

Climate Change Impact on Farmland Conversion: A Case Study of California, USA

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SUMMARY

Although there have been many studies on the conversion of agriculture land to urban usage, very limited efforts have been spent on studying the impact of climate changes on farmland conversion. Multiple difficulties are encountered in this issue. Firstly, climate changes occur over a long time horizon, so to reliably study the impacts of climate changes there need very good time series data. Secondly, there are many factors behind farmland conversion, among which most often cited urban-driven factors such as rapid population growth, increasing income and urban infrastructure expansion are easy to model in many studies as the exclusive causes of urbanization.

Another reason as often perceived in public opinion is that climate changes happen gradually rather than sudden changes, thus adaptive capability can be introduced on time to weather out the possible impact from global warming. This is not the case, unfortunately. Climate changes, while defined as the long term trend in mean climate variables such as temperature and precipitation, the increasing fluctuations in climate and the extreme events have the most serious consequence, given short-run adjustment may not be feasible or the adaptive capability to extreme events is “uneven and not adequate” (IPCC, WGII).

I suggest another approach to model the impact of climate changes on farmland conversion using climate extreme variables instead of climate normals (mean temperature or precipitation). I particularly look at the number of extreme heating days, or days which recorded temperature reached 90°F (32.2 degree Celsius). I construct a 25-year climate extreme surface using real time observations from the weather station network in California. The model is estimated for California prime farmland, the most productive farmland, using California’s Farmland Monitoring and Management Program (FMMP)’s GIS data, USDA’s Soil Survey (SSURGO), high resolution PRISM climate data and historical weather extreme records from US’s National Climatic Data Center.

Initial result confirms the proposition that farmland conversion is affected by climate condition, although the effect is minimal, but present and remains highly significant across a number of specification checks. Extreme variables are better predictors of climate change impact than using mean condition. Farmland conversion is nonlinearly affected by climate changes: an increase in heat and precipitation is beneficial, but excessive increase is harmful and will accelerate farmland conversion.

This result has several significant implication: (1) confirm that a shift in many recent empirical studies to account for climate variability can better predict climate change impact than using average condition (2) for countries subjecting to predicted large climate changes such as Vietnam, any reliable result must take into account the distribution of the tail rather than using averaging condition alone.

BIOGRAPHICAL NOTES

Frankie is pursuing a doctoral degree in environmental economics, with a special interest in climate changes and environmental impacts, at the University of California – Berkeley. Having attained an economic background from Hanoi Foreign Trade College in 2000, the author had worked as an economic reporter for Vietnam Economic News, Ministry of Trade, Vietnam before accomplishing a Master in International and Development Economics at the Australian National University in 2004 supported by Asian Development Bank's fellowship. During 2004 – 2006, the author was an economics lecturer at RMIT International University, Vietnam. Since 2006 Frankie has been working as a research assistant at the University of California, Berkeley.

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