Unequal Exposure: Climate Shocks, Monetary Policy, and the Spatial Distribution of Income

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Research Question

Do climate shocks (e.g., wildfires, hurricanes) amplify the heterogeneous effects of monetary policy across income groups or regions? In particular, are poorer households or lower-income regions more vulnerable to climate-monetary interactions due to limited consumption smoothing or insurance access?

Motivation

Recent macroeconomic research (e.g., Herreno and Pedemonte (2025)) shows that regions with lower per capita income experience larger responses to monetary policy shocks due to higher marginal propensities to consume (MPCs). Simultaneously, climate shocks like wildfires, hurricanes, or floods disproportionately affect economically vulnerable communities. But what happens when these two shocks coincide? Could monetary tightening exacerbate the contractionary effect of a climate shock in poor areas with less insurance, higher MPCs, and greater hand-to-mouth behavior? The combination of a climate shock and a monetary contraction may disproportionately harm low-income households and exacerbate spatial inequality.

This idea aims to contribute to the literature by showing that the interaction between climate shocks and monetary policy has unequal effects across space, with poorer U.S. regions experiencing significantly stronger adverse impacts on employment and inflation when contractionary monetary policy coincides with climate disasters.

Empirical Strategy

1. Data Sources

- **Climate shock exposure:** NOAA Storm Events Database, FEMA disaster declarations, wildfire footprints.
- **Monetary policy shocks:** Romer and Romer (2004) narrative shocks.
- **Local outcomes:** QCEW private employment, BLS CPI (metro-level inflation), ACS income and consumption data.
- **Income heterogeneity:** Census/ACS tract-level income data or county-level per capita income.

2. Empirical Specification

The empirical strategy follows a local projection framework. I estimate the dynamic effects of monetary policy and climate shocks using the following regression:

$$y_{i,t+h} = \alpha_i + \gamma_t + \beta_1 \text{MP}_t + \beta_2 \text{ClimateShock}_{i,t} + \beta_3 (\text{MP}_t \times \text{ClimateShock}_{i,t}) + \beta_4 \mathbf{X}_{i,t} + \beta_5 (\text{Income}_i \times \text{ClimateShock}_{i,t}) + \beta_6 (\text{Income}_i \times \text{MP}_t \times \text{ClimateShock}_{i,t}) + \varepsilon_{i,t+h}$$

where:

- $y_{i,t+h}$: regional outcome (e.g., employment, inflation, consumption) at horizon h.
- MP_t: national monetary policy shock at time t.
- $\text{ClimateShock}_{i,t}$: local exposure to a climate disaster (binary or continuous).
- Income_i: per capita income or poverty rate in region i.
- $\mathbf{X}_{i,t}$: vector of controls (e.g., unemployment, density, insurance coverage).
- α_i, γ_t: region and time fixed effects.

My interest is to estimate the coefficient β_6, which captures whether poorer regions experience stronger negative effects when monetary tightening coincides with a climate shock. I may supplement the analysis with an event-study design: compare outcomes before and after major disasters (e.g., Hurricane Katrina, Camp Fire) and monetary policy announcements.

Limitations and Challenges

Climate shocks are not randomly assigned. Even with time and region fixed effects, identifying interactions with monetary shocks relies on quasi-randomness in the timing of monetary policy relative to climate events. In addition, poorer regions may differ in unobserved resilience or federal aid access. I will explore robustness using instrumental variables (e.g., Bartik instruments for exposure to national industry shocks) and consider matching methods. A second challenge is measurement: income heterogeneity and disaster exposure must be accurately linked to local outcomes over time, requiring granular spatial matching.

References

Juan Herreno and Mathieu Pedemonte. The geographic effects of monetary policy shocks. UC San Diego and Inter-American Development Bank, working paper. Version: May 6, 2025, 2025. URL https://juanherreno.github.io/geo_mp.pdf.

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