Labor Responses to Rainfall Variability in Rural Ethiopia:

A Model of Migration, Off-farm Activities and Remittance

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INTRODUCTION

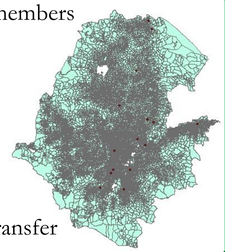
- Previous studies on labor responses to rainfall variability
  - generate more disagreement than consensus
  - focus on only one aspect of labor responses
  - generally ignore the role of rainfall variance
- More theoretical and empirical work is needed

OBJECTIVES

- Develop a model to jointly consider migration, off-farm labor supply and transfer decisions
- Evaluate the impacts of rainfall variability on migration, off-farm labor supply and transfers in rural Ethiopia

DATA

- Household data from the Ethiopian Rural Household Survey
  - ~1,500 households (HHs) from 15 villages across 3 waves (1999, 2004 & 2009)
  - detailed information on migration, off-farm activities, transfers, and HH demographics
- Climatic data from the African Flood and Drought Monitor
  - 30 years of daily rainfall data
  - only available at the village level
  - rainfall measures in main (Kiremt) season
- Dependent variables
  - share of migrated-out HH members due to labor market reasons
  - number of days worked off-farm per capita
  - per capita value of transfers
  - binary indicator for public transfer



THEORETICAL MODEL

- A world of three agents: a government, a rural household, and a sender of transfers from informal social safety nets (ISSN)
- The government offers a public transfer program, and the household must apply for it to get the benefit (& welfare stigma)
- The household sends a share of its adult members to urban area, allocates its remaining labor between on-farm and off-farm activities, and decides whether to participate the public transfer program
- The sender can either give its available resource to the household, or keep it with its own
- Rainfall is an input in the agriculture production, and rainfall shocks affect the mean and variance of agricultural income, and the available resource of the sender

EMPIRICAL MODELS

- Household i in village j at year t
- For household participation in public transfer y_{ijt}, panel logit/probit models: $\text{logit}/\Phi^{-1}\{\text{Prob}(y_{ijt}=1)\} = \alpha_0 + \beta_1 \frac{\bar{R}_{jt}}{\bar{R}_j} + \beta_2 \sigma_{jt} + \mu_{ij} + \nu_{ijt}$, $i = 1,\ldots N;\ j = 1,\ldots,15; t = 1,2,3$
- For other four dependent variables with censoring issues, fixed effects (FE) Tobit models & correlated random effects (CRE) Tobit models

$$y^*_{ijt} = \alpha_0 + \beta_1 \frac{\bar{R}_{jt}}{\bar{R}_j} + \beta_2 \sigma_{jt} + \mu_{ij} + \nu_{ijt}, \quad y_{ijt} = \max[0, y^*_{ijt}], i = 1,\ldots N;\ j = 1,\ldots,15; t = 1,2,3$$

$$y^*_{ijt} = \alpha_0 + \beta_1 \frac{\bar{R}_{jt}}{\bar{R}_j} + \beta_2 \sigma_{jt} + \lambda_1 \frac{\sum_{t=1}^{3} \bar{R}_{jt}/3}{\bar{R}_j} + \lambda_2 \frac{\sum_{t=1}^{3} \sigma_{jt}}{3} + + \mu_{ij} + \nu_{ijt}, \quad y_{ijt} = \max[0, y^*_{ijt}], i = 1,\ldots N;\ j = 1,\ldots,15; t = 1,2,3$$

RESULTS

(1) Share of Out-migration

	FE Tobit	CRE Tobit
HH size	0.006*	0.020***
	(0.00)	(0.00)
Ratio of rainfall in the past 5 years	-0.358***	-0.389***
	(0.05)	(0.05)
Standard deviation of rainfall in the past 5 years	0.111***	0.125***
	(0.01)	(0.01)
Mean ratio of rainfall		0.241
		(0.16)
Mean standard deviation of rainfall		-0.116***
		(0.02)
Constant		-0.322*
		(0.15)

(2) Off-farm Labor Supply

	FE Tobit	CRE Tobit
Ratio of rainfall in the past year	-1.572*	-4.334***
	(0.70)	(0.66)
Standard deviation of rainfall in the past 5 years	3.487***	4.222***
	(0.69)	(0.38)
Mean ratio of rainfall		-0.042
		(1.84)
Mean standard deviation of rainfall		-2.019**
		(0.63)
Constant		-5.348**
		(1.78)

(3) Remittance from Former HH Members

	FE Tobit	CRE Tobit
Ratio of rainfall in the past year	-99.430	11.860
	(236.5)	(30.07)
Standard deviation of rainfall in the past 5 years	222.3	3.518***
	(139.4)	(16.25)
Mean ratio of rainfall		101.900
		(83.05)
Mean standard deviation of rainfall		-108.500***
		(26.59)
Constant		-423.700***
		(85.39)

(4) Transfers from Other ISSN

	FE Tobit	CRE Tobit
Ratio of rainfall in the past year	-16.090	-14.420
	(24.89)	(11.98)
Standard deviation of rainfall in the past 5 years	113.000***	42.060***
	(25.91)	(6.85)
Mean ratio of rainfall		80.380*
		(33.30)
Mean standard deviation of rainfall		-78.390***
		(11.21)
Constant		-201.300***
		(31.53)

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

HYPOTHESES

- From the theoretical model
  - An increase in mean rainfall leads to decreases in the share of out-migration, off-farm labor supply, and the probability of participating in public transfer programs
  - An increase in the variance of rainfall leads to increases in the share of out-migration, off-farm labor supply, and the probability of participating in public transfer programs
  - Mean and variance of rainfall have no definite effect on transfers from ISSN

(5) Participation in Public Transfers

	Panel Logit	Panel Probit
Ratio of rainfall in the past year	-0.347***	-0.203***
	(0.10)	(0.06)
Standard deviation of rainfall in the past 5 years	0.234***	0.140***
	(0.05)	(0.03)
Constant	-1.429***	-0.856***
	(0.14)	(0.08)

CONCLUSIONS

- Share of out-migrated HH members decreases with mean rainfall level and increases with the standard deviation of rainfall
- Per capita off-farm labor supply and participation in public transfer programs decreases with mean rainfall level and increases with the standard deviation of rainfall
- Level and standard deviation of rainfall ***may*** have no effect on the amount of transfers that households receive from former HH members and other ISSN