

Climate Change Volatility and Crop Choices



In brief

- Whilst climate change undoubtedly affects average temperatures, less attention has been paid to weather volatility and the effect of this on the behaviour of farmers.
- Changes in the volatility of weather is a fundamental input of the agricultural production function. In standard models, agents self-insure by building up assets or engaging in behaviour designed to reduce the impact of risk on outcomes.
- This study attempts to investigate the impact of climate change volatility on choices made by farmers in developing countries.
- Results from the study show that the yearly coefficient of variation of temperature is increasing over time and that significant spatial heterogeneity exists in the estimated changes in the volatility of temperatures. Whilst similar spatial heterogeneity exists with rainfall, the residual volatility in rainfall seems to fall over time.
- Preliminary evidence suggests a relation between temperature volatility and crops production, with an overall negative relationship between yields of certain crops and temperature volatility. Further research is needed.
- The policy implications of this research could be great as policymakers would need to consider providing smoothing technologies to farmers, such as formal insurance.
- Policy interventions that could be considered are: weather insurance, provision of resilient crops, farming advice on how to cope with volatile weather. However, further research is needed before precise policy recommendations can be made.

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Climate change has generated much attention. Upward trends in average temperature are well documented facts. While somewhat less attention has been devoted to the impact of the increase in climate volatility on behavior is relatively less studied. In standard models with uncertainty or risk, precautionary behavior, and lack of formal insurance, agents self-insure by building up assets, or engaging in other type of behavior designed to reduce to impact of risk on outcomes. The goal of our project is to look at the impact of increasing climate volatility on choices made by farmers around the world, and in particular in developing countries. This first note provides a data description for several data sources as well as a descriptive analysis of the relationship between crop yields, farmed land and number of farmed crops and long-run temperature volatility.

Policy Motivation

The change in volatility of weather, a fundamental input in the agricultural production function, might have dramatic consequences for farmers, in particular in developing countries. In this paper we organize and describe a set of diverse, publicly available, data to motivate further work in the area of climate volatility and its effects on households' behaviour.

Policy Impact

- We establish a series of facts about the time series and cross-sectional profiles of temperature and rainfall. In particular, we confirm the general increase in average temperature recorded in the past decades, with however a large degree of heterogeneity across space.
- Second, and more importantly for our project, we establish some facts about the evolution of weather risk, expressed in terms of the (residual) volatility of temperatures and rainfall.
 - The (yearly) coefficient of variation of temperature is increasing over time.
 - There is a significant spacial heterogeneity in the estimated changes in the volatility of temperatures, with some countries and locations experiencing a large increase, and others a large fall in volatility.
- For rainfall the picture seems quite different:
 - On average the residual volatility seems to be falling over time.
 - There is again a significant amount of heterogeneity in the data when organized by country or location.
- We document a preliminary and descriptive relation between temperature volatility and crops production, cultivated land and number of crops planted and harvested. Such a preliminary evidence points towards the need of further research in the area of the effects of climate uncertainty. We document an overall negative relationship between yields of a number of crops and the temperature volatility. This should generate further discussion on how to insure households against risk.

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Audience

The audience of this brief is rather wide given the topic covered as well as its descriptive nature.

Policy Implications

“It is however too early to base policy recommendations solely on the basis of our descriptive results”

The policy implications could be rather crucial as policy makers would need to consider the case of providing smoothing technologies to farmers, for example as formal insurance against volatility or provision of new farming technologies and crops that are more resilient to weather variability.

It is however too early to base policy recommendations solely on the basis of our descriptive results. A large amount of supplementary work is needed in order to provide precise policy recommendations. We can here only mention some of the possible policies, but this would be highly speculative and preliminary and therefore to be only taken as such. As mentioned a great deal of work is needed. We see this as a first step towards a better understanding of the relationship between weather uncertainty and households' behaviour.

Possible policy interventions to be considered:

- Weather insurance
- Provision of resilient crops
- Farming advice on how to cope with volatile weather

About the authors

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