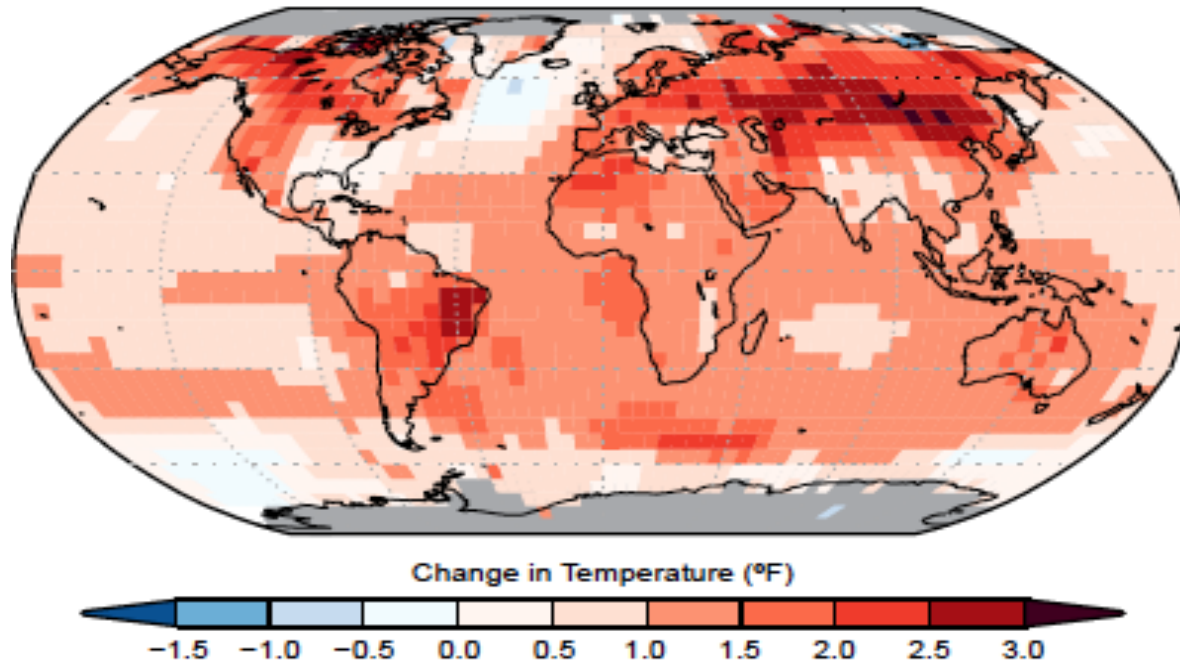


Natural Disasters, Climate Change, and Sovereign Risk by Enrico Malluci

Surface Temperature Change



Comments

Laura Alfaro

Harvard Business School & NBER

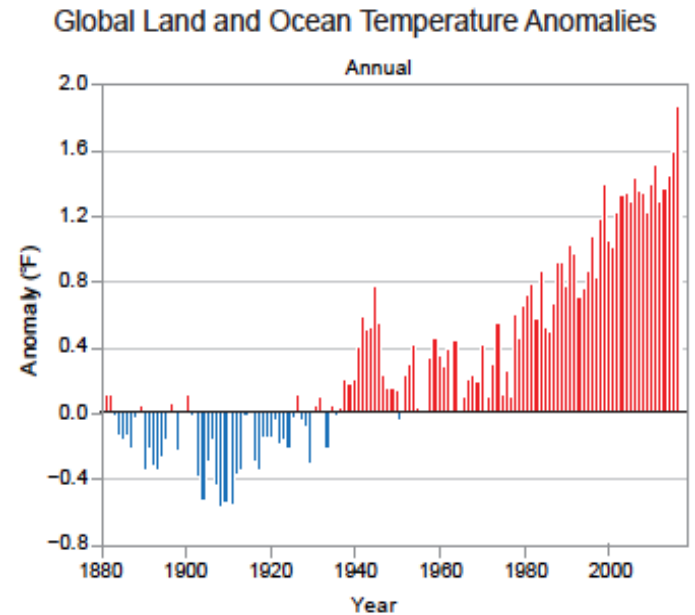
What Does the Paper Do?

Effects Global Climate Change on Debt Sustainability

- Focus: Hurricanes Disasters (exogenous shocks to income).
- Calibration exercise to reproduce frequency and intensity of major hurricanes (1980-2019):
 - Antigua and Barbuda, Belize, Dominica, Dominica Republic, Grenada, Honduras (CONCACAF)
- Findings:
 - **Extreme weather restricts** government's access to financial markets
 - **Disaster clause** (stop servicing debt when hurricane hits)
 - Facilitate market access allowing governments to borrow but spreads increase.
 - Role Debt Limits and welfare exercise.

First Order of Importance Question & Application (Poorer Countries)!

- Global annually averaged surface air temperature has increased by about 1C over the last 115 years. **This period is now the warmest in the history of modern civilization...**
- Thousands of studies conducted by researchers around the world have documented **changes in surface, atmospheric, and oceanic temperatures; melting glaciers; diminishing snow cover; shrinking sea ice; rising sea levels; ocean acidification; and increasing atmospheric water vapor... Heavy rainfall is increasing in intensity and frequency globally and is expected to continue to increase....**



Global Change Research Program
Climate Science Special Report, 2017

Comments

First Order of Importance Question & Application (Poorer Countries)!

- ✓ Suggestion to make it more general/future work: research agenda
- What is driving the results (intuition)?
- Effects of Hurricanes/GCC
- Contracts: Is debt the best way for poor small countries to deal with GCC?
 - High Debt Levels, Output Costs, Debt Limits
 - Other Contracts & Role of Multilaterals

Production, Debt, & Hurricanes

- Endowment: stochastic process with the addition of disaster term.

$$c_t = y_t(1 - h_t) + qb_{t+1} - b_t$$

- h_t : economy is hit with a hurricane, output loss: probability p_h
- Defaulting: output Cost $\delta(y) \leq y$.
 - Consumption smoothing is mostly achieved through default (contingent debt service)
 - Debt is predominantly used to front-load consumption
 - Additional output costs of defaulting required to obtain equilibria that resemble the data—**high debt levels**.

Hurricanes and Debt Sustainability

Qualitative Effects of GCC

- μ : If disasters \downarrow mean of endowment (less GDP) \rightarrow Country can hold \downarrow debt
 - Paper does slightly different (disasters out of GDP process) but same idea
 - Can GCC increase endowment mean?
(Warmer winters/Grow bananas in Canada).
- σ : If disasters \uparrow volatility of endowment \rightarrow motivation to hold \uparrow debt; sovereign defaults more often to smooth consumption; higher spreads.
 - Can GCC reduce variance?
- If mean dominates variance (first versus second order effect) \rightarrow lower debt, higher spreads, & bad events.

Hurricanes / GCC

Effects in Poor Countries

- “Changes in the characteristics of extreme events are particularly important for **human safety, infrastructure, agriculture, water quality and quantity, and natural ecosystems. ...**”

Global Change Research Program Climate Science Special Report, 2017

- “Climate change is a threat multiplier, with the potential to **push millions into poverty... forcing people to evacuate homes, grapple with food insecurity or the impacts of deforestation and biodiversity loss – ... damage to power generation and transport infrastructure alone.** They also trigger **wider disruptions for households and firms** costing at least \$390 billion a year.”

World Bank/Climate Change

Hurricanes / GCC

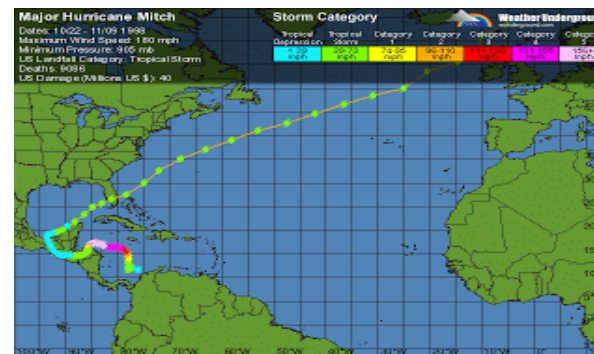
Mitigation & Adaptation

- “Countries now have a once-in-a-generation chance to set themselves on a sustainable, inclusive and resilient development path.
- **Making the right investments** now can unlock short term gains – jobs and economic growth – as well as deliver longer term benefits for people, including decarbonization and **resilience**....
- **Making infrastructure more resilient avoids costly repairs and minimizes the wide-ranging consequences of natural disasters for the livelihoods and well-being of people.”**

World Bank/ Climate Change

Hurricanes / GCC: Effects

Mitch October 29, 1988



	Honduras	Nicaragua	El Salvador	Guatemala
Deaths/missing	6500 dead with up to 11,000 still missing, presumed dead	3800 dead and 7000 missing, presumed dead.	230 deaths	200+ deaths
Homes damaged or destroyed	1.5 million (20% of country's population) had to evacuate their homes.	750,000 evacuated homes	500,000 evacuated homes	80,000 evacuated homes.
Infrastructure damage	Estimated 70 - 80% of transportation infrastructure destroyed; power. One third of all buildings in the capital damaged by the floods.	71 bridges destroyed - many on the few arterial roads in the country. Buildings/Power cost not accounted	Not known	Not known
Crop damage	70% of crops destroyed - losses estimated at \$900 million.	30% coffee crop lost. Beans, sugar and banana crops devastated.	80% of maize crops lost. Coffee, sugar cane lost.	Extensive damage to coffee and banana

Diseases: **contaminated food, water sources, and mold/outbreaks of Dengue fever and cholera.**
<https://hurricanemitch1998.wordpress.com/2014/04/22/hurricane-mitch-and-people/>

Hurricanes / GCC: Effects in Poor Countries

Mitigation & Adaptation

- Capital Stock
- Households/Firms (no crops today: no crops tomorrow)
- Effects: $f(\text{GDP})$
- Mitigate & adapt
-

⇒ Move beyond endowment economy:

– Role of Investment

- Bai and Zhang (2010, Econometrica)

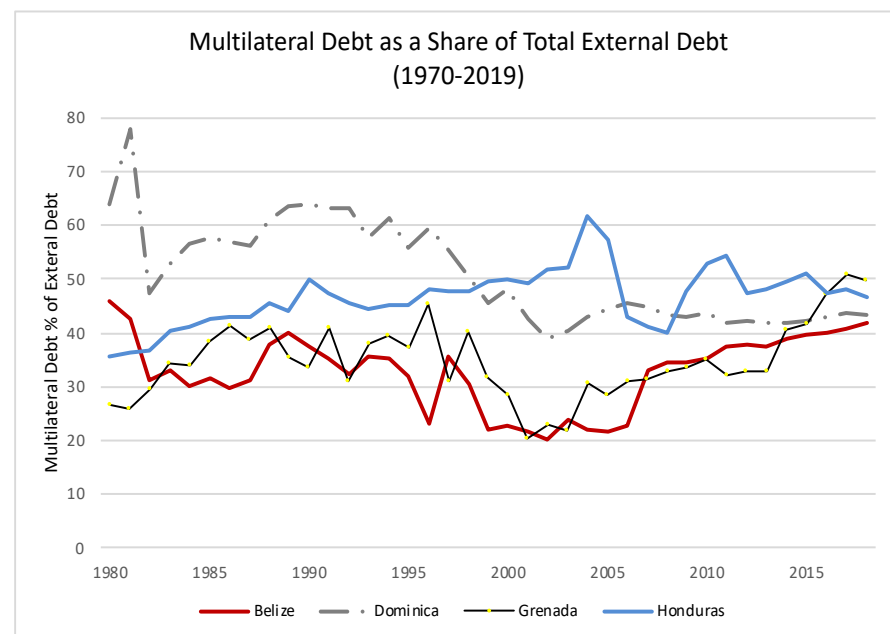
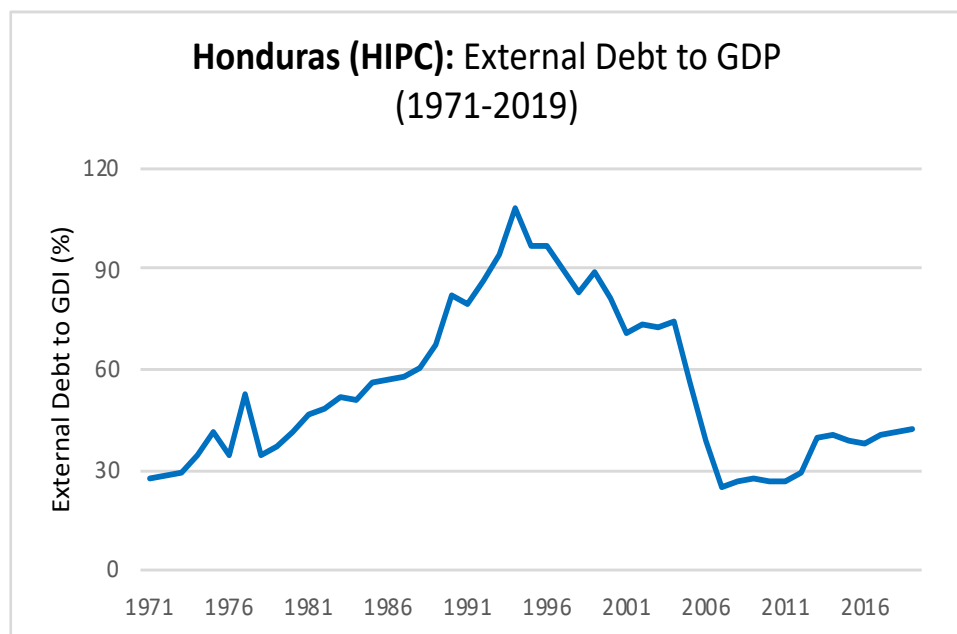
Debt & Hurricane Clause

Suspend debt servicing + No Costs Default

- Grossman and Van Huyck (AER, 1988)
 - **Partial excusable defaults** in bad times (contingent debt service).
 - Although most lending involves non contingent loans, if borrower's economy falters: Reschedule, renegotiate, change unilaterally payment; (lender) new loans, cut existing credit lines, etc.
- **Hurricane Clause: predictable** state contingent “renegotiation” process (moratorium) → Premium in loans (compensate partial payments).
- Overborrowing: Role for debt limits?
 - This paper
 - More general (Alfaro and Kanczuk, 2018).
- But is this why **debt is so high in these countries?**

Sovereign-Sovereign Borrowing

Role of Multilaterals (Bilateral Not Included)



Alfaro et. al (2014) “Sovereigns, Upstream Capital Flows and Global Imbalances”

Hurricane Clause & Debt Service

Best Contracts?

- Is debt (even contingent to harsh hurricanes) the best contract for poor small economies (is debt service moratorium enough)?
- Sovereign debt is thought of a incomplete contract problem.
 - Countries want to insure against bad shocks, but:
 - i. Not verifiable (GDP drop: bad luck or bad policies)
 - ii. Moral hazard (politicians will be politicians).
 - Imperfect debt is chosen: restructuring processes, mysterious output costs, etc.
- How about hurricanes?
 - Easily verifiable & not subject to moral hazard.
 - Diversifiable (at least for small Caribbean countries)
 - Insurance
- Why don't small countries (Caribbean) buy insurance more generally?

GCC, Contracts & Role of Multilaterals

- How should the International Financial Institutions (WBG, IMF) intervene?
 - So far: lending ex-post (subsidized); recurrent HIPC.
- Alternative?
 - Subsidizing insurance, rather than lending conditionally (private insurance companies better equipped to diversify)
 - As global temperature increases, and so number and size of accidents, insurance companies gradually increase insurance prices.

GCC: Global Scale Future Research

- How about beyond Caribbean?
 - Adverse effects increasing in the US (the other CONCACAF country)!
 - **GCC: Is at the Global Scale!**
- How do we think of debt sustainability in large economies?
- Should the world be saving for future? Investing now?
- Role of Multilaterals?

Final Thoughts

- Great, Clever Paper
- Opening a Rich Research Agenda
- First Order of Importance