

Natural Disasters and Child Labor in Brazil

Priscila S. Santos¹, Ana L. Kassouf² and Mary Arends-Kuenning³

¹University of São Paulo

²University of São Paulo and Partnership for Economic Policy

³University of Illinois Urbana-Champaign

Abstract

This study provides the first comprehensive evidence on how hydrological disasters in recent years have affected elementary education outcomes in Brazil, combining innovative data construction with modern causal inference techniques. Using nationally representative administrative records, the analysis links municipal disaster notifications from the Integrated Disaster Information System (S2ID) to both aggregate and individual-level performance data from the Basic Education Assessment System (SAEB) for the period 2013–2017. Two complementary empirical strategies are employed: a municipality-level panel estimated with the staggered difference-in-differences methodology of Callaway and Sant’Anna (2021), and a novel individual-level pseudo-panel built through probabilistic matching and corrected for attrition using inverse probability weighting.

The results show that hydrological disasters significantly reduce student proficiency in Portuguese and Mathematics for 5th-grade students, with effects that persist over the medium run. The impacts are particularly pronounced in the South and Southeast regions, where the frequency and intensity of hydrological events are highest. Crucially, the individual-level analysis reveals learning losses that are substantially larger than those suggested by municipality-level averages, indicating that aggregate models underestimate the true magnitude of disaster-induced educational harm.

The study also uncovers important heterogeneous effects. Boys experience greater losses in Mathematics, girls in Portuguese, and white students show the largest absolute declines across both subjects. Despite these substantial drops, the relative performance gaps between social groups remain largely unchanged. This pattern is consistent with evidence that students with higher baseline achievement levels may experience larger absolute learning losses when exposed to educational shocks, while structurally disadvantaged groups—already constrained by chronic inequalities—exhibit more limited margins for further deterioration.

By combining high-frequency disaster data with standardized learning measurements and rigorous quasi-experimental methods, this research advances the literature on climate shocks and human capital in several ways. It is the first study in Brazil to estimate heterogeneous disaster effects using individual-level educational data and demonstrates the value of integrating staggered DiD estimators with pseudo-panel methods to uncover impacts that would otherwise remain concealed. The findings highlight hydrological disasters as significant drivers of learning inequalities and reinforce the urgency of targeted policies—such as remedial instruction, psychosocial support, and resilient school infrastructure—to protect educational trajectories in a context of increasing climate-related risk.

By documenting how exposure to hydrological events impairs learning and disproportionately affects specific demographic groups, the research provides actionable evidence to inform more equitable and climate-resilient education policies.