

The Inequality, Economic Growth, Climate Change and Natural Disasters Nexus: Empirical Evidence

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Motivation

The interrelationship relationship between economic growth, income inequality, climate change and environmental degradation is a complex one. Convergence of income levels and decline in inequality between nations is also far from guaranteed and depends crucially on whether productivity enhancing policies and institutional frameworks are adopted (Sachs and Warner 1995; Acemoglu and Robinson, 2013). Many economies enjoyed sustained growth at the expense of degradation in environmental quality, while others have managed to reduce pollution and destruction through concerted regulatory efforts while their incomes were growing (Stern, 2004). Environmental degradation is a driver and consequence of natural disasters which reduces the capability of the environment to meet social and ecological needs. The frequency and intensity of natural disasters has been on the rise since the 1970s (Yamamura, 2015; Coronese et al., 2019) and is expected to increase exponentially in the coming years (Bae, 2018; IPCC, 2018, 2021). There is a general belief that preventing the consequences of climate change and developmental policies are mutually exclusive (Rao & Min, 2018). However, some of these preventive policies can ease the destructive consequences of climate change in developing countries, and at the same time, are necessary for the country's general development (Alano and Lee, 2016). These measures include reducing inequality within the country. Higher levels of inequalities within a country can increase the country's vulnerability to catastrophic events, and hence reduce its adaptability and mitigation capacities (Klomp & Valckx, 2014).

This paper contributes to the literature in several respects. To our knowledge, no paper has previously observed the interrelationship between growth inequality between and within countries, mediated by the problem of climate change. The prevailing orientation of the literature is to consider disasters as exceptional and independent events from each other. This literature falls short of explaining the growth of the frequency and increasing magnitudes associated with damages. We explicitly take into consideration the climate change context for each country by

also controlling for factors that reflect a change in their climatic conditions, even if they do not have disastrous effects, such as changes in the precipitation levels or heat waves.

Data and Methodology

This paper investigates the integrated paradigm of inequality, economic growth, climate change and natural disasters through a system of simultaneous equations. The proposed system of equations consists of three models, namely inequality, neoclassical stochastic growth, and disaster damage models. Following the work of Kahn et al. (2019) and Aiyar & Ebeke (2020), GDP growth rate is a function of country-specific climate variables, a set of macroeconomic indicators, inequality and disaster damage. While, disaster damage is a function of inequality, socioeconomic variables representing the adaptation demand and public budget related to the adaptation supply proposed by Cappelli et al. (2021). Inequality is a function of natural disasters, climate variables, institution quality and a vector of control variables. Different econometric techniques will be adopted namely between regression, group means regression, error components two-stage least squares, and error components three stage least squares as potential estimation techniques for the simultaneous equations, along with various dummy variables to capture the effect of regional disparities.

This paper constructs a panel database from year 1980- 2020 by matching country-level datasets and climate variables 0.5 degrees gridded monthly time series. The World Income Inequality Database (WIID)¹ will be the source of inequality variables. The WIID includes a comprehensive set of income inequality indices for 200 countries up to the year 2020. Climate variables, in our dataset, are terrestrial air temperature (°C), humidity (%) and precipitation (mm) obtained from Matsuura and Willmott (2018), which contains 0.5 degrees gridded monthly time series. Our macroeconomic indicators, which we collected from the International Financial Statistics (IFS) and World Bank Development Indicators (WDI) databases. In addition, for information on natural disasters, the WIID is matched with The Georeferenced Emergency Events Database (EM-DAT) for the same set of countries². The EM-DAT MENA and Turkey country data subset includes 547 climate-induced natural disaster events in the different countries of the region. In

¹ UNU-WIDER, World Income Inequality Database (WIID). Version 31 May 2021. <https://doi.org/10.35188/UNU-WIDER/WIID-310521>

² Centre for Research on the Epidemiology of Disasters (CRED). EM-DAT: The OFDA/CRED International Disaster Database. Brussels, Belgium: Catholic University of Leuven. <https://www.emdat.be>

addition to time and location, the dataset provides detailed information on the human impact of the disaster events such as number injured, affected and deaths.

Expected Policy Implications

The results of this research will provide unique insight into the complex and intertwined relationships between growth, inequality, and natural disasters. Each of those causes the other, while at the same time, being affected by it and therefore meaningful policy recommendations must involve a concerted effort to affect all three at once. Reducing inequality may hinder growth but can also boost it depending on the incentive structures and institutional regulations. Insisting on low environmental degradation may slow down growth but can also boost it through emphasis on green technologies that may ultimately be even more labor intensive, and hence more equitable. Lower inequality will ultimately reduce the intensity of economic losses from natural disasters, sparing countries even more severe losses as the frequency of such events intensifies. A carefully designed mix of policy solutions that tackles the three interrelated issues simultaneously is no longer a luxury, even for developing countries, given that our time to reverse climate change and its catastrophic impacts is about to run out.

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