

Long-Run Macroeconomic Challenges of Climate Change: U.S. State over 2000-2023

Climate change affects the US economy significantly and is not just an environmental concern. The need for significant investments in energy efficiency and renewable energy, risks to sectors like agriculture and insurance, increased costs from extreme weather events, and effects on public health and global competitiveness are just a few of the long-term economic effects of climate change. Comprehending these impacts is crucial for enabling knowledgeable decision-making by decision-makers, corporations, and the populace to alleviate and adjust to climate change while preserving economic expansion and worldwide competitiveness.

Farajzadeh et al (2023) analyze a macroeconomic-climate modeling approach to analyze the effect of climate change on various aspects of the economy, including output, capital depreciation, and productivity growth in Asian countries, and find that climate change is expected to have a significant negative effect on output per worker, particularly in the presence of severe damage. Similarly, Tol (2021) extends this analysis to a global scale, using a sample of 160 nations from 1950 to 2014. They find that weather anomalies increase inefficiency in hot, impoverished countries but decrease inefficiency in wealthy countries, especially those with minimal weather variability. Herrnstadt and Dinan (2020) predict that climate change will slow down the growth of the US economy. They believe that from 2020 to 2050, climate change will make the economy grow about 0.03% less each year. Over time, this could add up to the economy being about 1% smaller in 2050 than it would have been without climate change. Kahn et al (2019) examine the impact of precipitation fluctuations on per-capita real output growth in 174 nations and find that while fluctuations in precipitation do not significantly affect output growth, temperature differences from historical averages do. Their study also finds negative consequences on employment, labor productivity, and real production across a range of industries and states in the United States between 1963 and 2016.

The purpose of this paper is to examine how changes in climate conditions, such as temperature and precipitation, affect various macroeconomic indicators, such as GDP growth, employment rates, productivity, and other aspects of economic activity in U.S. states. The paper provides evidence for the damage that climate change causes in the US using various economic indicators at the state level. The study examines the long-term effects of weather shocks (persistent deviations in temperature and precipitation from their historical norms) on growth rates of real GSP and real GSP per capita for 48 US states from 2000 to 2023 using the Autoregressive Distributed Lag (ARDL) modeling approach. The study also provides policy recommendations and techniques that could help mitigate the negative economic effects of climate change.

The contribution of this work is to focus on the macroeconomic implications of climate change on state-level economic activity in the US and emphasizes the need for within-country research for comprehending the intricate interaction between economic growth and climate change and investigating which state is more vulnerable to climate change. This is critical because the effects of climate change are not constant and recent advances in economics, policy, and climate research may have a big impact on how the economy and climate interact. The study also analyzes regional and sectoral variations which would give practitioners and policymakers a more nuanced knowledge of the problem and enable them to create more focused and successful adaptation plans. Existing literature has primarily concentrated on developing countries, with limited attention to developed nations like the United States which is one of the world's largest economies. The study's findings could help policymakers, researchers, and practitioners better understand the economic implications of climate change in a developed country context. The researchers' findings also contribute to our understanding of the

relationship between climate change and economic performance, highlighting the importance of considering both short-term weather fluctuations and long-term climate trends in economic analysis.

The study finds that climate change has a long-lasting adverse impact on real output in various states and economic sectors. This means that deviations from historical climate norms negatively affect economic productivity and output, leading to lower economic growth and performance. Climate change also affects labor productivity and employment in the United States. This suggests that changes in climate conditions can lead to changes in the demand for labor and overall employment levels. Overall, the findings of the study highlight the importance of understanding the relationship between climate change and economic performance at both the state and sectoral levels. The study's econometric approach provides a valuable framework for analyzing and quantifying the long-term macroeconomic effects of climate change. Moreover, the findings imply that, in contrast to most cross-country findings, estimates for the United States typically exhibit symmetry about variations in climate variables—such as precipitation—from their historical norms.

In the first section of this paper, the purpose of the study, its importance, and its goals are described. The second part is the Literature Review, in this section, the body of research on the subject is reviewed, with an emphasis on earlier investigations, hypotheses, and conclusions about the long-term macroeconomic implications of climate change in the United States. The third section is Data and Methods: This part describes the study's variables, data sources, and analytical techniques. then the study's findings are presented in the fourth section, which also discusses how several macroeconomic indicators—such as GDP growth, employment rates,

productivity, etc.—are affected by climate change. In the end, the Discussion part will analyze the findings, and the key conclusions are outlined in this section.

References:

Farajzadeh Z, Ghorbanian E, Tarazkar M.H, (2023), The impact of climate change on economic growth: Evidence from a panel of Asian countries, *Environmental Development*, Volume 47,100898, ISSN 2211-4645,<https://doi.org/10.1016/j.envdev.2023.100898>.

Tol, Richard S. J. (2021), The economic impact of weather and climate, Fondazione Eni Enrico Mattei (FEEM), <https://www.jstor.org/stable/resrep30496>

Herrnstadt E, and Dinan T, (2020), CBO's Projection of the Effect of Climate Change on U.S. Economic Output, Working Paper Series, *Congressional Budget Office*, Washington, D.C.

Kahn M.E, Mohaddes K, Ryan N.C. Ng, Pesaran M.H, Raissi M, Yang J-Ch, (2019), Long-Term Macroeconomic Effects of Climate Change: A Cross-Country Analysis Author(s), *Energy Policy Research Group*, University of Cambridge, Stable URL: <https://www.jstor.org/stable/resrep30480>

Ludwig, Fulco & Terwisscha van Scheltinga, Catharien & Verhagen, Jan & Kruijt, Bart & van Ierland, Ekko & Dellink, Rob & de Bruin, Henk & Kabat, Pavel. (2007). Climate change impacts on Developing Countries - EU Accountability.