

Climate Variability and Agricultural Productivity: Evidence from Southeastern US

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Studying the sources of technical efficiency (TE) in agriculture is an important matter as it allows farmers and policy makers to identify and target (private and public) actions to improve productivity and, consequently, agricultural income (Solís et al. 2007). Fuglie et al. (2007) show that, during the past 60 years, the lowest levels of agricultural productivity in the US are highly correlated with severe drought. These results suggest that climatic conditions play an important role on defining agricultural efficiency.

In a recent extensive review of the agricultural efficiency literature, Bravo-Ureta et al. (2007) report very few published articles that include some kind of climate related variable in the empirical models. In general, authors have argued that weather and climate can be considered as stochastic shocks and thus, are naturally captured in the random error term in stochastic analyses (Coelli et al. 2005). However, some authors have questioned this approach claiming that the omission of environmental variables could bias the empirical outcomes (Demir and Mahmud 2002).

Consequently, the goal of this study is to empirically evaluate the extent in which agricultural productivity estimates are affected by variation on climate. To do so, we explore the case of the agricultural sector in the Southeast US. This geographical region is influenced seasonally by the El Niño Southern Oscillation (ENSO) phenomena making it ideal for studying the interaction of climate variability and agricultural productivity. Although, different methodologies have been developed to study TE the stochastic production frontier (SPF) approach offers several advantages over other available alternatives (Kumbhakar and Lovell 2003). Thus, to assess the impact of climate on TE we estimate alternative SPF models with and without climatic variables. We also test alternative variables to measure the influence of climate on TE; namely, seasonal rain fall and the ENSO phase.

The empirical results show that climate variables are not only statistically significant in all estimated models but that their omission could also generate significant inconsistencies on TE scores. These results have significant policy implications. Specifically, if the effects of uncontrollable climatic factors on TE are significant, but not accounted for, then agricultural strategies seeking corrective measures to improve productivity would have little impact since the real source of technical inefficiency is the uncontrollable climatic conditions.

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