AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Geospatial Analysis of Income Growth in Southeastern United States

Buddhi Raj Gyawali
Assistant Professor
Division of Environmental Studies and Sustainable Systems
College of Agriculture, Food Sciences and Sustainable Systems
Kentucky State University
Frankfort, KY
Phone: (502) 597 6029
Email: buddhi.gyawali@kysu.edu

Swagata "Ban" Banerjee
Associate Professor
School of Agriculture, University of Wisconsin-Platteville
Email: banerjees@uwplatt.edu

Selected Poster for the 2013 Southern Agricultural Economics Association (SAEA) Annual Meeting, Orlando, Florida, February 2-5, 2013

Copyright 2013 by Buddhi Gyawali and Swagata"Ban" Banerjee. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided this copyright notice appears on all such copies

Geospatial Analysis of Income Convergence in Southeastern United States

Abstract

Income convergence and both endogenous and exogenous factors causing income growth in the southeastern United States were examined by using county level census data between 1980 and 2000. The study found that spatial variations in education, employment, and industries concentrations were strongly related with income convergence in the region.

Key Words: Agglomeration, Black Belt, census, clusters, convergence, industries, employment, income, southeastern, spatial

JEL classification: O12, O15, R12

Introduction

This study explores income growth at the county level in the states of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, and Tennessee. The historical events in the southern United States have produced differing impacts and regional variations in demographic, industrial, and overall economic growth across the region. There are significant contrasts between rural and metro counties in demographics such as race, population density, education, industrial firms, jobs, and growing urban structures in these states. This study was aimed at eliciting the role of these variations in income growth and identifying the places where the income is converging or diverging.

Convergence theory predicts that low-income regions will exhibit faster growth rates as they eventually catch-up to more developed areas (Barro and Sala-i-Martin; 1992). Capital and other factors of production are assumed to be freely mobile and production must be characterized by diminishing returns to scale. The movement of capital serves as the key and automatic force driving regional convergence. However, the historical events in the southern United States have produced differing impacts and regional variations in demographic, industrial, and overall economic growth across the region. Majority of the studies on U.S. income convergence are based on states or multi-state aggregate data, with few examinations in metropolitan areas and counties (Hammond, 2006). The objectives of this study are: (1) examine income growth in these 10 states using the census data from 1980 to 2010, and (2) identify most significant predictors of income growth over the period between 1980 and 2010.

Data & Methods

Census data from 1980, 2010, & 2010 at the county level were downloaded from various sources such as NHGIS (National Historical Geographical Information System), U.S. Census, Social Explorer, and USDA/ERS. The data relates to demographic attributes (such as population, race, age, income, education, urban, rural), industry and jobs attributes (employment and commuting distance).

Following Mankiw et al. (1992) and Rey and Montouri (1999), income convergence in the 10-state southeastern region was estimated by ordinary least squares.

$$\ln\left(\frac{y_t}{y_{t-1}}\right) = \alpha + \beta_0(\ln y_{t-1}) + \varepsilon \qquad \textbf{(1)}$$

$$\ln\left(\frac{y_{i,t}}{y_{i,t-1}}\right) = \alpha + \beta_0(\ln y_{i,t-1}) + \beta_i(X_{i,t} - X_{i,t-1}) + \beta_j X_j + \varepsilon_{i,t}, \qquad \textbf{(2)}$$

Equations 1 and 2 estimate absolute and conditional income convergence, respectively, where y_i is the average per capita income of county i in year t (2000), ln is natural logarithm, $t\text{-}1$ is initial year (1980), X_j indicates initial conditions of the explanatory variables in year 1980, $X_{i,t-1}$ is a vector of growth in explanatory variables, β_i is a vector of X_i parameters, and $\varepsilon_{i,t}$ is an error term. The conditioning factors are initial and changed conditions of population, race, education, age structure, employment, and travel time to work that control per capita income growth.

Results

Absolute Convergence

The absolute income convergence model testing only log of initial per capita income was significant at (F=34, df=1,873, p<=.001), explained 3.7% (adjusted R^2=.037) of the total variation. The convergence coefficient (β value) was negative (-.195) and significant at the 5 percent level (t=-5.883) demonstrating convergence of per capita income in the southeastern U.S. counties. A negative sign suggests that poor counties are growing faster than rich counties. The convergence rate is estimated to be 1.09% per year. The low R^2 value indicates that a large amount of variation in average per capita income convergence is unexplained by the absolute model and more variables need to be explored to examine convergence further.

Conditional Income Convergence

The conditional income convergence model (Table 1) was significant (F=165,df=15,859, p<=.001, adjusted R^2=.738). The coefficient for initial per capita income level is negative and significant (β =-.468, t= -15.192) suggesting that there was conditional income convergence over the 20-year period. The convergence rate per year is 3.08%.

All of the changed and initial condition variables were significant at the 1% level confidence interval (p<0.1) except the change in high school population, which was significant at the 5% (p<0.5) confidence interval. All of the initial condition variables showed a positive significant relationship.

The changes in African American and rural population were the only changed variables negative and significant. The negative relationship suggests that a high level of income growth occurred in areas with low African Americans, which are mostly in rural areas. This means, higher levels of income growth occurred in non-African American areas of the region, and in areas where the African American population (AA) was in decline over 20 years.

Counties with higher population changes were more likely to have experienced positive income changes. The results show income growth in labor force population (ECO), retiree population (RE), high school graduate population (HS), college graduates (CO), employed population (EM), and increased travel time (TRT). Within the changed conditions, college graduates and employed population show the strongest relationship to income change. This observation is expected because counties with higher educated people and a large employed class are economically faster than counties without these characteristics.

These findings concur with Lim (2004) and Henry et al. (2004) who suggest areas with little improvement in higher education levels or low levels of job growth were more likely to have experienced declining or relatively lower income growth.

Figure 1. African-Americans dominated counties in the southeastern region

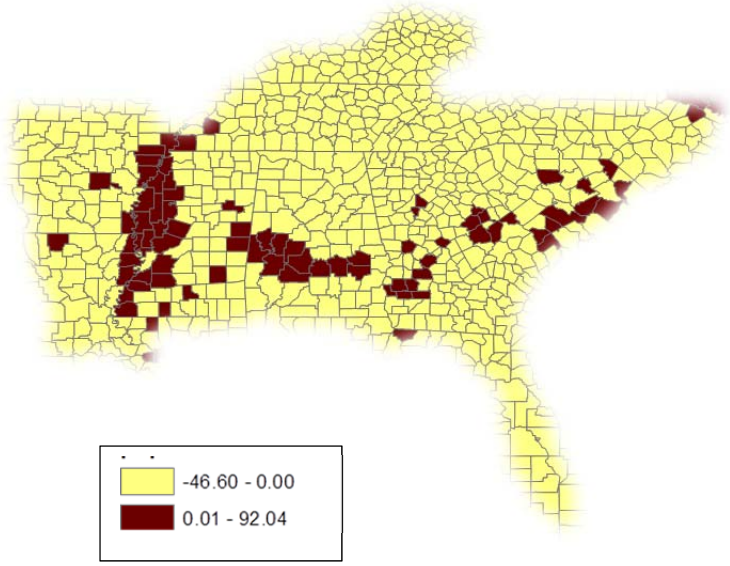

Figure 2. Population Growth between 2000 and 2010 in the Southeastern Region

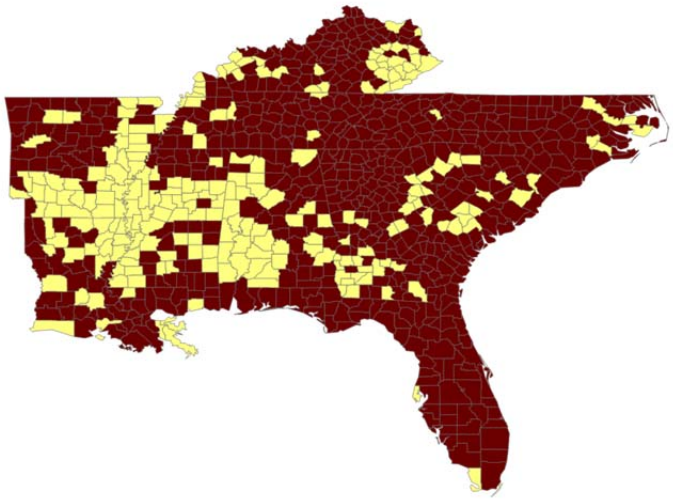

Figure 3. Per Capita Income Growth, 2000-2010

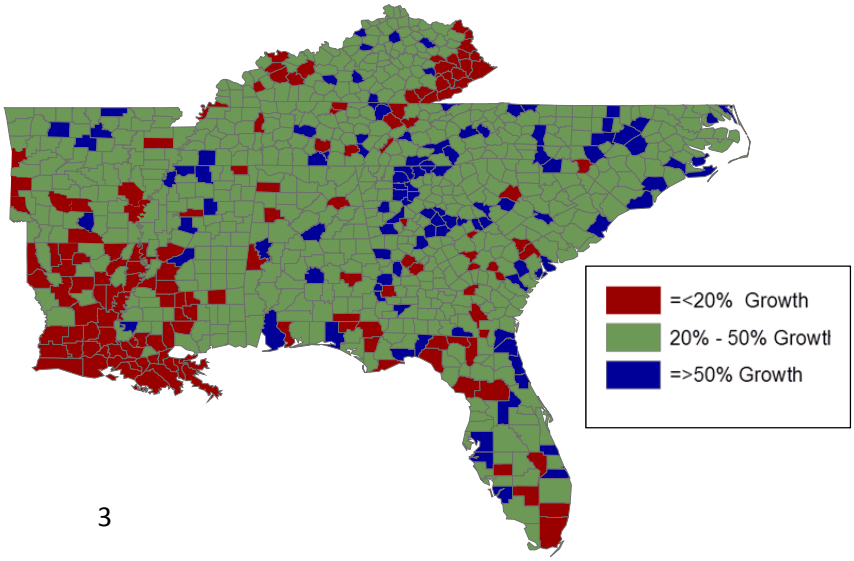

Table 1: Results of Conditional Income Convergence Analysis, 1980-2000

Variables	**β-coef.**	**Std. Error**	**t-value**	**Elasticity**
Constant	4.507	0.246	18.326	
Initial Condition (1980)				
Initial Per Capita Income	-0.467**	0.024	15.192	-9.049
African American Population	0.155***	0.000	5.951	3.312
Labor Force Population (ECO)	0.399***	0.001	9.569	22.827
Retiree Population (RE)	0.536***	0.001	14.617	6.673
High School Population (HS)	0.193***	0.001	6.439	3.235
Employed Population (EM)	0.495***	0.000	17.288	25.418
Changed Condition (1980-2000)				
African American Pop.	-0.115***	0.000	-5.889	-6.179
labor Population	0.260**	0.002	5.805	3.827
College Population	0.628***	0.001	17.556	96.781
Employed Population	0.374***	0.001	11.861	2.053
Rural Population	-0.099***	0.000	-5.178	-0.194
Travel Time (ΔTRT)	0.116**	0.002	5.217	0.010

Table 2 Growth in Population Attributes & Income, 2000-2010

States	Counties	Pop. Growth	Minority Pop.Growth	PCI Change	Income Conv. Per year
Florida	67	20.48%	-1.24%	36%	1.86%
Georgia	159	14.16%	-0.57%	39%	0.47%
North Carolina	100	13.07%	-0.14%	41%	0.20%
Tenennessee	95	8.96%	2.16%	36%	0.81%
South Carolina	46	8.64%	0.46%	36%	0.15%
Kentucky	120	4.66%	-0.36%	31%	0.36%
Alabama	67	3.17%	0.38%	34%	0.42%
Arkansas	75	1.80%	1.28%	32%	1.93%
Lousiana	64	1.30%	-1.28%	15%	1.37%
Mississippi	82	0.65%	-1.65%	33%	0.62%

Conclusion

The study found both an absolute and a conditional convergence in both years with an increasing rate. The conditional model was employed to show the relationship between income growth and its explanatory variables. Between 1980 and 2000, the convergence rate was 3.08%. The results suggest that poorer counties are growing economically faster than richer counties.

There are some limitations of this study as the models were not as strong due to the limitations in the availability of consistent data. Originally, we had proposed to use data from 1970-2010. Also, 1970 per capita income was not available and 2010 census data was not readily available at the time of research. This study is an illustration of what could be done to analyze current trends. However, with the available data and described limitation this is what we found.

Further research should be done to look in the sub-regional level and more control variables using recent census data. In addition, more variables could be examined such as: location of industries, road networks, wage disparity, and other social and community amenities indicators.

References

Sala-i-Martin, X.X. (1996). "Regional Cohesion: Evidence and Theories of Regional Growth and Convergence," *European Economic Review*, 40, 1325–1352.

Rey, S.J., and M.V. Janikas. (2005). "Regional Convergence, Inequality, and Space," *Journal of Economic Geography,* 5, 155–176.

Young A. T., M. Higgins, D. Levy. (2008). "Sigma Convergence versus Beta Convergence: Evidence from U.S. County-Level Data," *Journal of Money, Credit and Banking,* 40: 1083-1093.