

Policy considerations for managing the broad economic and financial repercussions of natural disasters



Sandra Eickmeier | Deutsche Bundesbank, CEPR, CAMA

Josefine Quast | Independent

Yves Schüler | Deutsche Bundesbank

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Abstract

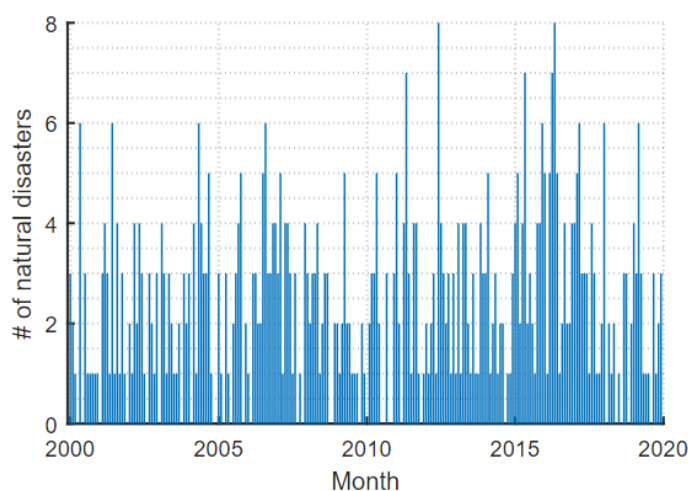
In this brief, we discuss evidence suggesting that policy responses to natural disasters are likely to be increasingly constrained by rising public debt and declining neutral interest rates. Our findings indicate broad and sustained impacts of natural disasters on macroeconomic and financial stability. Specifically, an increase in the frequency of disasters disrupts economic activity across labor, production, consumption, and investment, while also influencing financial risk, uncertainty, and climate awareness. In light of accelerating climate risks, this underscores the urgent need to enhance economic and financial resilience.

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As climate change accelerates, its implications for economic stability and policymaking become increasingly undeniable. The repercussions of natural disasters, a key consequence of climate change, pose long-term challenges to monetary and fiscal policies. Despite climate change mitigation not being their primary mandate, the objectives of central banks and fiscal authorities are inevitably intersecting with the broader effects of climate change.

For policymakers, particularly central banks and fiscal authorities, understanding how natural disasters and climate change phenomena impact economic activity, inflation, and financial stability is crucial. Central banks must deepen their understanding of these impacts and the transmission mechanisms that underlie them. Fiscal authorities, too, face the strain of managing public debt levels, which could be exacerbated by the ongoing challenges posed by climate change. Anticipating and accommodating the economic and financial effects of climate change is, therefore, essential for effective policymaking. This is critical not only for managing public finances but also for supporting the broader societal transition to a carbon-neutral economy.

Figure 1. Number of natural disasters per month in the US



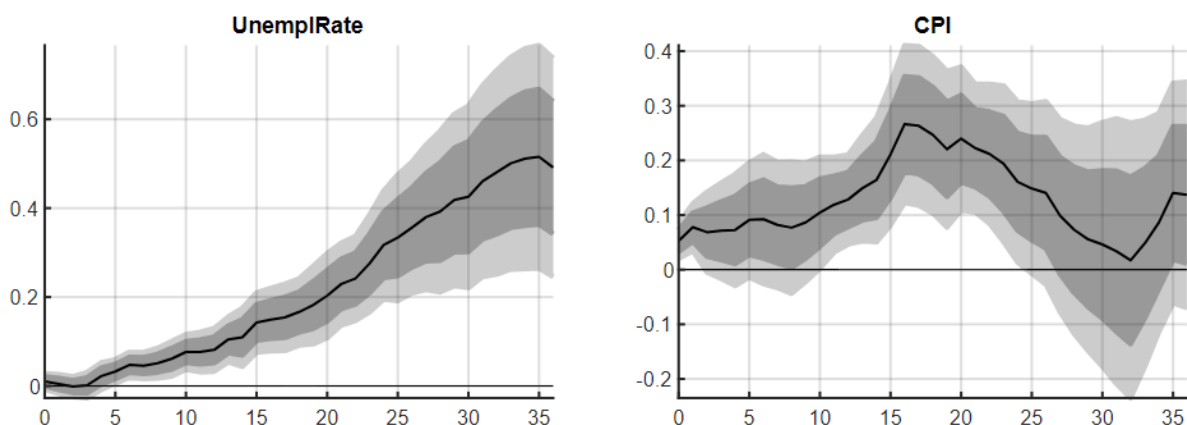
Notes: Number of extreme temperature events, floods, and storms in a given month.

In Eickmeier et al. (2024), we examine the dynamic transmission of natural disasters to the US aggregate economy, considering a large array of 61 variables. We focus on those disasters that are expected to intensify due to climate change, i.e. severe floods, storms, and extreme temperature events. We rely on local projections using monthly data over the pre-pandemic sample since 2000. Our impulse variable reflects the number of natural disaster events, i.e. their frequency (or occurrence), in the US in a given month (Figure 1). We project the effects over a horizon of up to three years. Over these horizons, we can maintain the assumption that the disaster occurrence is predetermined with respect to the macroeconomy and financial markets. In our analysis we examine the effect of a one standard deviation increase in the occurrence of natural disasters (which amounts to 1.7 disasters).

Severe and far-reaching macro-financial impacts of natural disasters

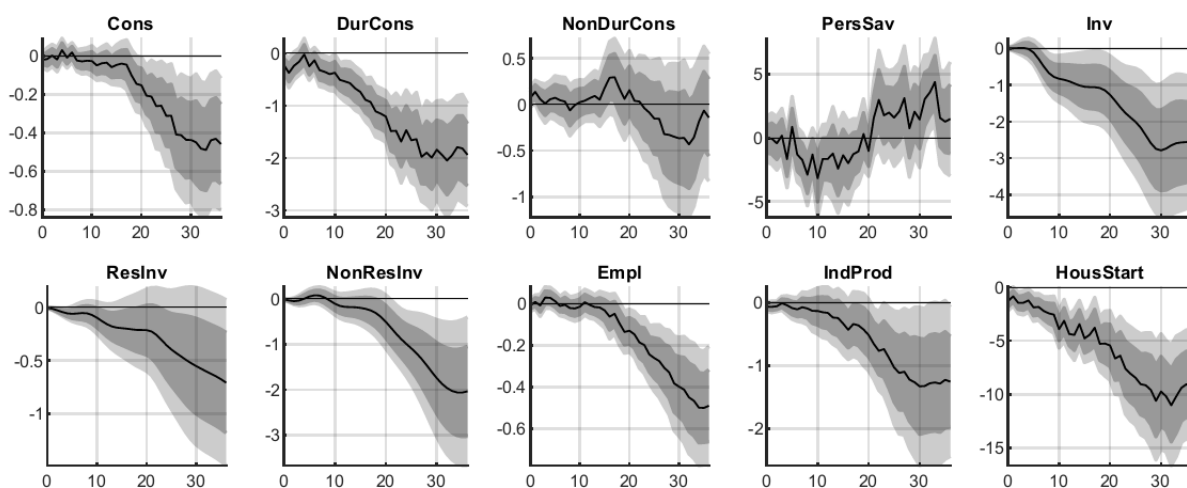
We find that an increase in natural disaster frequency triggers significant and enduring negative aggregate impacts on the real economy. The unemployment rate rises gradually and persistently by 0.5 pp, see Figure 2, assuming no further shocks occurring. The real effects are broad-based, as they manifest across various sectors, including labor and housing markets, production, consumption, and investment (see Figure 3). Furthermore, our analysis reveals that disasters temporarily elevate consumer prices, likely driven by transient increases in energy and food costs.

Figure 2. Impulse responses of unemployment rate and consumer prices



Notes: In pp for the unemployment rate, in % for consumer prices. Gray areas indicate 68% and 90% confidence bands. x-axis: months.

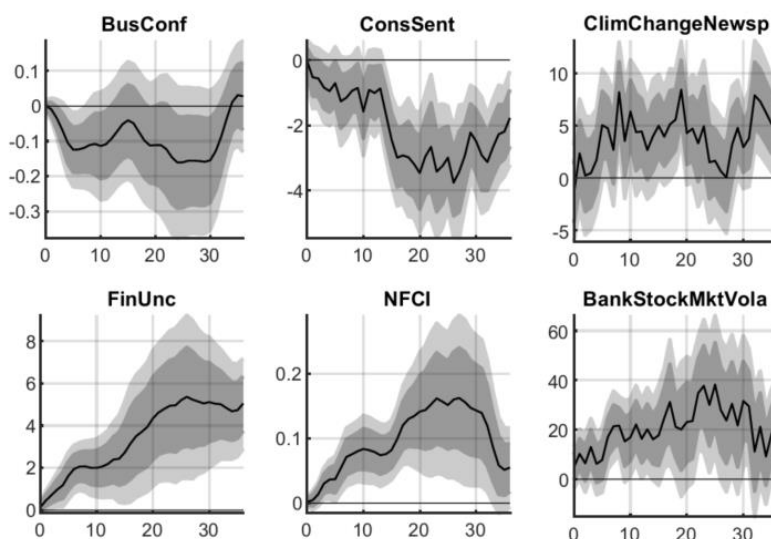
Figure 3. Impulse responses of a broad set of real activity variables



Notes: In %. Abbreviations: Cons: personal consumption expenditure, DurCons: durable consumption, NonDurCons: non-durable consumption, PersSav: personal savings, Inv: private investment, ResInv: residential investment, NonResInv: nonresidential investment, LabProd: labor productivity index, defined as output per hour, Empl: employment, IndProd: industrial production, HousStart: housing starts. Gray areas indicate 68% and 90% confidence bands. x-axis: months.

Our analysis also suggests that the adverse real effects can be attributed to a widespread decline in confidence, an increase in uncertainty, a tightening of broad financial conditions, encompassing financial risk perceptions, and heightened awareness of climate change (see Figure 4). Indeed, climate attention can serve as an additional channel of transmission. The way individuals perceive the link between natural disasters and climate change likely influences their adaptation strategies, preferences, and broader behavior, thereby impacting the real economy. We also observe a widespread rise in bank risk and the economy's susceptibility to future bank risk following the disasters, coupled with a decrease in holdings of (comparatively secure) treasury securities. Conversely, banks appear to be adjusting their portfolios toward safer business and real estate loans, potentially to mitigate the heightened risk.

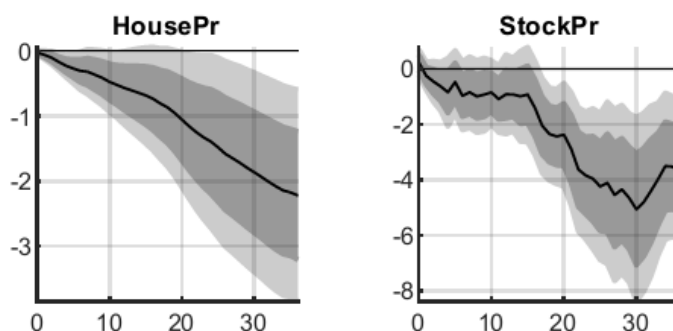
Figure 4. Impulse responses of confidence, media attention toward climate change, and financial uncertainty and risk



Notes: In %. Abbreviations: BusConf: business confidence index, ConsSent: consumer sentiment, ClimChangeNewsp: newspaper coverage on climate change. Financial uncertainty Jurado et al. (2015), NFCI (in ordinary units): Chicago Fed national financial conditions index, BankStockMktVola: bank stock market volatility. Gray areas indicate 68% and 90% confidence bands. x-axis: months.

Figure 5 shows that both, real stock and house prices, decline gradually and persistently. This is in some sense remarkable, as the literature suggests that disasters are already reflected in asset valuations (e.g. Barro (2006)). Yet, we still find significant effects of our impulse variable on asset prices. Negative wealth effects, hence, may contribute to the negative consumption and investment responses we observe. A drop in house prices may weaken households' borrowing capacity, leading to diminished demand for durable goods. The negative wealth effect is also consistent with the theoretical discussions presented by ECB (2021), which argues that escalating physical risks reduce the value of residential properties and capital assets. These reductions may be due to both expected direct effects (e.g. destruction of capital) and indirect effects. The latter may include increased insurance premiums and reduced availability of insurance coverage as insurers adjust their risk assessments and pricing models in response to heightened disaster risks. Furthermore, the decline in asset prices is relevant for financial stability. It can harm household and non-financial firm balance sheets, increasing the risk of loan defaults and stress within the financial system.

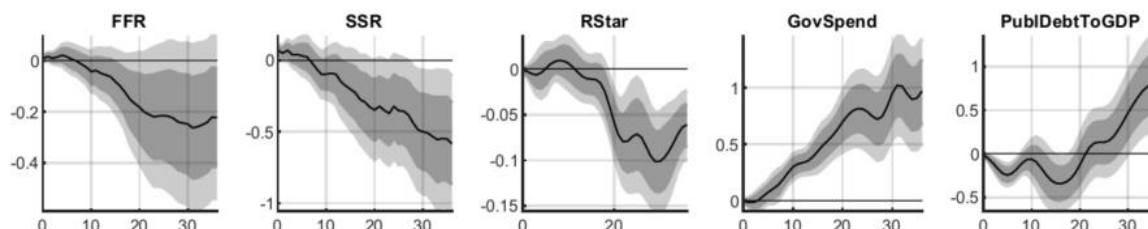
Figure 5. Impulse responses of asset prices



Notes: In %. Abbreviations: HousePr: house prices, StockPr: stock prices. Gray areas indicate 68% and 90% confidence bands. x-axis: months.

It is interesting to observe that monetary and fiscal policy variables move in the direction that could contain negative macro-financial impacts (see Figure 6). Furthermore, we find that anchored inflation expectations appear to help contain price pressures. However, we note a persistent increase in public debt relative to GDP, exposing the US government to heightened vulnerability in future adverse scenarios. Furthermore, our results suggest a long-lasting decline of r -star, limiting future space to manoeuvre for monetary policy as well.

Figure 6. Impulse responses of monetary policy and fiscal variables



Notes: In % for government spending, in pp for all other variables. Abbreviations: FFR: federal funds rate, SSR: shadow short rate provided by Wu & Xia (2016), RStar: one-sided estimate for r -Star by Laubach & Williams (2003), GovSpend: government total expenditures, PublDebtToGDP: total public debt in % of GDP. Gray areas indicate 68% and 90% confidence bands. x-axis: months.

Our results are robust to a variety of specifications, highlighting the consistent impact of natural disasters across different types. For instance, we assess the effects of individual disaster types – storms, floods, and extreme temperature events – separately, and exclude large events such as Hurricane Katrina. Despite these variations, we document similar outcomes across all disaster types, underscoring the broad relevance of these findings for policy considerations.

Further, we investigate the role of public perception, particularly media attention to climate change, and its potential effects on economic outcomes. Our analysis suggests that the impact of media attention may be comparable to that of natural disasters, indicating that climate awareness and public sentiment could be important factors to consider in policy planning and communication strategies. Given the evidence on the interconnectedness between climate risks and public behavior, policymakers may want to account for these psychological and social transmission mechanisms in their strategies to build resilience.

Moreover, we explore the relationship between natural disaster frequency and global temperature changes, as demonstrated by Bilal and Känzig (2024), showing that even minor increases in global temperatures can have significant macroeconomic effects. This finding emphasizes the urgency for policy actions that integrate both short-term disaster response and long-term climate change mitigation, addressing not only immediate economic recovery but also systemic risks associated with rising temperatures.

Clearly, as with previous empirical studies, our analysis reflects past adjustments, and many of the costs and necessary adjustments are yet to materialize. As natural disasters are projected to intensify and occur more frequently, and as individuals increasingly associate these events with climate change, the manner in which the economy adjusts will largely depend on individual and collective behavioral responses. This makes predicting the duration, direction, or size of these effects challenging. Despite these uncertainties, we believe our research provides valuable insights into the aggregate effects of natural disasters, offering guidance to policymakers on potential interventions that could improve outcomes.

Summary

In this brief, we discuss evidence on the dynamic transmission of natural disaster occurrence and its impacts on the US aggregate economy and financial markets. Our findings suggest that natural disasters have significant, persistent macro-financial consequences, with broad-based declines in economic activity potentially linked to increased risk

perceptions, uncertainty, and declining confidence. We also observe a delayed increase in media attention toward climate change following natural disasters, which is likely to intensify over time, leading to stronger associations between these events and climate change. This suggests that future responses to such events might need to involve more substantial adjustments.

Additionally, our analysis indicates that the temporary rise in consumer prices may be linked to increases in energy, food prices, and production costs. While macroeconomic policies appear to have played a supportive role during natural disasters, the sustainability of these measures could be challenged as climate change exerts downward pressure on r^* and raises public debt levels. These factors could potentially limit the effectiveness of monetary and fiscal policies in addressing the economic repercussions of natural disasters. Therefore, enhancing economic and financial resilience to such shocks is increasingly important, underscoring the need for thoughtful and strategic actions to address climate change and its broader effects.

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About the author(s)

Sandra Eickmeier is a Research Economist at the Deutsche Bundesbank. Further affiliations: CAMA and CEPR. Her fields of interest include monetary-financial linkages, international macro, macroeconometrics, and more recently humanistic psychology.

Josefine Quast is an Economist who conducts empirical research related to questions on the reliable and robust measurement of business cycles, financial cycles, and data transparency as well as macro-climate and macro-financial linkages. She served as a junior economist in the Research Centre of the Deutsche Bundesbank. Josefine holds a Ph.D. in Economics from the University of Wuerzburg, Germany and completed the Advanced Studies Program in International Economic Policy Making, held at the Kiel Institute for the World Economy.

Yves Schüler is a Senior Economist at the Research Centre of the Deutsche Bundesbank. In the past, he held positions at the research department of the Inter-American Development Bank, the Directorate General Macro-Prudential Policy and Financial Stability at the European Central Bank (ECB), and the research department at the ECB. Yves holds a PhD in Economics from the University of Konstanz and completed the Swiss Program for Beginning Doctoral Students in Economics. His research area is macro-finance and climate economics.

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SUERF Secretariat

c/o OeNB, Otto-Wagner-Platz 3A-1090 Vienna, Austria

Phone: +43 1 40 420 7206

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