

“Gone with the Storm: Rainfall Shocks and Household Wellbeing in Guatemala”

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This paper

- Exploits the occurrence of a natural shock, Tropical Storm Agatha (2010), which brought to Guatemala the largest rainfall since 1963, to identify its short- & medium-term impacts on
 - **Household well-being** (consumption, poverty indicators)
 - **Children's human capital** (school enrollment and health)
 - **Labor force supply responses** (adults and children)
- Carries out sub-group analysis to understand factors that raise resilience and attempts to disentangle some of the mechanisms
- Seeks to derive policy lessons to strengthen disaster and risk management strategies to protect vulnerable populations

How?

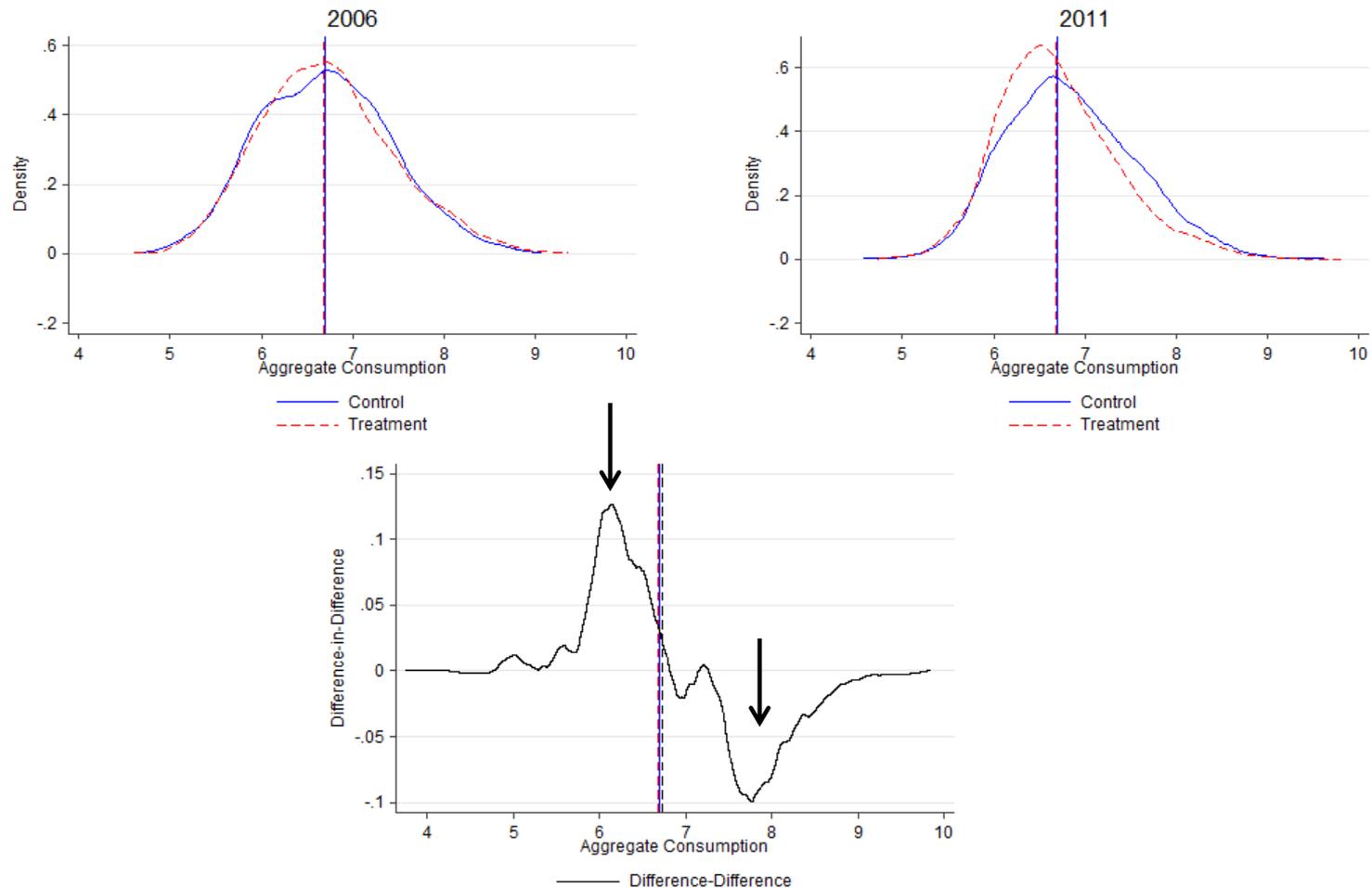
- It employs a standard double-difference analysis

$$Y_{imt} = \alpha_m + 2011_t + \beta Storm_{mt} + X_{imt}'\gamma + \varepsilon_{imt}$$

- Using cross-sectional LSMS data from 2006 (pre-shock) and 2011 (post-shock)
- Exploits quasi-exogenous variation in the intensity of the shock (monthly and daily rainfall data from 73 weather stations)
- And performs a number of placebo tests on two control groups

The raw DD shows a fall in consumption among affected households

Consumption per-capita distribution and changes for control and treatment groups (2006 and 2011)



Source: LSMS 2006 and 2011 and World Bank calculations

Human capital formation was disrupted in rural areas

- School enrollment fell by 4% for rural children 7-11 years old

Impact estimates of the effect of Agatha on school enrollment

	<i>School Enrollment</i>		
	<i>7 to 15</i>	<i>7 to 11</i>	<i>12 to 15</i>
<i>National</i>	(1)	(2)	(3)
t * (rainfall z-score > 2)	-0.022*	-0.028**	-0.017
	[0.012]	[0.013]	[0.017]
Observations	33,022	18,977	14,045
Baseline Mean	0.833	0.906	0.782
<i>Urban</i>			
t * (rainfall z-score > 2)	0.006	0.002	0.010
	[0.018]	[0.017]	[0.031]
Observations	11,530	6,513	5,017
Baseline Mean	0.886	0.937	0.855
<i>Rural</i>			
t * (rainfall z-score > 2)	-0.027*	-0.035**	-0.022
	[0.015]	[0.015]	[0.021]
Observations	21,492	12,464	9,028
Baseline Mean	0.804	0.890	0.742

Increasing the prevalence of child labor

- Mostly among those who stopped attending school

Impact estimates of the effect of Agatha on child labor force participation

	<i>Labor force participation</i>		
	<i>7 to 15</i>	<i>7 to 11</i>	<i>12 to 15</i>
<i>National</i>	(1)	(2)	(3)
t * (rainfall z-score > 2)	0.031*	0.020	0.047*
	[0.018]	[0.016]	[0.027]
Observations	33,222	12,464	9,028
Baseline Mean	0.183	0.101	0.300
<i>Urban</i>			
t * (rainfall z-score > 2)	-0.021	-0.023	-0.020
	[0.022]	[0.019]	[0.038]
Observations	11,599	6,515	5,084
Baseline Mean	0.136	0.0644	0.233
<i>Rural</i>			
t * (rainfall z-score > 2)	0.042*	0.030	0.061*
	[0.023]	[0.023]	[0.033]
Observations	21,623	12,461	9,162
Baseline Mean	0.236	0.120	0.374

Robustness: No placebo treatment effects

- Base results robust to “fake” treatments in pre-shock period using, ruling out pre-treatment differential trends

Placebo test: Impact estimates of the effect of Agatha on consumption and poverty on pre-shock period

Measure of Shock	Total	Moderate	
	Consumption	Poverty	Poverty Gap
	(1)	(9)	(11)
t * (rainfall z-score > 2)	-36.633 [41.047]	-0.023 [0.030]	0.002 [0.015]
Observations	20,788	20,788	20,788
Number of municipalities	322	322	322
Baseline Mean	957.0	0.459	0.174

Note: Parameter estimates from a placebo test of the effect of the shock based on a diff-in-diff analysis using pre-shock data (2000 and 2006)

Source: LSMS 2000 and 2006 and World Bank calculations

Robustness: No placebo treatment effects

- Base results robust to “fake” treatments on time-invariant variables in post-shock period, ruling out endogenous compositional changes

Placebo test: Impact estimates of the effect of Agatha on pre-determined variables

Measure of Shock	Education	Age	Gender	Area of residence	Single-married
	(1)	(2)	(3)	(4)	(5)
t * (rainfall z-score > 2)	-0.238	-0.086	0.014	0.013	0.009
	[0.154]	[0.378]	[0.011]	[0.024]	[0.011]
Observations	23,320	23,500	23,500	23,500	23,498
Number of municipalities	327	327	327	327	327
Baseline Mean	3.966	45.47	0.788	0.424	0.792

Note: Parameter estimates from a placebo test of the effect of the shock based on a diff-in-diff analysis using post-shock data (2006 and 2011)

Source: LSMS 2000 and 2006 and World Bank calculations

Conclusions

- Robust evidence suggests that Agatha led to a sizable –and possibly persistent– deterioration of human welfare among affected households
- Similar impacts widely documented in the literature but those triggered by excessive rainfall often concentrated in rural areas
- This paper shows that urban areas are as vulnerable
- Agatha could be responsible for up to 20% of the increase in poverty between 2006 and 2011 –often attributed solely to the effects of the global and food price crises.
- Households adopted sub-optimal coping strategies that could harm human capital accumulation