



RESEARCH BRIEF

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Climate Change and the Ethiopian Economy

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What are the impacts of climate change on the Ethiopian economy? Agriculture in Ethiopia is heavily dependent on rain. In addition to its low adaptive capacity, its geographical location and topography make the country highly vulnerable to the adverse impacts of climate change. Results indicate that, over a 50-year period, the projected reduction in agricultural productivity may lead to 30 percent less average income, compared with the possible outcome in the absence of climate change.

Understanding the potential economy-wide impacts of climate change for a given country is critical for designing national adaptation strategies, as well as formulating effective global climate-policy agreements. Developing countries particularly need to tailor adaptation policies to offset the specific impacts they anticipate. Quantifying the impact of climate change on the overall economy can be crucial in guiding appropriate policy.

The objective of this paper is to make a general equilibrium analysis of the potential impacts of climate change. We simulated the future development of the Ethiopian economy over 50 years, using results from a Ricardian model and two different scenarios for total factor productivity¹ growth: 1) no growth at all during the projection period (present to 50 years out), and 2) average growth in the same period based on the political and economic reforms from 1992 to the present.

The impact of climate change was assessed in terms of its effect on crop and livestock farming and how these effects translate into the entire economy, in terms of economic growth and poverty reduction. Looking at the two zones that dominate Ethiopia's agricultural production today—the moisture-sufficient highlands areas with cereal-based agriculture and the drought-prone highlands—their projected outcomes are somewhat different, but climate change is expected to have a huge impact on both.

Key Points

- Climate change is expected to result in 30 percent less average income in Ethiopia in the next 50 years.
- In the short term, adaptation policies should target drought-prone highlands, because productivity is expected to decline continuously in those areas throughout the study period.
- Even with good future growth trends, huge impacts on overall income levels are inevitable. Thus active adaptation policies will be necessary, assisted by external support.

¹ Total Factor Productivity (TFP) accounts for effects on total output not caused by changes in levels of inputs. For example, land, capital, and labor could be the inputs required for a certain production. However, other unobservable qualities, such as efficiency of labor and soil quality, also affect productivity. TFP is often seen as the real driver of growth within an economy. Studies reveal that, whilst labor and investment are important contributors, TFP may account for up to 60% of growth within economies.

In the moisture-sufficient highlands where cereals dominate, which currently account for the largest share of agricultural production, overall productivity is projected to increase until approximately 2030 as a result of climate change, but to decline sharply thereafter. This is true both for crop and livestock. This is apparently due to nonlinear effect of temperature on yields. For example, crops have a certain range of temperature requirements during their growing season. Yields increase with increase in temperature until the optimum limit, but then temperatures above the threshold level quickly become very harmful, and yields start to decline significantly.

In the drought-prone highlands, the situation is somewhat different. Land productivity and crop yield is expected to decline as a result of climate change more or less continuously throughout the period studied, but much of the decline occurs relatively soon. After that, deterioration slows down temporarily between 2030 and 2050.

Overall the result indicates that TFP growth matters more than climate change for the outcomes during the entire study period. Nonetheless, climate change has a sizeable impact. Even in the high TFP growth scenario, due to the sharp decline in agriculture after 2030, climate change is projected to have a sizeable impact on the economy. Income is projected to increase dramatically in the high-TFP-growth scenario, but, at the end of the simulation period, it is nonetheless some 30 percent lower than it would have been without climate change. In the no-TFP-growth scenario, climate change also leads to a loss of some 30 percent of income, compared with the no-climate-change baseline.

Conclusions

Even though TFP growth matters more than climate change for the overall outcome, climate change will have a dramatic impact even in the high-growth scenarios. Agriculture completely dominates Ethiopia's economy and any climate-change impacts on agriculture will be considerable in the coming decades. Thus, even with optimistic assumptions about future growth trends, which would ease the transition of both labor and capital to new agricultural activities and to new activities outside agriculture, there is no way to avoid huge impacts on overall income levels, compared with what might prevail without climate change. Abandoning almost all the current economic activities in favor of new ones over the next few decades represents a major transition that farmers and private agents will have difficulty undertaking on their own, even in a favorable macroeconomic environment. This huge transition will have to be eased by active adaptation policies on the part of the government and will surely need outside support.

ABOUT THIS BRIEF

This brief is based on Gebreegziabher, Z., J. Stage, A. Mekonnen, A. Alemu, 2011, "Climate change and the Ethiopian Economy – A Computable General Equilibrium Analysis", Discussion Paper Series Efd DP 11-09, Environment for Development (Efd), University of Gothenburg, Göteborg, Sweden.

FURTHER READING

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