The role of inter-household transfers in coping with post-disaster losses in Madagascar

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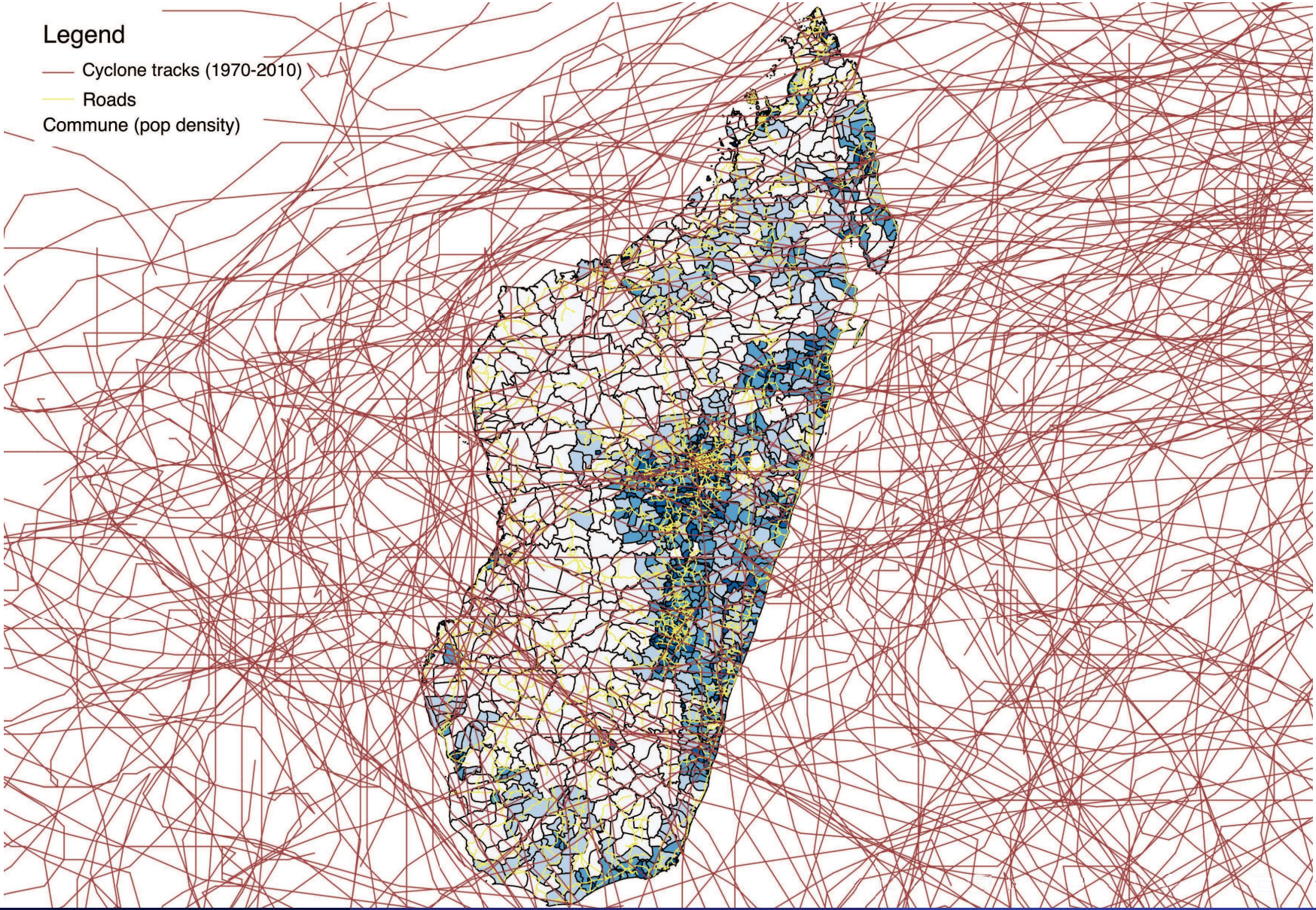
Background and motivation

- There is an important and complex relationship between natural disasters and economic growth (impacts on growth, channels, etc).
- Empirical studies are still limited (Antilla-Hughes and Hsiang, 2012).
- Madagascar is the second most exposed country to multi-disaster risks in Africa (cyclones, droughts, floods, locust invasions).
- Five out of twenty million people live in zones at risk of natural disasters (GFDRR, 2013). As of 2013, Madagascar has the fourth lowest GDPpc ($265 per capita).
- I focus on cyclones, a relatively frequent weather shock that hits the country(3 to 5 cyclones a year.

Figure 1: Cyclone tracks passing Madagascar from 1970 to 2010



Question

What are the direct and indirect impacts of weather shocks on households' well- being (access to public goods, assets, income and child mortality) in Madagascar?

- Preview of the results: 1) cyclones have no direct impacts on urban households but 2) significantly reduces well-being in rural areas 3) urban households are indirectly impacted through the channel of relief transfers which flow from urban to rural households.

Data

- Cyclone data from the International Best Track Archive for Climate Stewardship (IBTrACS) database compiled by the National Oceanic and Atmospheric Administration (NOAA): cyclone tracks since 1970 recorded as 6-hour observations over every $1/34° \times 1/34°$pixel.
- Household-level data from cross-sectional periodical household survey,EPM (Enquête Périodique Auprès des Ménages), conducted by Madagascar's National Statistics Bureau (INSTAT). The EPM consists of a series of multi-thematic surveys, representative at the national and the regional levels (Information on household assets, income, consumption and transfer)
- The EPM survey was collected in 1993, 1997, 1999, 2001, 2004, 2005 and 2010.

The wind speed variable

- Similarly to Antilla-Hughes and Hsiang, the windspeed variable (W) is calculated as the maximum windspeed reached by the cyclone over the $1/34° \times 1/34°$ pixels constituting a commune.
- Since date of interview and date of cyclones are available, I define the windspeed variable as the maximum windspeed reached in the commune in the 12 months before the interview. I also create lagged values of windspeed for up to five years prior to the interview.

Cyclone summary statistics

Unit of observation	Sample	N	Mean	Std..Dev	Min	Max
Province	All Provinces	6	81.86	11.23	70.67	101.74
District	All Districts	110	81.76	30.89	0.00	183.74
Commune	All Communes	1204	77.36	53.57	0.00	222.19
Commune	EPM Sample	612	88.56	51.34	0.00	222.19
Household	EPM Sample	39899	85.21	48.35	0.00	222.19

Table : Summary statistics for Madagascar's cyclone exposure: annual area-averaged maximum wind speed in km per hour

Empirical strategy

- Identfication: comes from the random nature of frequency, intensity and paths of cyclones. No evidence of self-selection when doing randomization check.
- I use Anttila-Hughes & Hsiang's (2012) lagged exposure model:

$$Z_{hct} = \sum_{L=0}^{5} [\alpha_L \cdot W_{c,t-L}] + \tau_t + \mu_c + \xi X_{hct} + \epsilon_{hct}$$

h indexes households, $c$indexes communes and t indexes years. Z is the outcome of interest (asset, income, health outcome, etc) while W is the cyclone wind speed. τ is a year fixed-effect, μ is a commune fixed-effect and X is the vector of observable household characteristics. ϵ_{hct} is an error term for household-level disturbance. Five year lags are included and Conley clusters are used for calculation of standard errors.

Results: Impact on household well-being

VARIABLES	(1) Electricity	(2) Solid Walls	(3) Log Exp	(4) Poverty	(5) Child Mortality
Maximum Windspeed			Panel A: Rural		
t and t-12 months	-0.001**	-0.009***	-0.005**	0.003***	-0.000
t-12 and t-24 months	0.001**	-0.009**	-0.001	0.005	0.005
t-24 and t-36 months	0.001	-0.016***	-0.005	0.005**	0.016**
			Panel B: Urban		
t and t-12 months	0.000	-0.004	-0.000	-0.002	0.001
t-12 and t-24 months	0.000	0.001	-0.001	-0.001	-0.002
t-24 and t-36 months	-0.000	-0.006	-0.001	0.004***	-0.008**

- Electricity: 1mps $\uparrow$ in W $\Rightarrow$ 0.1% $\downarrow$ electricity. Average cyclone (24.6mps): 2.4% decrease.
- Assets: significant, negative and extremely large impact: -0.009*** for the same year and for the first lag (22.1% per cyclone), -0.016*** for two lags (40% per cyclone)
- Expenditure: average cyclone $\Rightarrow$ 12.3% decrease in expenditure.
- Poverty: average cyclone $\Rightarrow$ 7.4% increase in the probability of being poor
- No impact on child mortality for same year and no impact on urban areas.

Results: Investigating the Role of Transfers

- Intra-HH transfers alone amounted to USD 160 millions in 2010.
- 59.7 % of HH in sample either sent (35%) or received (24%) a transfer.
- Transfer data: has the HH received (sent) a transfer? how much? why? how often?
- Reason categories: pension, indemnization, scholarship, festivities and customs,support, support to family, taxes and other.
- "Received relief transfer" : having received a non-regular transfer while living in a commune that had experienced a cyclone. "Send relief": non-regular transfer. For both variables, I only focus on transfers that were labeled for support, support to family and others.
- 87% of relief transfers come from family and less than 1% comes from government. The average value of relief transfer received equals $58 in rural areas(10% of annual income) and $12 in urban areas (2% of annual income). Transfer data is not available for the 1999 EPM survey.

Results: Transfers predict cyclones

VARIABLES	(1) Received a transfer	(2) Received a transfer	(3) Sent a transfer	(4) Sent a transfer
Maximum Windspeed	Urban	Rural	Urban	Rural
t and t-12 months	0.005***	0.003***	0.001	0.001
t-12 and t-24 months	0.001**	-0.001	0.000	-0.003***
t-24 and t-36 months	0.000	-0.000	0.001	-0.002

- The probability of receiving a transfer for a household that lives in a commune hit by a cyclone increases with windspeed. Average cyclone: 12.3% higher probability of receiving a transfer in urban areas and a 7.4% higher probability of receiving a transfer in rural areas.
- Windspeed in the current year for sender does not predict the probability of sending out a relief transfer.
- On average, being hit by a cyclone in the previous year in rural households is associated with a 7.4% lower probability of sending out a transfer. This is again consistent with the findings that rural households are more vulnerable to and more strongly impacted by cyclones than urban households.

Results: Indirect effects through transfer

VARIABLES	(1) Log Exp	(2) Poverty	(3) Child Mortality	(4) Log Exp	(5) Poverty	(6) Child Mortality
Maximum Windspeed		Urban			Rural	
t and t-12 months	-0.000	-0.002	0.002	-0.005**	0.004***	0.003
t-12 and t-24 months	-0.000	-0.001	-0.001	-0.001	0.006	0.005
		Rural shocks			Urban shocks	
t and t-12 months	-0.007	-0.007	-0.051	-0.007	-0.005	0.106
t-12 and t-24 months	-0.028***	0.017*	0.003	-0.003	-0.013	-0.023

- For the year before the survey, a 1mps increase in the average windspeed in rural areas surrounding urban households within a same district is associated with a 3% reduction in expenditure.
- Similarly, a 1mps increase in the average rural shock is associated with a 2% increase in the probability of the urban household of being poor.
- For rural households, direct shocks of being themselves hit by cyclones on expenditure and poverty are still significant but there are no indirect impacts from urban shocks.

Conclusion

- This paper looked at the impacts of income shocks on household well-being (assets, income, poverty and child mortality) and found rural areas are most vulnerable to cyclones and urban areas appear to be unaffected. In rural areas, the average cyclone is associated with a 12.3% decrease in expenditure and a 7.4% increase in probability of being poor. No significant impact on child mortality in year before but lagged impact, consistent with Anttila-Hughes and Hsiang's hypothesis that shocks divert resources away from childcare and translate into higher mortality in the following years.
- These results are not surprising given the better infrastructure seen in urban areas (cyclones have no significant impact on housing) and since urban households do not rely as much on agricultural income and activities as rural households do.

Conclusion

- Cyclone shocks predict transfers to both urban and rural areas. Majority of transfers come relatives and urban households.
- Iindirect effects of rural shocks on urban households: large and significant reduction in well-being (lower expenditure and higher poverty) of urban households associated with rural shocks happening the year before the survey.
- Relief transfers might divert resources away from urban households that could have been invested on productive assets and investments in the current year.
- I do not find a similar indirect impact channel for rural households.
- This suggests that putting into place a SDRFI scheme in Madagascar would assist rural HH better cope with shocks and relieve urban HH from assuming the burden of social assistance to rural HH.