

CLIMATE CHANGES AND IMPACTS ON AGRICULTURE PRODUCTION IN SÃO PAULO-BRAZIL: APPLICATIONS OF SPATIAL PANEL DATA MODELS

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São Paulo is the most populous and the richest state in Brazil, with 40 million people and 30% of total Brazilian GDP. Agriculture represents only 2% of the states' GDP, but it plays a strategic role in the national trade balance. São Paulo is the leading producer of sugarcane/ethanol and a net exporter of coffee, fruits and meat. Extreme climate events have significantly affected the urban and rural economic activities, especially the severe droughts observed in the early 2010. We analyze the impacts of climate changes on the gross value of agricultural production (GVP) in São Paulo. Analyses are based on a panel with data for 568 (historically comparable) municipalities between 1994 and 2014. Climate data were collected from conventional stations and interpolated across the state's municipal areas using spatial interpolation techniques. We tested different specifications of spatial panel data models (SAR and SE models with fixed effects) to evaluate how variations in temperature and precipitation affect the GVP of permanent and temporary crops. Results indicate that spatial dependence is more significant in the models for permanent crops, since it reflects the existence of important spatial clusters of production, such as in the cases of fruits and coffee. In turn, the main temporary crops are present throughout the whole territory, namely sugarcane and corn. Increases in the average temperature and reduction in rainfall tend to affect negatively the GVP, and, most importantly, higher temperature variability tends to be the main villain of agriculture in São Paulo.

Keywords: climate change, agriculture, spatial autoregressive model, spatial error model, fixed effects estimation.

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