School, Work, and Rainfall in Madagascar

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Focus on Research

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Households in developing countries, where rainfed agriculture is still the basis of the livelihoods of a large part of the population, are exposed to the effects of the changing weather conditions. The paper by Marchetta, Sahn, and Tiberti (*American Journal of Agricultural Economics*) uses panel household-level data to examine how the decisions concerning work and education of children in Madagascar are significantly influenced by normal weather variability, and not just extreme weather events such as cyclones.

Extreme weather events, such as floods, cyclones, or prolonged periods of drought, clearly produce major adverse consequences for rural households, as they give rise to a loss of income and destruction of assets such as livestock. These consequences, in turn, have implications for some key decisions, notably those concerning the education of the children and decision regarding labor market participation. Even moderate negative fluctuations of weather conditions impact rural households, especially in regions where household rely on rainfed agriculture for their livelihoods. The incomplete character of markets, and especially, the lack of formal insurance mechanisms, is often accompanied by poorly functioning of local informal insurance mechanisms, such as interhousehold transfers, given the covariate nature of weather shocks.

The article by Marchetta, Sahn, and Tiberti (*American Journal of Agricultural Economics*) relies on panel data collected at the household-level in Madagascar to analyze how extreme weather events, and notably, cyclones, as well as normal fluctuations in rainfall, influence the probability that teenagers will quit school to start working. The data used in the empirical analysis come from two waves of a panel survey conducted in 2004 and in 2011/12, which followed a cohort of teenagers (in the first wave, cohort members were aged between 14 to 16, that became young adults eight years later, at the time of the second wave. This represents an age of transition from school to work, when even temporary adverse shocks could produce significant (and often
irreversible) effects. The data allow for the reconstruction of a yearly panel from 2004 to 2011, using answers to retrospective questions on school attendance and economic activity. The individual-level data can be matched to localized information on the level of rainfall obtained from satellite observations of cloud coverage (to overcome the paucity of ground weather stations in Madagascar), exploiting information on the (time-varying) location of each cohort member in the sample. The measurement of rainfall can be fine-tuned to the relevant crop-growing season. Furthermore, the survey not only contains information on school attendance, but also on school test scores and 2004 household assets, which can be used to analyze to what extent the socioeconomic status of households dampen the effects of weather variability on the schooling and work decisions for the teenagers and young adults in the sample.

Thus, the empirical analysis has three main goals, related to exploration of: (1) how normal rainfall variability affects schooling and work decisions, and school performance for households residing in rural communities; (2) the extent to which there is heterogeneity across households in these responses; and (3) the impact of extreme weather events, notably cyclones. The estimation of a bivariate probit model reveals that positive rainfall deviations, that is, rainfall above the local long-term average, increase the probability of school enrollment while reducing the probability of going to work. These results suggest that the income effect in the agricultural sector induced by weather anomalies dominates the substitution effect, such that a higher agricultural productivity owing to favorable weather conditions could induce households to employ their younger members in the fields, possibly withdrawing them from school. The analysis also reveals relevant differences across households, as higher asset holding can smooth the causal relationship between rainfall deviations and the two dependent variables. Furthermore, women are more likely to be pushed into the labor market following negative weather events. The empirical analysis also reveals that weather anomalies affect cognitive test scores among school attendees, and that (unsurprisingly) cyclones reduce the probability of being enrolled in school.

These results underscore the vulnerability of young individuals that has reached a critical juncture in their lives, not just with respect to the occurrence of major (and highly disruptive) weather events, but also with respect to moderate fluctuations in the levels of rainfall—this is especially important in a country where three out of four persons still derive most of their earnings from rainfed farming activities. This occurs notwithstanding the fact that farmers rely on a mix of crops that are well-suited to local weather conditions. The more erratic pattern of rainfall, likely to be induced by global warming, can only magnify concerns related to the vulnerability of young adults, particularly, as household coping strategies in the face of temporary shocks can have lasting consequences on their lives.
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