

Comment

Subhra Bhattacharjee: The discussion on climate change is fraught with controversies, largely because of the uncertainties associated with its causes and consequences. This paper is part of the relatively recent and growing body of literature that seeks to quantify the possible effects of climate change, particularly in the farm sector. It is extremely difficult to quantify the extent of climate change in any particular geographical region, and only recently have there been systematic empirical analyses of the economic impacts of climate change. The usual practice in these studies is to use changes in long-run averages and variability in weather patterns to stand in for the changes in climate. This paper takes the same approach to model the impact of climate change on choice of enterprise by households in South America.

Agriculture, livestock, and forestry are among the most weather-dependent enterprises, and thus they display the earliest impacts of climate change. Changes in land use, primarily in agriculture and forestry, also account for about 20 percent of global greenhouse gas emissions. As a result, the majority of empirical economic analyses of climate change are concentrated in this area. Most studies focus on one side of the two-way causality—either the impact of climate change on one or more of agriculture, livestock, and forestry or the impact of land use changes on total emissions.

In most of the literature on the impact of climate change on agriculture, livestock, and forestry, the dependent variable is land values, yields, or farm profits, with a range of climate, soil, market, and farm characteristics as the independent variables.¹ Many of these studies rely on pooled or panel data sets, though some studies also use cross-sectional data. Niggol Seo's paper is among the smaller body of work that uses the choice of enterprise—or land use—as the dependent variable. It is a logical next step for the author

1. Schlenker, Hanneman, and Fischer (2005, 2006); Schlenker and Roberts (2009); Kurukulasuriya and Mendelsohn (2008).

after his earlier work on crop choice, livestock choice, and choice of agricultural systems in South America using the same data set.

The strength of this paper lies in its focus on enterprise choice rather than land value or farm profits. From the policymaker's perspective, understanding the impact of climate change on land use or choice of enterprise could be of more direct use than the impact of climate change on land values or farm profits because a policymaker would be concerned about changes in farm profits and land values largely to the extent that they affect farmers' choice of land use, input use, or demand for insurance. The value of modeling the impact of climate change on enterprise choice lies in informing policy that seeks to affect either the product mix from the agriculture, livestock, and forestry sectors or their total emissions. This paper, in predicting the impact of changes in temperature and precipitation on enterprise choice, could inform those policy efforts. Moreover, this exercise is undertaken for a large region spanning seven countries and a wide range of soil and weather conditions.

A weakness of the exercise, however, is that it seeks to model enterprise choice without using any choice-specific variables. The independent variables in the paper can be categorized under four headings: climate-related variables (such as temperature, precipitation, and functions thereof); soil type; geographical variables (including flat land, altitude, distance from port, and country of location); and farm or household characteristics. All of these variables remain the same for a household or farm regardless of its choice of enterprise. The set of independent variables does not include any variable that is different for different enterprises. Furthermore, other than access to electricity, this set does not include any variable that can be changed by policy.

This compromises the usefulness of the work for policymakers. If the enterprise mix is expected to shift over time on account of climate change and if a policymaker, concerned about food security or carbon emissions, wants to prevent such a shift, the first instrument of choice would likely be the relative price or the price of a key input. The sensitivity of enterprise choice to prices would then provide a clear idea of the magnitude of taxes or subsidies required to steer an adequate number of households toward or away from a particular enterprise choice.

A number of sophisticated land-use models can map specific policy changes into changes in land use and from there into changes in output and emissions while controlling for a wide range of factors.² These models can make

2. For example, FAPRI (2004); Tyrell and others (2004).

predictions about the impact of changes in weather-related variables and also provide predictions on responses to policy changes in the short term, conditioning for climate, geographic, use-specific, and sociodemographic variables. The approach used in this paper requires less data than these models, but the exclusion of choice-specific variables buys the lower data requirements at the cost of usefulness for policy. Including one or more such variables would enhance the usefulness of the work and also refine the paper's econometrics by allowing the identification of the individual parameters.

Another area in which this approach could be extended is in modeling risk aversion. The latent variable underlying enterprise choice in this paper is profit from an enterprise, not utility from profit. Modeling behavior in terms of utility maximization rather than profit maximization will enable the author to model risk aversion without requiring any additional data.

Latin America is likely to be very strongly affected by climate change in the short to medium term. The impact of climate change is already showing up in the more frequent incidence of extreme weather events. Not only are land use patterns going to change in response to climate change, but such changes in land use patterns will likely affect the pace of climate change through emissions. In parts of South America, land use changes account for as much as 50 percent of total greenhouse gas emissions. A shift from crops or forestry into livestock would sharply increase the emission of these gases. This work complements the existing literature by exploring the direction and implications of these changes.

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