Hurricanes, Natural Disasters, and Climate Salience

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November 30, 2023

Overview

Research Question

How does the salience of climate events change behavior?

- There is a literature measuring this, but their outcome variables are indirect measures such as google trends, or voting behavior
- I want to know if this translates into action
- The key question is: does exposure to a climate event such as a hurricane lead people to change their emitting behavior

Background Theory

- As far as I can tell, there is no micro-founded model for decision making with climate expectations. The only model I could find was a classical Ramsey-type model.
- The framework to keep in mind is producers are maximizing profit based on future expectations of profits, and climate damages. Before the hurricane, the expectations of climate damages are too low. So, we should see too much production
- After the hurricane, expectations are corrected, so there is a smaller opportunity cost giving up current production. Production should then decrease. Assuming pollution is an increasing function of production, we should see emissions drop.

Extreme Weather Can Affect Perception

- Herrnstadt and Muehlegger (2013) find that searches for climate related terms ("climate change", "global warming") increase with extreme temperatures and lack of snow fall.
- They also find US senators vote more pro-climate if their state recently experienced unusual weather
- Fich and Xu (2023) find that corporate shareholders support more environmental proposals if they (the shareholder, not the firm) have been in a hurricane.

Strategic Responses to Monitoring

- Zho (2021) finds that in counties where air quality is monitored intermittently, air pollution is significantly higher on unmonitored days
- The mechanism is government applying air quality alerts on monitored days
- This gives us another potential channel for climate salience changing emissions

Data

Three primary data sources:

1. NASA's Moderate Resolution Imaging Spectroradiometer (MODIS) algorithm
2. EPA's Air Quality System (AQS)
3. National Hurricane Center and Central Pacific Hurricane Center Hurricane reports

This is quite a data-heavy project, and the data sources are interesting. The next slides explain in more detail

MODIS

- Zou (2021) refers to this measure of air quality as "space truth"
- NASA operates two satellites (Terra and Aqua) which measure various key indicators in the atmosphere and ocean.
- The orbits are designed such that the entire Earth is mapped every one-two days
- My key metric is aerosol product which encapsulates key pollutants (nitrates, sulfates and black carbons)
- Resolution is 10x10 km.

AQS

- Liu et al (2007) refer to this as "ground truth"
- Data from thousands of monitors around the country mandated by the Clean Air Act
- Collects similar particulate matter concentration data to MODIS
- Various monitors run on 1-in-6, 1-in-3, and 1-in-1 day frequencies

NOAA Hurricane Report

- Detailed reports of every hurricane to make landfall or near landfall on the US and Mexico since 1995
- Contains latitude, longitude, pressure, and wind speed data
- This will be the treatment. I can either make it binary (hurricane/ no hurricane), or continuous (degree of wind speed/pressure)

Identification Strategy

- Hurricane hitting a county is source of exogenous variation
- Three potential channels for climate salience affecting emissions
  1. "Self" effect
  2. Climate sympathy effect
  3. Government channel

"Self" Effect

This effect is basically does being in a hurricane cause people to emit less by making the risk more salient.

- Most obvious channel.
- I don't know how to measure this.
- This effect is what the other studies were trying to get at with their proxy variables. So, I won't focus on this channel

Climate Sympathy Effect

This effect is: Does a hurricane hitting a city with similar risk increase climate salience for non-hit cities?

- The control group here in the diff-in-diff is similar cities/counties in the hurricane prone area that weren't hit by the treatment hurricane.
- For example: if New Orleans is hit by a hurricane a control could be Houston. Houston is similar-ish in size and also a coastal, non-hurricane prone city. Its far enough away that we shouldn't have a spillover effect.
- Probably a synthetic control

Strategic Monitoring

Does the salience of a hurricane change governments' strategic gaming of pollution monitors?

- The idea is that if climate change becomes more salient to members of the government, they will have a smaller incentive to game the emissions monitoring.
- The control group is again similar places in hurricane prone areas not hit by the treatment hurricane. Probably synthetic again
- I think this is the most interesting outcome variable

Conclusion

Limitations:

- I don't currently have individual level data, so I can't track people directly affected by the hurricane
- We can't directly measure areas hit by the hurricane because hurricanes obviously decrease output directly
- I expect climate sympathy effects to be small, and my sample size is small, so detecting an effect may prove difficult
- Hurricanes happen fairly frequently, so its difficult to detect how long potential effects last