Long-Run Impacts of Earthquakes on Economic Growth

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Background and Motivation

While natural disasters are known to have devastating immediate impacts, their long-run effect on economic growth is not yet well understood and some studies have even suggested positive impacts (Fig 1). For the natural hazard of earthquakes, no global empirical study has so far been conducted that applies a disaster measure that represents the physical hazard of earthquake ground shaking. In this paper, I apply an econometric model and exploit the random within-country variation of shaking over years to identify the causal effect of earthquakes on economic growth.

Main Results

I find significant negative global long-term growth impacts of earthquakes (Fig 2) that are comparable with previous findings in the literature on cyclones[3]. In particular, the results suggest that 8 years later an average (non-zero) exposure reduces GDP per capita by 1.9%. A 90th percentile exposure results in a reduction by about 4%. Furthermore, I find evidence that (i) the impacts on growth are primarily incurred by low and middle-income countries and that (ii) high-income countries are potentially even able to experience positive “building back better” effects (Fig 3). Moreover, based on an analysis of different spatial aggregation approaches, I conclude that impacts are primarily driven by localized high intensity events and not by spatially large exposure to lower intensity shaking.

Spatial Data Aggregation

Economic growth data is independent of country size and a single-valued annual exposure measure that is also independent of country size is therefore needed. The commonly applied approach of a simple spatial average requires the assumption that long-term impacts increase in a linear manner with the geophysical hazard, and it introduces a form of measurement error. In this work, four different earthquake exposure variables to link the geophysical measurements with the economic measurements are calculated and evaluated (Fig 6).

The spatial aggregation approach applied to summarize the natural hazard is found to be highly relevant. Using a simple spatial average of shaking across the entire country (Exposure 1A) instead of other measures that put more emphasis on disaster events compared to the aggregated measure, would result in underestimating the overall impact on GDP (Fig 5).

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Conclusion

This paper provides the first global empirical study on long-run economic impacts of earthquakes that utilizes a disaster measure that represents the physical hazard of earthquake ground shaking. I find significant net long-run economic growth impacts with ample heterogeneities in the effects. Low-income countries are strongly negatively affected while high-income countries might even be able to benefit from “building back better” effects. Furthermore, I find that localized disaster events are the drivers behind impacts compared to more widespread nuisance exposure.

References