

# To Stay or To Go?

Evidence on the link between Migration,  
Climate Disasters, and Human Development



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# Human Development

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UNDP – Human Development

# Human Development

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UNDP – Human Development



<http://hdr.undp.org>

Human Development Report 2007/2008

*Fighting Climate Change: Human solidarity in a divided world*



Human Development

- ◆ All future generations
- ◆ All poor of *today* – Urgent action !!

# Human Development Report 2007/2008



Climate Change  Human Development



- ◆ Losses in agriculture productivity, food security
- ◆ Water stress
- ◆ More intense, frequent and unpredictable extreme weather events – disruption of livelihoods
- ◆ Negative impacts on ecosystems (biodiversity and livelihoods)
- ◆ Health

# Human Development Report 2007/2008



Climate Change  Human Development



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## Soluciones



**Mitigation:** change behaviour through market, regulation, international cooperation

**Adaptation:** 4 Is= Information, Infrastructure, Insurance, and Institutions

# Climate and Migration

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Climate

Human Development

Migration

Climate Change has the potential to intensify pressures to migrate.  
(HDR 2007/2008)

... but relation between climate and migration is complex



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Projections linked with climate change refer to more intense, more frequent, and less predictable **climate disasters**

# Climate and Migration (cont.)

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Climate  
disaster

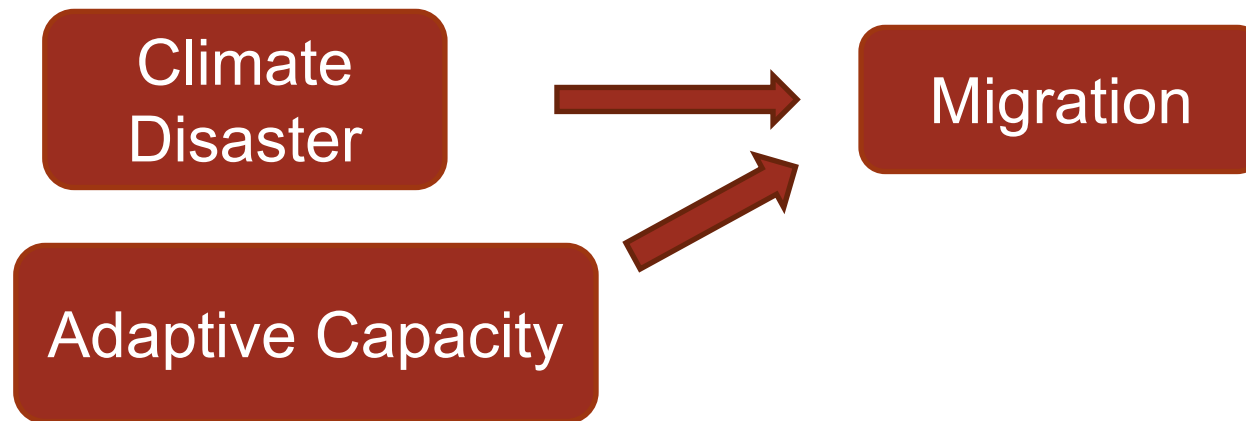
Migration

Not so many studies linking climate disasters and migration.  
(Perch-Nielsen, 2004; Brown, 2007)

“Much more research on the role of climate and environmental factors  
in individual and collective migration decisions is required.”  
(UNITAR, NY, May2008)

2<sup>nd</sup> “Bonn point”

# Migration as Coping Strategy



## Research questions:

- i) What are the determinants of migration in the aftermath of a climate shock? Disentangle factors!!
- ii) Is there a link between climate shocks and migration?

# Nicaragua 1998 - Hurricane Mitch

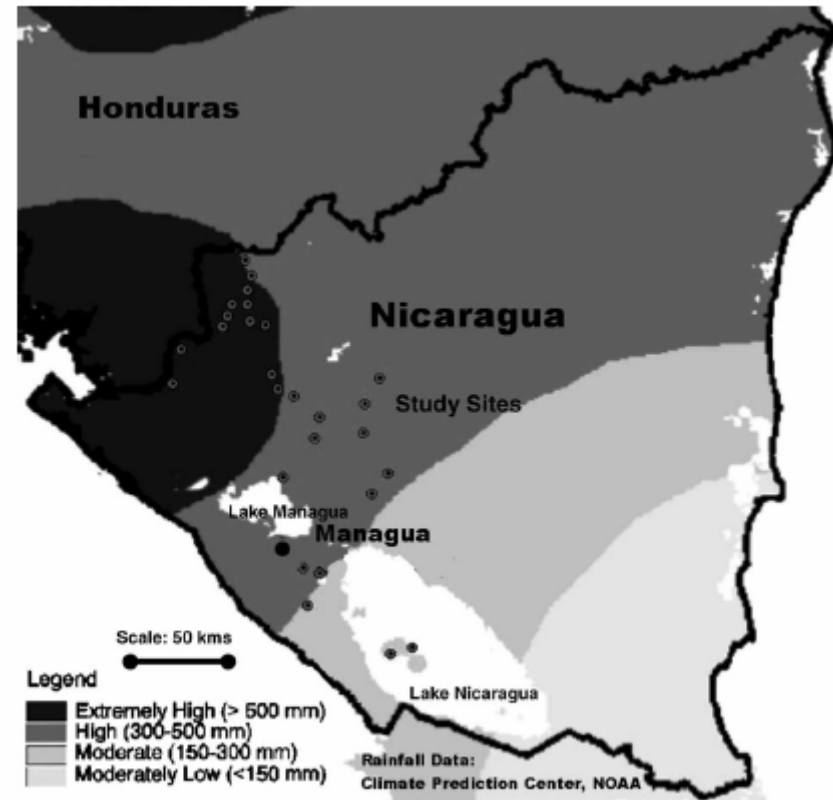


Fig. 1. Map of study sites and levels of hurricane intensity.

Source: E. Holt-Gimenez / *Agriculture, Ecosystems and Environment* 93 (2002) 87–105

Fatal victims in Central America: 20,000;

- in Nicaragua 3,000 and a 20% of the population affected.

# Data



- Nicaragua Household surveys – LSMS (Living Standard Measurement Surveys)
- Years 1998 and 2001
  - right before Hurricane Mitch
  - and 3 years after
- Panel data for a large group of households= 2,983

Comparable information across surveys	1998	2001
Survey size: Households	4,209	4,959
Individuals	18,992	22,810
Dwelling and Household	X	X
Composition of Household	X	X
Health	X	X
Education	X	X
Economic Activity	X	X
Migration	-	X
Fertility and Maternal Health	X	X
Mortality	-	X
Time Use	X	-
Enterprises and Self-Employment	X	X
Expenditures and Income	X	X

# Variables

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## Migration

**M=1**, if household has **at least one** migrant btw 1999 and 2001  
(110 families = 3.7% panel sample)

**M=0**, if household does not have any migrant in 1999-2001  
(2,873 families)

# Variables



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Mitch as compared to previous tropical storms since 1971  
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## Adaptive Capacity

- Wealth (index),
- Dependency ratio,
- Other hh characteristics (gender of head of hh, education of head hh, size hh, unemployment of head of hh, savings),
- Community characteristics (rural/urban, distance to health, distance educ services, etc).

# AC - Household characteristics & Migration

	Total	M=1	M=0	Diff.	
	Mean	Mean	Mean	Mean	Signif.
<b>Household characteristics</b>					
Rural (%)	0.453	0.518	0.450	0.07	
Household size (#)	4.7	5.3	4.7	0.57	**
Dependency ratio	1.137	0.959	1.144	(0.18)	**
Distance to health service (< 1 hr) (%)	0.900	0.882	0.901	(0.02)	
Distance to primary school (< 2 hrs) (%)	0.994	0.982	0.994	(0.01)	
Having savings (%)	0.068	0.064	0.068	(0.00)	
Migrants in hh before 1999 (%)	0.497	0.827	0.485	0.34	***
<b>Household head characteristics</b>					
Age ( years)	46.6	51.3	46.5	4.81	***
Female (%)	0.279	0.345	0.276	0.07	
Education - no education (%)	0.356	0.427	0.354	0.07	
Education - Secondary+ (%)	0.215	0.164	0.217	(0.05)	
Unemployment (< 1 year) (%)	0.044	0.045	0.044	0.00	
Unemployment (> 1 year) (%)	0.112	0.073	0.114	(0.04)	
<b>Wealth quintiles (%)</b>					
Quintile 1 (poorest)	0.213	0.209	0.213	(0.00)	
Quintile 5 (richest)	0.207	0.227	0.207	0.02	
<b>Exposure to Mitch (rain intensity) (%)</b>					
Low	0.284	0.245	0.285	(0.04)	
Medium	0.380	0.309	0.383	(0.07)	
High	0.336	0.445	0.332	0.11	**
Observations	2983	110	2873		

Note: \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%



# Results: Probit

Probability of  
Household has a  
Migrant in 1999-2001

<b>Pr(migration 1999-01)</b>	<b>Marginal effects</b>	<b>z-values</b>
Exposure to High Mitch	0.0144**	-2.57
Migrants in hh before 1999	0.042***	-6.64
Wealth quintile 1	-0.007	-0.96
Wealth quintile 2	-0.013*	-1.68
Wealth quintile 3	-0.005	-0.7
Wealth quintile 4	-0.001	-0.09
Distance to health center	-0.002	-0.23
Distance to primary school center	-0.054	-1.42
Rural	0.013**	-2.19
Head hh education (secondary +)	0	-0.05
Female head hh	0.014**	-2.19
Age head hh	0.001***	-2.86
Dependency ratio (more dependents than workers)	0.029***	-3.04
Dependency ratio level (more workers than dependents)	0.017*	-1.69
Hh size	0.001	-1.41
Head hh unemployment < 1 year	0.004	-0.31
Head hh unemployment > 1 year	-0.016**	-2.2
Having savings	-0.006	-0.59
Observations	2963	
Robust z statistics in parentheses		
* significant at 10%; ** significant at 5%; *** significant at 1%		

# Robustness Results

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- i) Propensity Score Matching, Matching on  $\Pr(\text{Exp}=1 \mid \text{AC}_{1998})$
- ii) Probit on the Matched Sample
- iii) Attrition and Heckman 2-stages

... reinforces the evidence that Exposure to high Mitch does make migration more likely...

# Conclusions

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- ★ Evidence that household exposed to high Rains of Mitch are more likely to migrate after the disaster than those households not exposed to severe Mitch
- ★ Results are robust for unobservables and for attrition test (no evidence on selection bias)

## Future Research:

- ❓ Further analysis of Migration's impact on HD outcomes

# Robustness Results: PSM

Propensity Score Matching, Matching on  $\Pr(\text{Exp}=1 \mid \text{AC}_{1998})$

**Average probability migration**

Exposed High Mitch

Non-Exposed High Mitch

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
mig_98	Unmatched	0.048951	0.030824	0.018127	0.007308	2.48
	ATT	0.049	0.0326	0.0164	0.0084	1.95

A household exposed to high Mitch is 1.64 percentage points more likely to migrate than a household non-exposed to high Mitch (increase probability=50.3%)

... reinforces the evidence that Exposure to high Mitch does make migration more likely...

# Robustness Results: PSM & Probit



## Pr (Migrating<sub>1999-2001</sub>) on the matched sample:

$$\text{Pr}(\text{migrating}_{1999-2001}) = f(\text{Exposure Mitch}, \text{pscore})$$

<b>Pr (M=1, 1999-2001)</b>	<b>Marginal effects</b>	<b>z-value</b>
Exposure to High Mitch	0.0205***	2.75
Propensity score	-0.1562***	-2.73
Observations	2979	

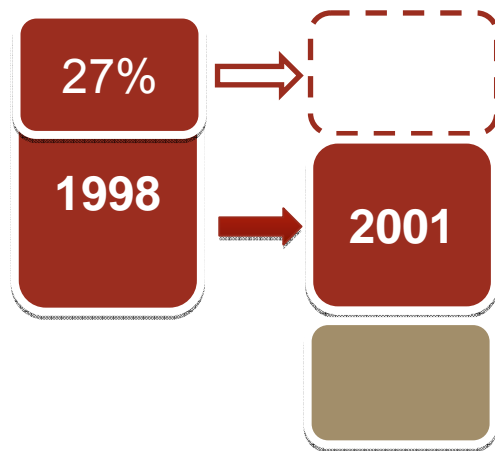
Robust z statistics in parentheses  
\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1 %

... still evidence that Exposure to high Mitch does make migration more likely...

# Robustness Results: Attrition

## Attrition and Sample Selection - Heckman

? What about those households that drop sample (1998 only)?



Is attrition causing **selection bias** ?

↳ Heckman – 2 stages

$$E(M_{HC} | Z_{HC}, S = 1) = \beta_0 Exp_{HC} + \beta_1 AC_{HC} + \gamma \cdot \lambda(\delta Z_{HC})$$

... but we do not reject H0:  $\gamma=0$

No evidence of selection bias on our estimations !!