Evaluating the impact of timely disaster response in the Philippines

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Introduction

- The effects of disasters can be devastating, affecting hundreds of millions of inhabitants annually.
- There are efforts to improve the speed of government response following disasters to reduce impacts on populations struck. However, the quantification of the gains of improvements of the *speed of reconstruction funding allocation*, has not, to our knowledge, been rigorously estimated.
- In this study, we quantify the effect of increases in the rate of disaster reconstruction spending on labor outcomes in the Philippines post-typhoons.
- We use an fixed effects and instrumental variables approach to identify the effects of government spending on wages, whether the household head is employed, and the number of hours the household head worked, controlling for a vector of extreme weather rainfall and typhoon indices to identify the effects caused by exogenous variance in government spending rates.

Background

- According to data from the Emergency Events Database produced by Centre for Research on the Epidemiology of Disasters, more than 197 million individuals are affected by natural disasters each year on average.
- The poor are more vulnerable to natural disasters and usually face the maximum impact from these disasters [Fothergill and Peek, 2004, Janvry, 2015, Kahn, 2005, Masozera et al., 2007, Pelling, 1997], âboth because of the weaker infrastructure found in poorer locales and the subsequent difficulty in rebuilding areas that are harder hit.
- There is no general consensus as to how disasters affect labor outcomes in equilibrium over the long term [Kirchberger, 2015.
- Much of the past literature has focussed on the impact of disasters on various economic outcomes: e.g., wages, employment, hours worked, migration, and remittances, or health outcomes: self-reported health status, lung capacity, and height to weight ratio [Anttila-Hugues and Hsiang, 2013, Halliday, 2006, Menendez, 2014, Premand, 2008, Yang, 2008]
- In this study, we look at how disasters affect labor outcomes themselves, we look at how the rate of government disbursement of funds in response to disasters, affects labor outcomes. Few papers study the affects of government's role in budgeting that occurs before (expenditures) and after (receipts) a disaster.

Nov 2013
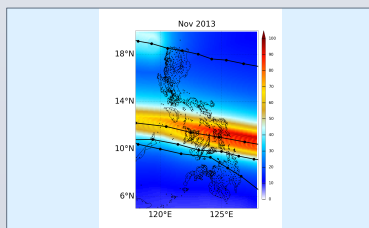
Data

1. PSA, Labor Force Survey

The outcome data, $w_{h,y,t,m}$ (household-level wages, employment, hours worked), originate from the Labor Force Survey (LFS).

2. DOF-BLGF, Statement of Receipts and Expenditures

We obtained quarterly government spending on public services (based off the statement of receipts and expenditures) by municipality 2009-2014 directly from the Bureau of Local Government Finance in the Department of Finance (BLGF-DOF) based in Manila, Philippines.

3. PAGASA, Rainfall

We created the set of rainfall controls from monthly rainfall and temperature data purchased from Philippines Atmospheric, Geophysical and Astronomical Service Administration (PAGASA). Rainfall by municipality was derived from measurements captured from 50 weather stations dispersed across the Philippines. Municipality measures were interpolated using an inverse distance weighting function. The 5 nearest stations were considered. In the case that the nearest station had missing values, the next station was considered.

4. PCE, Political Affiliation

Provincial political affiliation data come from the Philippines Commission on Elections (PCE). The Liberal Party (LP) retains the largest share, while the Nationalist People's Coalition (NPC)/BISKEG, NPC and and Nacionalista Party (NP) follow (where NPC and NPC/BISKEG become one party by 2012). Our estimates incorporate a dummy variable for whether the province shares the same political affiliation as the incumbent president (or the LP party between 2009 and 2012).

5. NOAA, IBTrACS, Wind Model

We use an empirical approach following Holland et al. [2010] to generate the wind structure of 105 storms that moved over the Philippines between 2000 and 2014. After obtaining the radial profile of the surface wind, we generate an axisymmetric two-dimensional wind map. We then include the impact of storm movement on surface winds that results in stronger winds on the right side of the storm. Such a two-dimensional wind map is calculated hourly throughout each storm's lifetime. Finally, we combine the modeled winds and derive the monthly maximum winds over the Philippines from 2000 to 2014. As an example, the figure to the left shows the monthly maximum surface winds induced by tropical cyclones over November 2013. While there were 4 storms passing through the Philippines, the main influence is from Typhoon Haiyan. A local maximum at the upper-left corner of is due to Typhoon Korsa.

## Identification Strategy: 2SLS

Second Stage

$$w_{h,y,t,m} = \beta_0 + \beta_1 \hat{S}_{y,t,m} + \Lambda_0' G_{y,t,m} + \Gamma_0' X_{h,y,t,m} + \Pi_0' Y_{y,t,p,m} + \phi_y + \psi_m + \delta_t + \epsilon_{h,y,t,m}$$

First Stage

$$S_{y,t,m} = \alpha_0 + \Lambda_1' G_{y,t,m} + \Gamma_1' X_{h,y,t,m} + \Pi_1' Y_{y,t,p,m} + \Omega_1' Z_{h,y,t,m} + \mu_{y,t,m}$$

- In the second stage, w is an outcome variable, wages or hours worked, h represents the household, y is year, t is quarter or month, p is province, and m is municipality. S represents the amount of government spending at the municipal level at time t and y.
- We include three sets of control variables: average weather trends at the municipality level by quarter, household demographic controls, and economy proxies at the municipality and provincial level.

Results: Typhoons v. BLGF

Total Budget (BLGF) / Quarterly typhoon index

----- Total budget   —— Typhoon Index
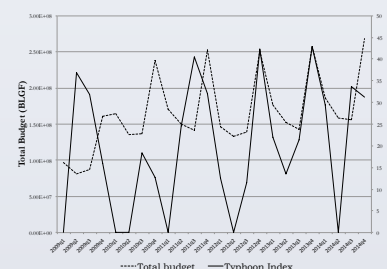
Results: Effect of government statement of receipts and extreme rainfall on HH labor

Table 3: Effect of government statement of receipts and extreme rainfall events on HH labor

	Hours worked by HH head		Whether HH head was employed		HH head daily wage	
	(1)	(2)	(3)	(4)	(5)	(6)
Log of total BLGF budget	0.547***	1.584	-0.006**	0.031	-9.726**	-164.852*
	(0.157)	(1.564)	(0.003)	(0.034)	(4.114)	(98.539)
Log of total BLGF budget, 1 quarter prior	0.536***		-0.000		1.263	
	(0.182)		(0.004)		(4.164)	
Log of total BLGF budget, 2 quarters prior	0.961***		-0.010***		4.784	
	(0.153)		(0.003)		(3.424)	
# of high rainfall events in yr (>3 std. dev.)	0.806**		0.009		-11.751	
	(0.364)		(0.006)		(14.137)	
# months between high rainfall event and end of fiscal year	-3.979***		-0.038*		57.352**	
	(1.210)		(0.022)		(23.983)	
Normed, annual night lights	2.455***	2.616***	-0.020***	-0.047**	8.821	97.492*
	(0.255)	(0.976)	(0.005)	(0.021)	(8.278)	(54.466)
Mean annual rainfall	-0.006***	-0.005***	0.000***	0.000***	0.024	-0.025
	(0.001)	(0.001)	(0.000)	(0.000)	(0.025)	(0.043)
Mean annual temperature	0.433***	0.364***	0.001	0.006*	-6.374**	-22.317**
	(0.088)	(0.168)	(0.002)	(0.003)	(3.143)	(10.777)

Results: Effect of government statement of receipts and extreme rainfall on HH labor4

	Hours worked by HH head		Whether HH head was employed		HH head daily wage	
	(1)	(2)	(3)	(4)	(5)	(6)
Log of total BLGF budget	0.584***	34.270***	-0.006**	0.012	-9.159**	-217.994
	(0.156)	(13.037)	(0.003)	(0.156)	(4.273)	(190.317)
Log of total BLGF budget, 1 quarter prior	0.477***		-0.000		1.210	
	(0.181)		(0.004)		(4.200)	
Log of total BLGF budget, 2 quarters prior	0.984***		-0.010***		4.296	
	(0.153)		(0.003)		(3.345)	
# mean number of months between typhoon and end of fiscal year	0.113***		-0.000		-1.252	
	(0.030)		(0.001)		(1.026)	
# max typhoon index observed in quarter	-0.008		-0.000		0.087	
	(0.008)		(0.000)		(0.260)	
# max typhoon index observed in quarter, 1 quarter prior	-0.006**	0.003	0.000**	0.000*	-0.218**	-0.255**
	(0.003)	(0.005)	(0.000)	(0.000)	(0.100)	(0.120)

Conclusions

- We find that the amount of government spending on a quarterly basis has a robust and positive effect on hours worked, a weak and negative effect on daily wages, and find no effect on employment.
- These results suggest that an increase in speed of government response impacts the supply of labor more than the demand because of the decrease in wages. The impacts are of non-trivial scale. For example, a 25% increase in the rate of quarterly typhoon reconstruction funding leads to people working more than a full work day per week (8.5 hours) in that municipality, or a 22% increase in hours worked during that quarter. To get a rough sense of the magnitude of increased hours in macroeconomic terms, 22% of the 27.8 labor share of GDP in the Philippines in 2008 is 6% of GDP [Marquez and Juan-Bautista, 2012].
- The findings demonstrate clear positive impacts from efforts for expedited release of funds in typhoon-affected areas.