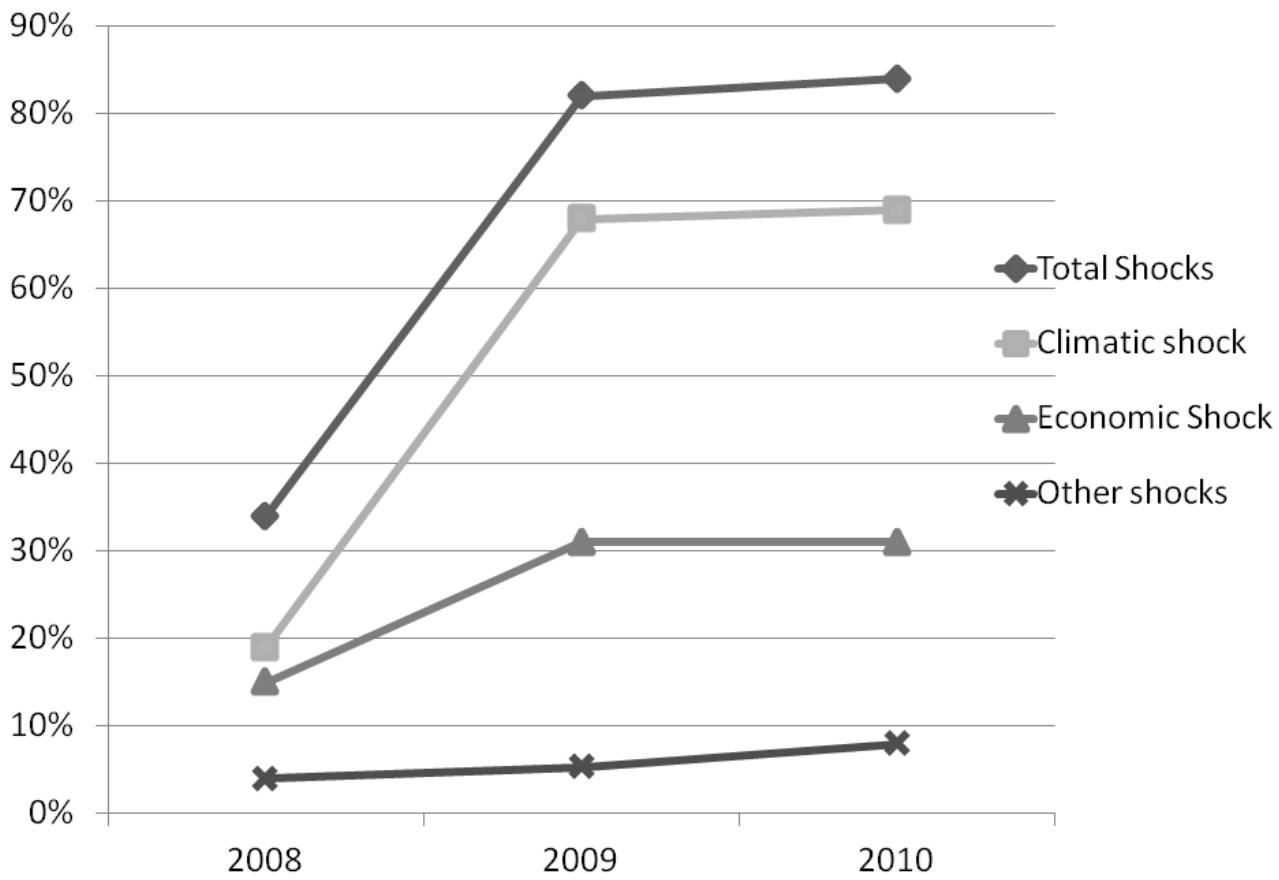
- High vulnerability

Structure:

- 486 households interviewed in March 2011
- Cross sec. data on hh characteristics, production, expenses, assets, income
- Additional retrospective data on shocks and loans $\rightarrow$ **Panel**

Household Losses

Fig.2: Prevalence of Self Reported Losses in the Sample



Evaluation Setting

Tobacco Production in Colombia:

- 2 companies dominate market
- Contract farming scheme

Insurance Implementation:

- One company started collaboration with insurance company in 2008
- Farmers of other company have no access to crop insurance
- Voluntary access to insurance program
  (Insurance uptake: 2009: 61%, 2010: 85%)

→Quasi Experimental Setting?

Evaluation Strategy

Identifying Assumptions:

1. No unobs. self selection into company
2. No unobs. self selection into treatment

Estimation Procedure:

1. Balance Test
2. OLS with pooled data (controlling for obs. differences)
   - Access to the program as treatment var (Intend-to-Treat)
   - Insurance status as treatment var (ATE)
3. Fixed Effects (ATE)

Identifying Assumption 1

Balance Test Coltabaco vs. Protabaco Farmers

	t-Test		t-Test
Age	(-0.14)	Assets 2005 (in mio. Pesos)	(-0.15)
Education hh head	(-0.28)	Asset-index 2005	(1.24)
Remoteness	(-0.23)	Mobile Assets (in mio. Pesos)	(1.95)
Memberships in associations	(0.98)	Experience Tobacco	(0.03)
Gender	(0.05)	Burley main harvest 2005	(4.93)**
Rooms 2005	(-0.87)	Technology index 2	(1.07)
Children	(-1.53)	Irrigation System 2005	(0.87)
Viviente 2005	(1.17)	Land cultivated 2005	(0.46)
Owner 2005	(-0.96)	Tobacco land cultivated 2005	(2.87)**
Highest debt category 2005	(-0.51)	Land diversification 2005	(0.62)

* $p<0.5$, ** $p<0.01$. Probability weights used.

Identifying Assumption 2

Balance Test Insured vs. Uninsured Protabaco Farmers in 2010

	t-Test		t-Test
Age	(0.08)	Assets 2005 (in mio. Pesos)	(-0.19)
Education hh head	(0.06)	Asset-index 2005	(-1.39)
Remoteness	(0.05)	Mobile Assets (in mio. Pesos)	(-0.98)
Memberships in associations	(0.73)	Experience Tobacco	(-0.31)
Gender	(0.65)	Burley main harvest 2005	(2.15)**
Rooms 2005	(-1.33)	Technology index 2	(-1.73)
Children	(0.07)	Irrigation System 2005	(-2.59)**
Viviente 2005	(-1.71)	Land cultivated 2005	(0.24)
Owner 2005	(0.81)	Tobacco land cultivated 2005	(2.07)*
Highest debt category 2005	(-0.59)	Land diversification 2005	(1.86)

* $p<0.5$, ** $p<0.01$. Probability weights used.

Impact of Insurance Access on Coping Strategies (ITT)

$$Coping\ Strategy = Access_i + X_i + u_i$$

ITT		Pooled		
	Mean	Obs	Coeff.	T-stat
Coping strategy:				
Used formal loan	0.23	598	-0.14	(-1.06)
Used informal loan	0.07	578	-0.01	(-0.04)
Sold assets	0.06	598	0.19	(0.84)
Used Savings	0.14	598	0.17	(1.04)
Reduction of Consumption	0.07	578	-0.34**	(-2.01)
Refinanced loan	0.03	598	-0.80***	(-4.08)

* p<0.1, ** 0.<p<0.05, *** p<0.01. Probit model estimated for pooled data Probability weights used.Control vars not reported.

Impact of Insurance Status on Coping Strategies (ATE)

$$Coping\ Strategy = Insurance_i + X_i + u_i$$

ATE	Pooled			Fixed Effects		
	Obs	Coeff.	T-stat	Obs	Coeff.	T-stat
Coping strategy:						
Used formal loan	596	0.43***	(3.54)	567	0.17***	(3.05)
Used informal loan	596	-0.27	(-1.28)	567	0.07	(1.07)
Sold assets	578	-0.01	(-0.06)	567	-0.01	(-0.17)
Used Savings	596	-0.18	(-1.06)	567	-0.10*	(-1.80)
Reduction of Consumption	578	-0.24	(-1.37)	567	-0.02	(-0.47)
Refinanced loan	596	-0.58***	(-2.61)	567	0.02	(0.53)

* p<0.1, ** 0.<p<0.05, *** p<0.01. Probit model estimated for pooled data and linear models for Fixed effects. Probability weights used.Control vars not reported.

Impact of Insurance Access on Capital Use (ITT)

$$Capital\ Use = Access_i + X_i + u_i$$

ITT		Pooled		
	Mean	Obs	Coeff.	T-stat
Loan Types:				
Used external loan	0.56	776	0.15	(1.17)
Used bank loan	0.27	776	0.12	(0.86)
Used cooperative loan	0.34	776	0.15	(1.21)
Used informal loan	0.07	776	-0.28*	(-1.85)
Loan Size:				
Log Value external loan	14.78	417	-0.01	(-0.05)
Log Value bank loans	14.89	186	0.08	(0.68)
Log Value cooperative loans	14.54	263	-0.01	(-0.08)
Log Value informal loans	14.02	64	-0.25	(-0.85)

* p<0.1, ** 0.<p<0.05, *** p<0.01. Probit model estimated for pooled

Impact of Insurance Dummy on Capital Use (ATE)

$$Capital\ Use = Insurance_i + X_i + u_i$$

ATE	Pooled			Fixed Effects		
	Obs	Coeff.	T-stat	Obs	Coeff.	T-stat
Loan Types:						
Used external loan	774	0.30**	(2.48)	749	0.18**	(2.01)
Used bank loan	774	0.37***	(2.72)	749	0.19***	(3.02)
Used cooperative loan	774	0.22*	(1.82)	749	0.02	(0.30)
Used informal loan	774	-0.14	(0.89)	749	0.05	(1.18)
Loan Size:						
Log Value external loan	417	0.11	(0.92)	412	0.19	(1.29)
Log Value bank loans	186	0.20	(1.18)	183	0.23	(0.86)
Log Value cooperative loans	263	0.07	(0.44)	263	0.21	(1.67)
Log Value informal loans	64	-0.65**	(-2.50)	64	-0.64	(-1.54)

Impact of Insurance Access on Loan Motives (ITT)

$$Loan\ Motive = Access_i + X_i + u_i$$

ITT		Pooled Data		
	Mean	Obs	Coeff.	T-stat
Loan Motive:				
Investment	0.39	776	0.19	(1.54)
Repay Debts	0.07	776	-0.33*	(-1.90)
Consumption	0.13	776	-0.02	(-0.11)
Housing	0.03	776	0.48*	(1.69)
Loan Conditions:				
Maturity (month)	22.51	338	5.06**	(2.26)
Interest Rate (%)	1.97	270	-1.07**	(-2.04)

* p<0.1, ** 0.<p<0.05, *** p<0.01. Probit model estimated for pooled data. Probability weights used.Control vars not reported.

Impact of Insurance Dummy on Loan Motives (ATE)

$$Loan\ Motive = Insurance_i + X_i + u_i$$

ATE	Pooled Data			Fixed Effects		
	Obs	Coeff.	T-stat	Obs	Coeff.	T-stat
Loan Motive:						
Investment	774	0.36***	(2.96)	749	0.10	(1.34)
Repay Debts	774	-0.12	(-0.72)	749	-0.00	(-0.06)
Consumption	774	0.29*	(1.84)	749	0.14***	(3.18)
Housing	774	0.31	(1.09)	749	0.002	(0.49)
Loan Conditions:						
Maturity (month)	338	3.79	(1.31)	335	-5.42	(-0.92)
Interest Rate (%)	260	-0.79	(-1.33)	269	0.25	(0.82)

* p<0.1, ** 0.<p<0.05, *** p<0.01. Probit model estimated for pooled data and linear models for Fixed effects. Probability weights used.Control vars not reported.

Impact of Insurance Access on Financial Outcomes

$$Financial\ Outcomes = Access_i + X_i + u_i$$

		ITT			ATE	
		2010			**2010**	
	Mean	Obs	Coeff.	T-stat	Coeff.	T-stat
Cross Sectional Outcomes:						
Log Outstanding Debts	14.23	234	-0.02	(-0.06)	-0.10	(-0.40)
Increased savings in 2010 (%)	0.05	388	0.01	(0.02)	-0.09	(-0.27)
Tobacco Specialization	0.44	382	0.06**	(2.16)	0.04	(1.53)
Log Productive Assets	13.67	315	0.22	(0.79)	-0.22	(-0.88)
Expenses per capita	3.07	379	0.04	(0.13)	-0.23	(-0.83)
Income per capita	8.52	387	1.71	(1.62)	-0.72	(-0.57)
Log Tobacco Income	0.14	343	0.07	(0.29)	-0.06	(-0.30)

* p<0.1, ** 0.<p<0.05, *** p<0.01. Probit model estimated for pooled data. Probability

Robustness Checks

1. **Shock filter:**
   - Filter for hh with shocks confirm findings
2. **Instrumental Variable:**
   - Lagged shocks in the neighborhood as IV
   - Results support findings
3. **Heterogeneous impacts of the Insurance?**
   - Low asset farmers have a lower creditworthiness
   - If insurance works as collateral for lenders effect assumed to be equal or higher for poorer households
     $\rightarrow$effect tend to be smaller for low asset group indicating that demand effects drive findings

Summary

1. No robust program effect on Coping Strategies
2. Increased Capital Use with insurance
3. No short term effect on financial outcomes

IV Effects Coping Strategies (2SLS)

	LATE					
	Pooled Data			Fixed Effects		
	Obs	Coef.	z-Value	Obs	Coef	z-Value
Used Bank Loan	386	-0.07	(-0.04)	364	-0.02	(-0.06)
Used Informal Loan	375	0.94	(0.45)	364	0.28	(1.00)
Sold Assets	386	1.83*	(1.74)	364	-0.00	(-0.01)
Used Savings	386	-2.10*	(-1.75)	364	-0.17	(-0.57)
Red. Consumption	348	-0.21	(-0.09)	364	-0.09	(-0.42)
Refinanced Loans	359	2.15*	(1.86)	364	-0.02	(-0.12)

* p<0.1, ** 0.<p<0.05, *** p<0.01. Lagged neighborhood loss used as IV.

IV Effects Capital Used (2SLS)

	LATE					
	Pooled Data			Fixed Effects		
	Obs	Coef.	z-Value	Obs	Coef	z-Value
Loan Types:						
Used ext. loan	498	2.31***	(3.92)	476	0.90**	(2.50)
Used bank loan	498	0.68	(0.44)	476	0.64**	(1.97)
Used cooperative loan	498	2.63***	(9.71)	476	0.66**	(2.03)
Used informal loan	498	2.43***	(5.12)	476	0.34*	(1.84)
Loan Size:						
Log Loans	282	-1.40	(-0.70)	164	2.75	(0.97)
Log bank loans	130	19.11	(0.23)	38	2.30	(0.46)
Log cooperative loans	171	-0.81	(-0.45)	84	1.84	(1.05)
Log informal loans	37	-4.55	(-1.23)	16	-1.48***	(-4.11)

* p<0.1, ** 0.<p<0.05, *** p<0.01. Lagged neighborhood loss used as IV.

IV Effects Capital Used (2SLS)

	LATE					
	Pooled Data			Fixed Effects		
	Obs	Coef.	z-Value	Obs	Coef	z-Value
Loan Motive:						
Prod. Investment	498	1.25	(0.97)	476	0.47	(1.64)
Repay Debts	485	0.46	(0.22)	476	0.04	(0.34)
Consumption	498	2.52***	(5.15)	476	0.34	(1.32)
Housing	485	2.47***	(4.58)	476	0.21*	(1.68)
Loan Conditions:						
Maturity (month)	222	23.33	(-0.41)	114	114.01	(0.31)
Interest Rate (%)	171	2.17	(-0.95)	62	1.78**	(2.03)

* p<0.1, ** 0.<p<0.05, *** p<0.01. Lagged neighborhood loss used as IV .

Heterogeneous Effects Capital Use (ITT)

$$Capital\ Use_{it} = Access_i + Access_i * low\ asset_i + X_{it} + u_{it}$$

	ITT			
	Access Coef.	z-Value	Access*low asset	z-Value
Used ext. loan	0.20	(1.42)	-0.11	(-0.83)
Used bank loan	0.28*	(1.78)	-0.34**	(-2.42)
Used cooperative loan	0.14	(1.00)	0.02	(0.17)
Used informal loan	-0.26	(-1.43)	-0.05	(-0.24)
Log Loans	0.21*	(1.71)	-0.47***	(-4.08)
Log bank loans	0.21	(1.59)	-0.33**	(-2.24)
Log cooperative loans	0.17	(1.09)	-0.38***	(-2.91)
Log informal loans	0.14	(0.43)	-0.75**	(-2.01)

* p<0.1, ** 0.<p<0.05, *** p<0.01. Only for hh with loan. Linear models estimated.Probability weights

Heterogeneous Effects Loan Motive

$$Loan\,Motive_{it} = Access_i + Access_i * low\,asset_i + X_{it} + e_i + u_{it}$$

	ITT			
	Access Coef.	z-Value	Access*low asset	z-Value
Loan Motives:				
Investment	0.12	(1.18)	-0.04	(-0.30)
Repay Debts	-0.04	(-1.32)	0.04	(1.10)
Consumption	0.08	(0.89)	-0.07	(-0.71)
Housing	-0.01	(-0.72)	0.01	(0.87)
Loan Conditions:				
Maturity (month)	7.35***	(2.85)	-5.26**	(-2.12)
Interest rate (%)	-0.94*	(-1.75)	-0.28	(-1.12)

Frame Research Area