Weather Insurance and Investment Choice

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  -Income smoothing (ex ante): income diversification, investment.
- Thus weather insurance may be
  -Welfare enhancing (obviates need for consumption smoothing mechanisms)
  -And efficiency enhancing (results in more efficient investment choices)

Income Smoothing Mechanisms

- Income diversification (Morduch, 1995; Dercon, 2002)
  -Farming multiple, non-adjacent plots (Not robust to covarying shock)
  -Off farm labor
  -Prospects for off-farm employment may be correlated with on-farm income (e.g. agricultural labor)
  -Migration/Remittances (Stark and Levhari 1982)

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  -Migration/Remittances (Stark and Levhari 1982)
- Altering production decisions
  -Shift to low variance (low yield) crops (Morduch, 1995)
  -Reduce inputs: fertilizer, etc. (Bliss and Stern, 1982)
  -Delay planting until weather information arrives (Morduch, 1995)

This Study

- This study:
  -Analyzes Mexican government program which provides insurance against natural disasters.
  -Using RD design, evaluates impact of weather insurance on investment decisions of rural Mexican households.

- Findings:
  -Insurance appears to change investments in agricultural inputs.
  -Insurance induces international migration, in this context.

Program Overview
Fondo de Desastres Naturales (FONDEN)

- Federal agency, established in 1996
- Provides natural disaster relief
  - drought, flood, frost, earthquake, etc.
- **Indemnities to low-income households**
  - Relief packages for home damage
  - **Indemnities to rural producers for damage to productive assets**

Program Overview
Eligibility for Compensation

- Eligibility Requirements for Rural Producers (farm and livestock)
  - Control less than 5, 10 or 20 hectares of land
    - Cut-off depends on state of residence
    - "Control": own, rent or borrow
  - Non-irrigated land
  - Own less than 25 animal units (e.g. 100 fowl=1 cow)
  - No other insurance coverage

Program Overview
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- Agricultural Producers
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  -5 hectares general crops: 1,740 pesos = 1 month agricultural wage
  -Indemnity$\approx$ 80% irreversible farm investment (Skees et al., 2002)
- Scope of Indemnities
  -1997 to 1999: 1 BN pesos in compensation for agricultural losses
  -Back of the Envelope: 4% of rural households received indemnity in a given year

Program Overview
Dispersal of Indemnities

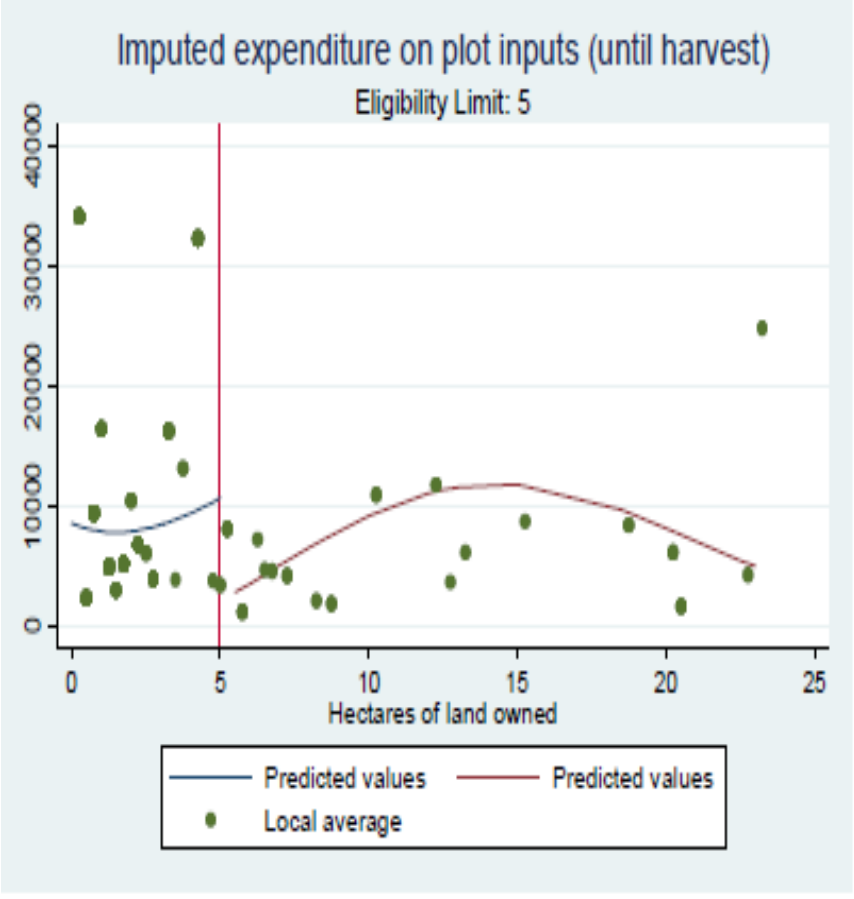
- Official declaration of disaster
  - Requested by local officials
  - Parametric triggers
    - Drought: cumulative rainfall$<$50% historical average for two consecutive months
    - Frost: for sorghum -9°C, for wheat -6°C, etc.
- Federal and state authorities assess damage, agree to reconstruction plan
- State provides 30% of relief funds
- FONDEN resources disbursed to State governments
- Payments distributed to affected producers
  - By municipal authorities and Secretary of Agriculture

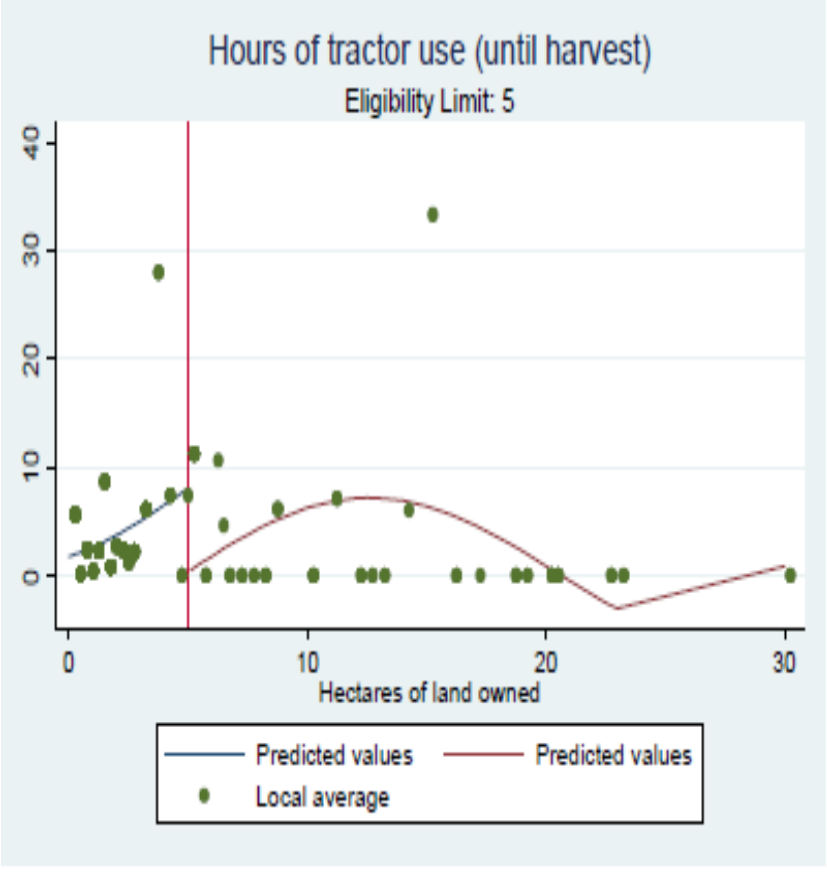
Empirical Design

- Can't simply compare eligible to ineligible households.
  - Differ in landholdings which also determines investment.
- "Regression Discontinuity Design"
  - Compare households who control just less than the maximum amount of land allowed to households who own just more than the limit.
  - Control for effect of land ownership on investment.
  - Note: assumes households don't change landholdings on account of the program.
    - (Assumption tested statistically)

- The National Household Survey of Rural Mexico (ENHRUM)
  - Nationally representative sample of rural Mexican households.
  - Conducted between January and mid-March 2003
  - Surveys households residing in rural communities of 500 to 2,499 people
  - Eighty communities, distributed over 14 of the 32 Mexican states

Results
Agricultural Investment





Results
Agricultural Investment

Table 3: Effect of FONDEN Eligibility on Agricultural Investment

	Imputed expenditure on plot inputs (until harvest) (1)	Hours of tractor use (until harvest) (2)	Hours of traction animal use (until harvest) (3)	Uses improved seeds (0-1 Indicator) (4)
		Panel A: Eligibility According to Own Land		
FONDEN eligible according only to land criteria (0-1 Indicator)	2869	7.12	-17.53	0.13
	(15702)	(4.252)*	(8.590)**	(0.075)*
Observations	1039	1039	1039	831
R-Squared	0.05	0.14	0.11	0.11
		Panel B: Two Stage Least Squares Results		
FONDEN eligible (0-1 Indicator)	4046	10.04	-24.72	0.20
	(22142)	(6.23)	(12.483)**	(0.115)*
Observations	1039	1039	1039	831
Mean of dependent variable	20014	10.09	12.6	0.22

* Significant at the 10% confidence level

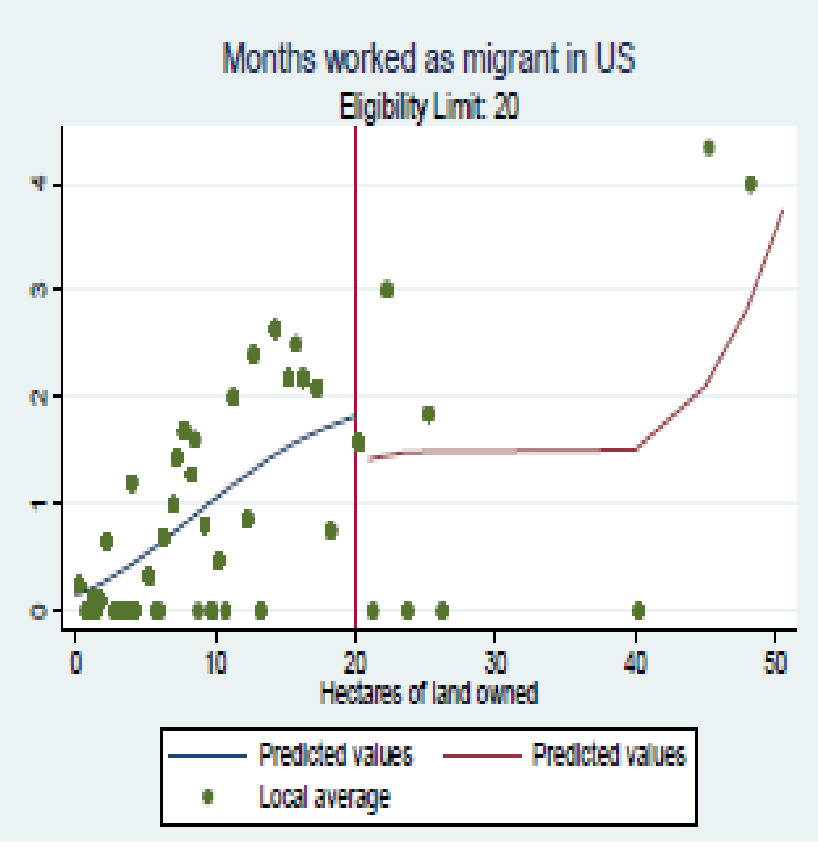
** Significant at the 5% confidence level

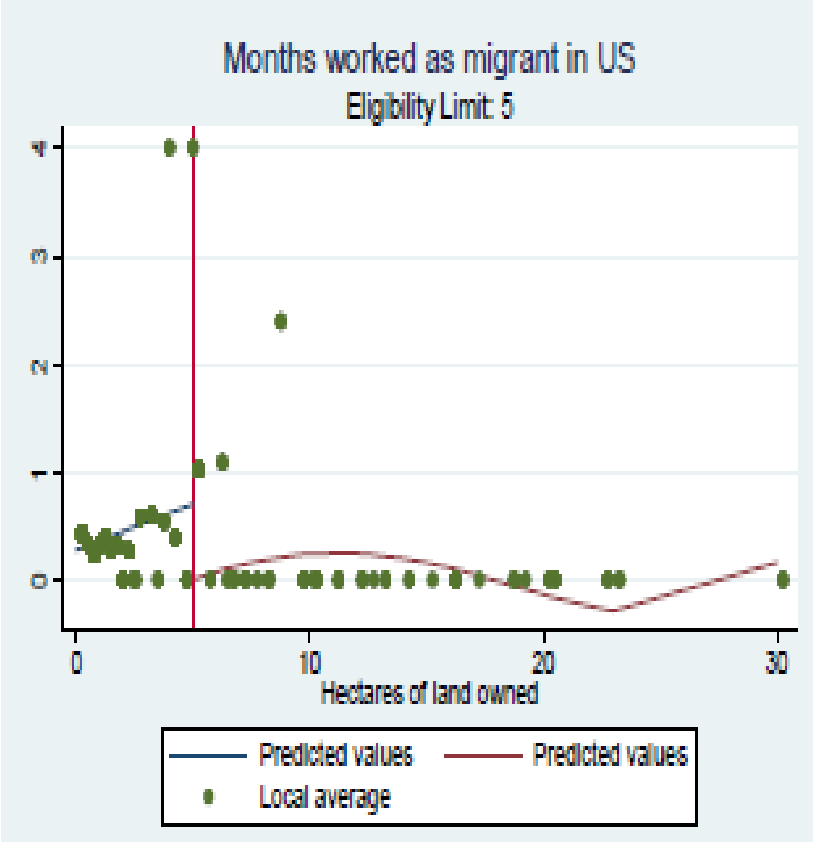
*** Significant at the 1% confidence level

Discussion of Results
Agricultural Investment

- Some indication of shift towards more expensive forms of capital.
  - Average price per kilo of improved seeds is 61.5 pesos vs. 5.0 for local "Criolla" seeds.
  - Average rental price for (hrs of) tractor $\approx$ 3 times that of traction animal.
- Insignificant expenditure difference.
  - Noisy measure, makes detecting difference difficult.
- Direction of effects in accord with intuition: insurance makes investment in risky agricultural production more attractive.

Results
Migration





Results
Migration

Table 4: Effect of FONDEN Eligibility on Labor and Migration Outcomes

	Estimated days agricultural labor (total)	Estimated days non-agricultural labor (total)	Member migrates to US or Mexico (0-1 Indicator)	Months worked as migrant in US	Months worked as migrant in Mexico
	(1)	(2)	(3)	(4)	(5)
			Panel A: Eligibility According to Own Land		
FONDEN eligible according only to land criteria (0-1 Indicator)	-8.32	9.05	0.07	0.80	-0.16
	(5.23)	(5.419)*	(0.029)**	(0.234)***	(0.22)
Observations	3294	3294	3294	3294	3294
R-Squared	0.09	0.07	0.11	0.09	0.06
			Panel B: Two Stage Least Squares Results		
FONDEN eligible (0-1 Indicator)	-14.77	16.06	0.12	1.42	-0.28
	(9.41)	(10.01)	(0.051)**	(0.433)***	(0.39)
Observations	3294	3294	3294	3294	3294
Mean of dependent variable	17.44	17.84	0.14	0.63	0.76

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Discussion of Results
Migration

- Migration often thought of a mechanism to diversify income and reduce risk.
- International migration, however, is a risky investment itself.
  - Risk of unsuccessful border crossing / job search.
  - Relatively costly to finance international migration.
- Evidence that, by reducing overall risk, insurance induces international migration.
  - Insurance has larger impact in Mexican states without strong historical network in U.S.

Conclusion

- Insurance against natural disasters induces rural Mexican households invest in risky international migration.
  - Insurance may have other effects in different contexts.
- Some evidence of shift to more expensive inputs / other technologies.
- Effects of insurance suggests that risk is a constraint on investment by rural households.
- Also suggests that weather insurance may be enhance efficiency/resource allocation as well as increase welfare.

Thank You!