

Insuring Growth: The Impact of Disaster Funds on Economic Recovery

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Disaster funds are a key part of climate change adaptation efforts.

- Damages from extreme weather events are likely to increase in the coming decades
 - Climate change will likely lead to more intense and more frequent storms, Emanuel (2013)
 - Demographic trends imply increased exposure to weather risks, Mendelsohn et al. (2012)
- Governments, in developing economies, have a limited ability to smooth the losses created by extreme weather events.
- Risk-financing instruments could be used mitigate the losses
 - National disaster funds can be deployed to mitigate the losses from recurrent events.

Can Disaster Funds provide a cost effective way of mitigating these losses ?

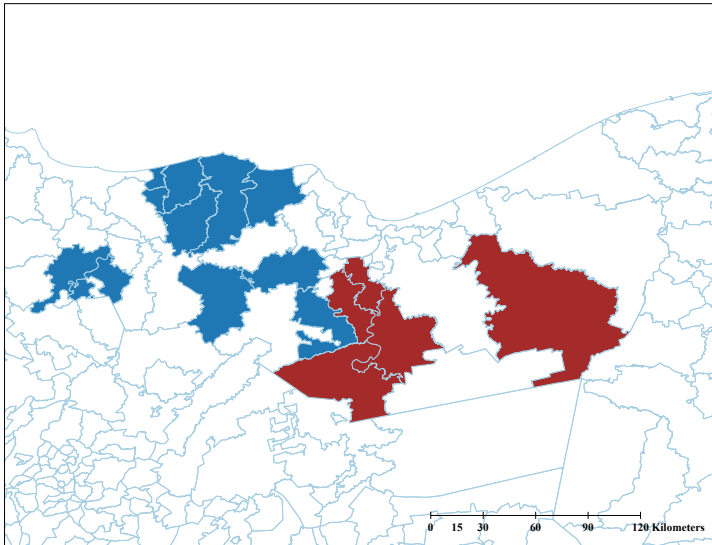
- Disaster Funds: ex-ante budgeting allocations for post-disaster reconstruction
- Disaster Funds provide a double gain:
 - ***Reduce the opportunity cost of reconstruction***
 - Allows firms and households to better manage risk by knowing in advance the government response

We use a unique dataset and the institutional features of Mexico's Natural Disaster Fund (FONDEN) to provide some of the first estimates of the impact of disaster funds on local economic activity

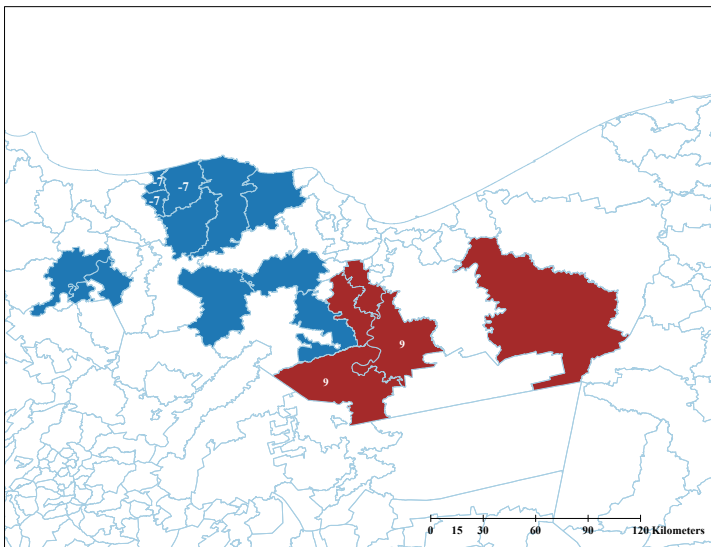
Mexico's Natural Disaster Fund: Fonden

- Program setup by the federal government in 1999
- Uses a bottom up risk layering approach:
 - Risk retention: Financed by a protected budget allocation
 - Transfers risk: Placement of CAT-Bonds
- Provides rapid reconstruction funds for low-income housing and public infrastructure
 - Rebuild roads, hydraulic, health, and educational infrastructure
- On average the program spends USD \$939 million a year in reconstruction
- Roughly USD \$8.32 per capita

We exploit a nearly ideal research environment: Mexico's FONDEN

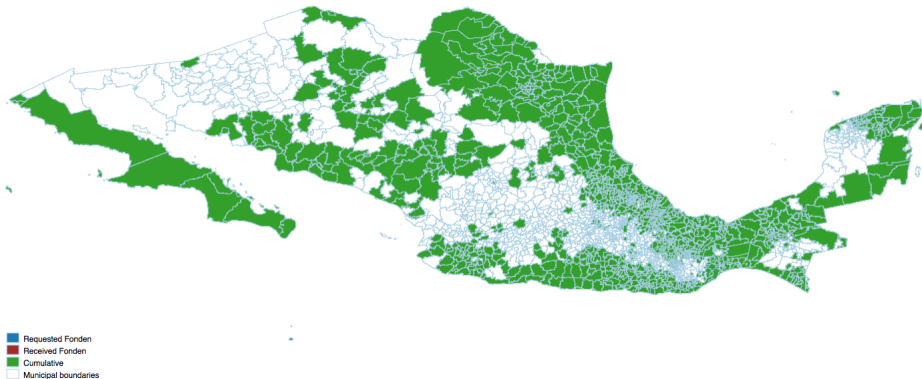


Our source of variation is created by Fonden disaster thresholds

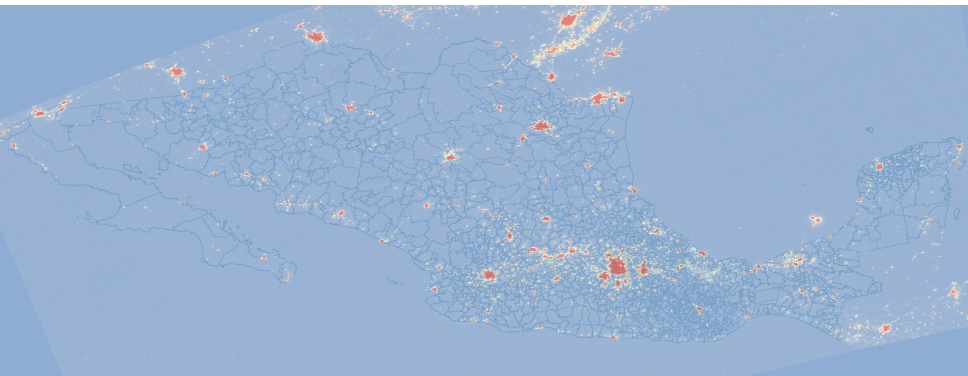


Heavy Rain Events (2004-2013)

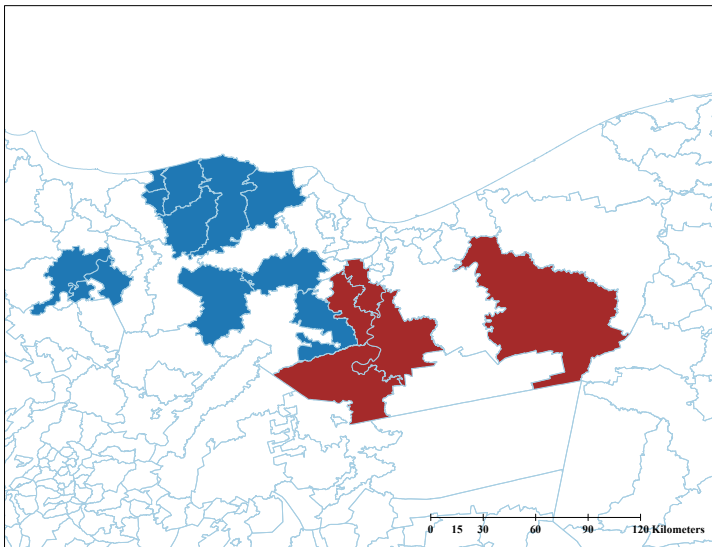
74% of municipalities will request Fonden funding



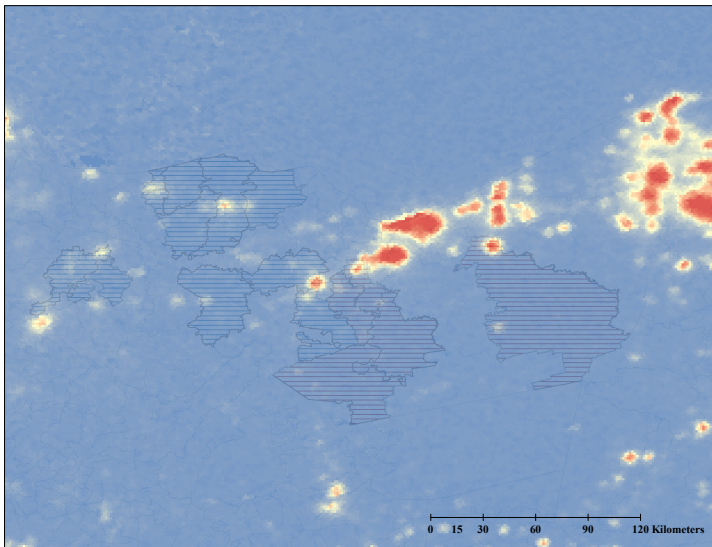
We measure economic activity using *night lights* imagery



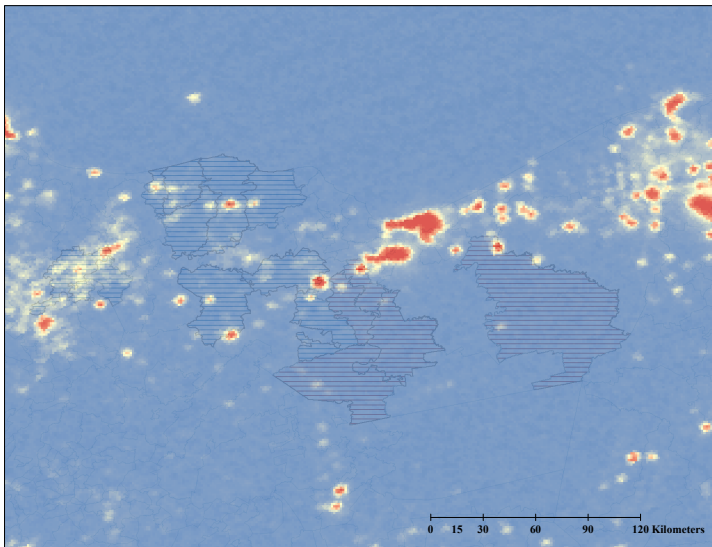
We measure LOCAL economic activity using night lights



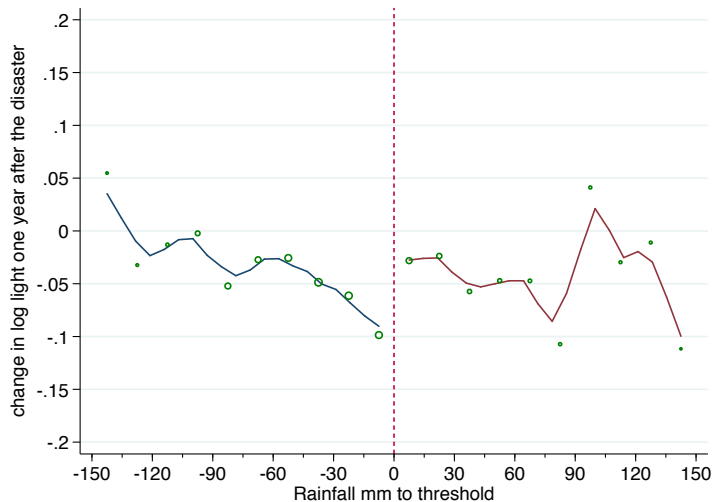
Year the disaster takes place



One year after the disaster occurs



Fonden increases local economic activity

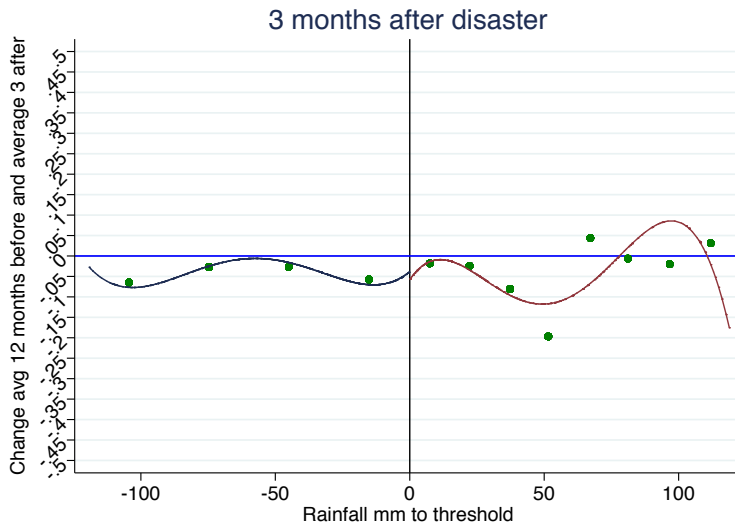


What is the value of the growth created by Fonden?

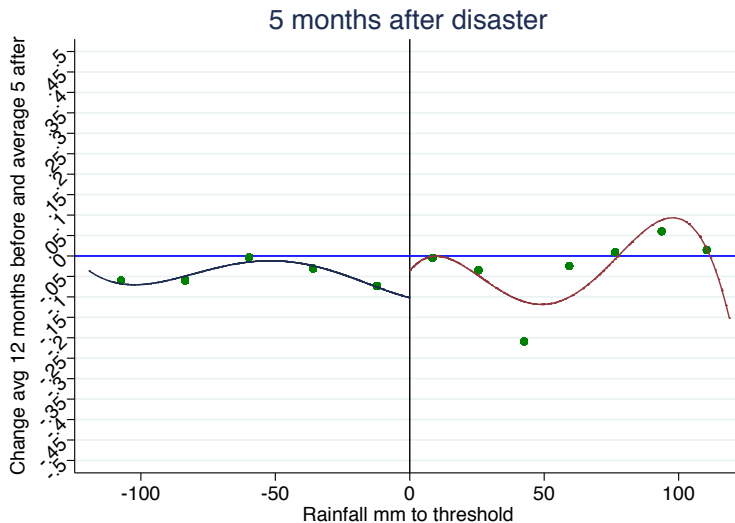
Back of the envelope

- Word of warning! This number is noisy and hard to pin down.
 - uncertainty of estimating the impact of FONDEN and of estimating the elasticity of light to GDP
- Value of local economic activity generated by FONDEN 2004-2011
 - Mean: USD \$6.38 billion
 - Std Dev: USD \$ 5.63 billion
- Cost of the program: USD \$ 4.9 billion
- Mean benefit-cost ratio: **1.29**

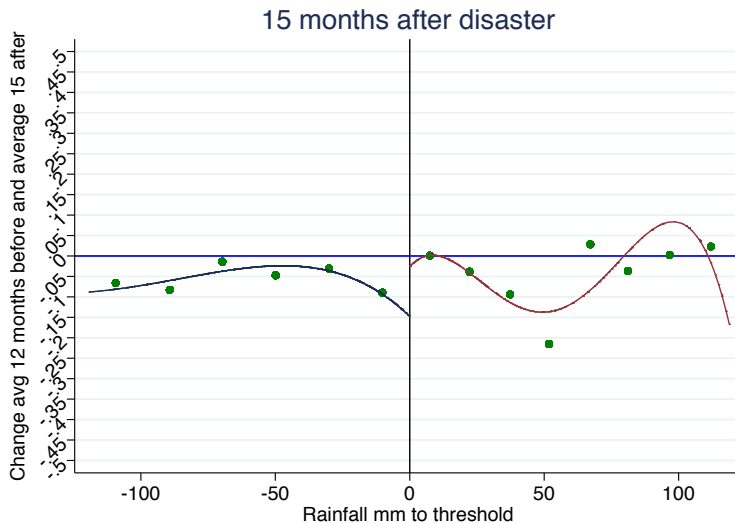
Fonden increases local economic activity for up to 2 years



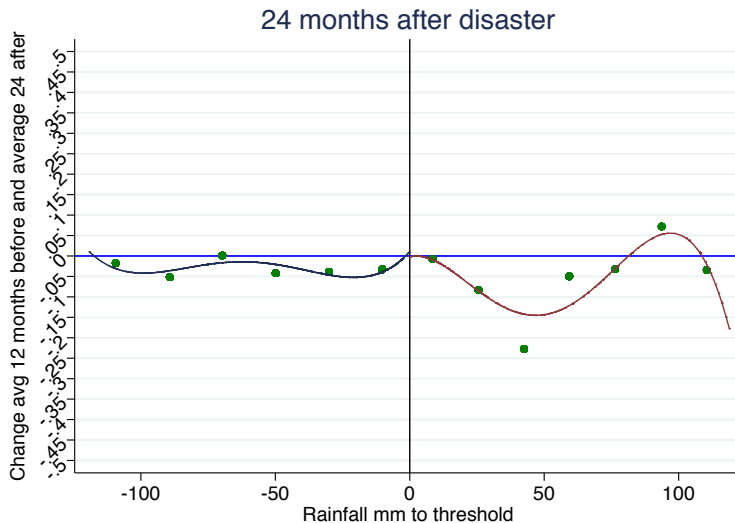
Fonden increases local economic activity for up to 2 years



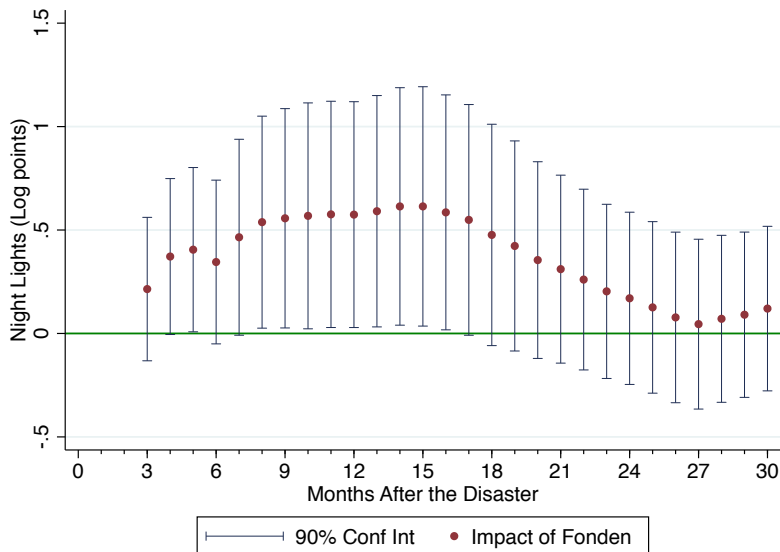
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Fonden increases local economic activity for up to 2 years



Takeaway

- Fonden is a cost effective component of Mexico's of climate change adaptation efforts
 - Fonden is capable of boosting local economic activity for as long as 2 years
 - During these two years access to disaster funds led to an increase in local economic activity of as much as 6%

Policy makers interested in learning from the experience of FONDEN have two great resources: Mahul (2011) and World-Bank (2012)

Emanuel, Kerry A., "Downscaling CMIP5 climate models shows increased tropical cyclone activity over the 21st century," *Proceedings of the National Academy of Sciences*, 2013, *110* (30), 12219–12224.

Mahul, Olivier, "Sovereign Disaster Risk Financing," Technical Report, World Bank 2011.

Mendelsohn, Robert, Kerry Emanuel, Shun Chonabayashi, and Laura Bakkensen, "The impact of climate change on global tropical cyclone damage," *Nature Climate Change*, 2012, *2* (3), 205–209.

World-Bank, *FONDEN: Mexico's Natural Disaster Fund-A review*, Washington D.C.: World Bank Publications, 2012.