Exploring Variations in Income Growth in Southeastern United States

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ABSTRACT

This paper examined income convergence in 875 counties of the 10-state southeastern region using Census data for 1980 and 2000. Logarithmic difference of average per capita income between those years was regressed on socioeconomic variables. Changes in education, labor force, and employment were strong determinants of income growth.

INTRODUCTION

This study examines income convergence at the county level in the states of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, and Tennessee.[1] The objectives of this study are to: (1) examine income convergence in these ten states from 1980 to 2000, and (2) identify predictors of income growth over the period 1980 to 2000. 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. 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). This study is aimed at eliciting the role of these variations in income growth using the data available at the county level, which is the first known effort in the southeastern United States.

REVIEW OF LITERTURE

A study conducted by Crown and Wheat (1995) used 1950-1987 data on state per capita income convergence. The study found that South is catching up the income growth of Northern States. They found that income convergence in the South resulted from the South's overcoming of its legacy of slavery, agricultural dependence, high Black population percentages, poor education, and low wage rates. High South-to-North migration contributed to raise incomes in the South. The study also found in 1950, all ten southern states (West Virginia, North Carolina,

[1] Initially, the state of Virginia was also included in the study, but was later excluded because county-level data suggested this state to be too "urban" and income was "skewed" when that state was included.

South Carolina, Georgia, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, and Louisiana) recorded income at more than 25% below the national average. However, after 1950, the income gap between southern and non-southern states closed and income growth increased by 161%.

Sunwoong Kim's (2003) study focused on literature by Myrdal and Hirshman. The two authors independently identified two opposing forces in economic growth that make regional incomes converge or diverge. On the one hand, they argued that growth necessarily creates divergent productivity growth among different regions through agglomeration economies in the center (the region with higher productivity). Savings in transportation cost due to geographical proximity, external economies of scale of production, increased productivity due to more specialized inputs are often cited as reasons of agglomeration economies. On the other hand, the growth of the center will induce growth of the periphery (the regions with lower productivity) through technological transfers from the center to the periphery and factor movements across regions. These forces tend to make regional per capita income converge

Over time, there has been a tendency for weaker rural regions to catch up. The relationship is the opposite in metropolitan counties, where leading counties tend to grow wages the fastest. It is also the opposite of the relationship between metropolitan and rural regions, where metropolitan regions on average grew wages more strongly despite starting out with higher initial wages (Porter et al., 2004). The evidence is consistent with the concept of "conditional convergence" prominent in the growth literature. Rural regions are revealed as a distinct group of regions with underlying characteristics that put them on a different growth path than metropolitan regions. Within their group, rural regions converge to one growth path while the two growth paths of the rural and metropolitan regions do not converge (Porter et al., 2004).

Convergence theory predicts that low-income regions will exhibit faster growth rates as they eventually catch-up to more developed areas even as the rate of growth in high income regions slows Barro and Sala-i-Martin (1995). While the assumptions for this to occur may seem somewhat strict, capital and other factors of production are assumed to be freely mobile and production must be characterized by diminishing returns to scale. The theory has spawned a large empirical literature aimed at measuring and testing economic convergence between countries and sub-national regions. The sigma convergence is the strongest and the most intuitive concept of convergence. When the dispersion of real per capita income across a group of economies falls over time, there is σ-convergence.

In order to explore regional wage disparities, observationally equivalent workers must be compared. The role of regional workforce differences in the relative wages of regions should be isolated from pay differentials that comparable workers would receive in other regions. Most sources of wage disparity are accounted for by evaluating the typical differences in returns associated with worker characteristics, including education levels, experience, industry, race, and sex.

If income or wages of the component parts of the nation's regions or states are converging (decreasing) over time, then there is no basis to infer rising inequality among those spatial units. If income or wages are diverging (increasing) however, that is a basis for inferring rising inequality among spatial units. The movement of capital serves as the key and automatic force driving regional convergence. Economic convergence, at least in theory, is attained when differences in rates of marginal returns to capital between regions is equal to zero. When such occurs it is assumed that income per capita would also have equalized between regions Hall and Ludwig (2006).

Sigma convergence is the tendency for variation of income or wages among nations or sub-parts of a nation to diminish over time. It is measured by the variance, or standard deviation, or coefficient of variation of per capita income or wages for spatial units over time. A long-term decline in the annual measure of variation indicates sigma convergence. Both Friedman (1992) and Quah (1993) consider sigma convergence to be the only valid measure of convergence because the usual tests for beta convergence are subject to Galton's fallacy of regression to the mean Drennan (2003).

The most thorough study of convergence among parts of the United States was done by (Barro and Sala-i-Martin, 1991). Testing for sigma convergence using state per capita income data, 1880 to 1988, their results support sigma convergence for all decades except the 1920s and the 1980s, which they dismiss as aberrations. Their test is for unconditional sigma convergence because to test for conditional sigma convergence their argument would require measuring the dispersion between the actual per capita income and the steady-state value, which is unknown. The data set used by Barro and Sala-i-Martin ends in 1988, and as noted, they found evidence of divergence of per capita personal income among states for the decade of the 1980s.

EMPIRICAL MODEL

Following Mankiw et al. (1992), Sala-i-Martin (1996), and Rey and Montouri (1999), income convergence in the 10-state southeastern region was estimated by ordinary least squares. Two income convergence models were estimated: (1) Absolute Income or β-convergence (equation 1) and (2) Conditional Income Convergence (equation 2).

Initially, a univariate β-convergence model was estimated to determine if there was an absolute income convergence over the 20-year period (Sala-i-Martin 1996):

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

where y_t is the average per capita income in year t (2000), *ln* is natural logarithm, *t-1 is* initial year *(*1980 and 1990, respectively), α is a constant, β_0 is a coefficient vector, and ε is an error term. However, the absolute income convergence may not occur due to differences in the steady-state conditions. Differences in demographics, employment, industry structures, and other factors may affect a region and lead to unbalanced growth in the region. That is, the income growth process may be conditioned by these factors and a conditional income convergence model has to be estimated (Barro and Sala-i-Martin 1991; Sala-i-Martin 1996). Such a model is:

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

where y_i is the average per capita income of county i in year t (2000), *ln* is natural logarithm, *t-1 is* initial year *(*1980 and 1990, respectively), 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 (see Table 1 for descriptions of the variables used).

DESCRIPTIONS OF VARIABLES

Previous income convergence studies have reported six socioeconomic factors play important role in income convergence. These factors are population, race, labor structure, age, education, and employment. In this study, initial levels and changes in population density,

population between 16 and 64 years old, African-American population, college education, unemployed population, and travel time to the workplace were used in the model. Heterogeneity and endogeneity biases were controlled by including the initial conditions of the variables. Inclusion of both initial and changed conditions of the control variables help show whether the income change was a result of initial conditions, some changes of their conditions, or both.

Table 1: Variables used in Income Growth Model

VARIABLE	DESCRIPTION	VARIABLE TYPE
Change in the Income Growth	Natural log of the ratio of PCI of each county in 2000 to real (in 2000 $-value) PCI in 1980/1990 for each county	DEPENDENT
INITIAL CONDITION		
African American Population (AA)	Initial (1980,1990) population, 50% or more AA	INDEPENDENT
Labor Force Population (ECO)	Initial (1980,1990) population in 16-64 age bracket	INDEPENDENT
Retiree Population (RET)	Initial (1980,1990) population, 65 years of age and above	INDEPENDENT
High School Population (HS)	Initial (1980,1990) high school graduate population	INDEPENDENT
College Population (COLL)	Initial (1980,1990) population with at least a bachelor degree	INDEPENDENT
Employed Population (EM)	Initial (1980,1990) employed population, 16 years and above	INDEPENDENT
Urban Population (URB)	Initial (1980,1990) 50,000 or more population in county	INDEPENDENT
Travel Time (TRAVT)	Initial (1980) average travel time to work (in minutes) per person in a county	INDEPENDENT
Population Density (PDEN)	Initial (1980,1990) people per square mile at the county level	INDEPENDENT
CHANGED CONDITION		
Changed African American Population	Difference in % of AA population, 1980-2000, 1990-2000	INDEPENDENT
Changed Labor Force Population	Difference in % of 16-64 age group population, 1980-2000, 1990-2000	INDEPENDENT
Changed Retiree Population	Difference in % of 65-and-over age group population, 1980-2000, 1990-2000	INDEPENDENT
Changed High School Population	Difference in % of High School graduate population, 1980-2000, 1990-2000	INDEPENDENT
Changed College Population	Difference in % of Bachelor degree holder population or over, 1980-2000, 1990-2000	INDEPENDENT

Changed Employed Population	Difference in % of employed population, 1980-2000, 1990-2000	INDEPENDENT
Changed Urban Population	Difference in % of urban counties with 50,000 or more population	INDEPENDENT
Changed Travel Time	Difference in % of the average travel time to work (in minutes) per person in a county, 1980-2000	INDEPENDENT
Changed Population Density (PDEN)	Difference in % of people per square mile at the county level	INDEPENDENT

RESULTS

Descriptive Statistics, 1970 and 2000

The descriptive statistics are used to summarize and describe the data. The descriptive statistic table (Table 1) shows the minimum, maximum, mean, and change value of all major variables in 875 counties. There was a 96% increase in population in the study area over a 30-year period. The population race variables are categorized into African American, White, and Other population. The white population shows a decline of -1.73%, African American population increased by 2%, and other population shows a positive change of 2983%.

The population class is categorized into three variables; young, labor force (eco), and retiree population. Retiree's are the most significant variable in this class at 30% increase, the young population declined by -28%, and the labor force population increased by 10%. The education class includes the high school and college graduates. Both high school and college variables show a significant increase at 79% for high school and 142 %. Employment is also a factor in population change and resulted in an increase by 10%. Next, rural and urban population is examined. Rural population shows a decrease by 4%, while urban population shows an increase by 63%, Population density is also explored to estimate the change in amount of people per square mile. Population density shows an increase by 96% over 30 year period. Overall, other population increased at 2,983%, college graduates at 142%, high school graduates at 79%, population density at 96%, and urban population at 63%.

Descriptive Statistics, 1980 and 2000

Total population shows a 51% increase in population in the study area over a 20-year period (see Table 3). The race variables are categorized into African American, White, and Other population. The white population shows the only decline in population by -3%, African

American population increased by 53%, and other population by 663% over the 20-year period. The population class variables are categorized into young, labor force (eco), and retiree population. The labor force population increased by 14%, the young population decreased by -30%, and the retiree population increased by 10%. The education class includes the high school and college graduates. Both high school and college population show a significant increase at 112% for high school and 154 %, respectively. Employment is also a factor in population change and resulted in a increase at 5%. Next, rural and urban population is examined. Rural population shows an increase by 1%, while urban population shows a increase by 31%, Population density is also explored to estimate the amount of people per square mile. Population density shows an increase at 51%. Lastly, per capita income is observed with 34% increase over a twenty year period. Overall, the most significant variables changed are other groups of population, high school, and college population.

Table 2: Descriptive Statistics of Variables, 1970 and 2000

Demographic / Socioeconomic characteristic	**Minimum**		**Maximum**		**Mean**		**% Change**
	1970	2000	1970	2000	1970	2000	
Total Population	1814	2077	1,267,792	2,253,362	42,764.47	69,023.25	96.64
White (%)	18.60	13.31	100.00	99.56	77.09	75.52	-1.73
African American (%)	0.00	0.00	81.10	86.13	22.66	21.25	2.02
Other (%)	0.00	0.28	32.17	41.83	0.25	3.22	2983.16
Young (%)	15.09	12.80	39.53	28.04	29.54	20.88	-28.87
Labor Force Pop	48.92	51.39	83.96	76.97	59.54	65.49	10.19
Retiree	0.45	1.80	35.00	34.72	59.54	13.63	30.69
High School	5.78	15.87	40.86	47.43	21.03	34.34	79.46
College	1.08	4.86	31.79	44.10	5.90	13.26	142.31
Employed	2.97	20.94	68.80	71.48	49.61	53.84	10.39
Rural	0.33	0.11	106.06	100.00	69.82	63.84	-4.70

Urban	0.00	0.00	99.67	99.89	6.42	36.16	63.58
Population Density	2.50	4.09	1982.49	2457.90	80.37	121.81	96.64

Table 3: Descriptive Statistics of Variables for 1980 and 2000

Variable	Minimum		Maximum		Mean		% Change
	1980	2000	1980	2000	1980	2000	1980-2000
Total Population	2,032	2,077	1,625,781	2,253,362	51,853	69,023	51.51
White	15.04	13.31	99.99	99.56	77.87	75.52	-3.15
African American	0.00	0.00	84.16	86.13	21.37	21.25	53.73
Other	0.00	0.28	35.45	41.83	0.75	3.22	662.52
Young	15.83	12.80	41.01	28.04	30.34	20.88	-30.92
Labor Force Pop	46.04	51.39	72.88	76.97	57.21	65.49	14.72
Retiree	0.81	1.80	33.96	34.72	12.45	13.63	12.20
High School	7.32	15.87	29.91	47.43	16.76	34.34	112.45
College	1.60	4.86	21.35	44.10	5.30	13.26	154.11
Employed	8.42	20.94	70.66	71.48	51.35	53.84	5.49
Rural	0.08	0.11	100.00	100.00	67.65	63.84	1.96
Urban	0.00	0.00	99.92	99.89	32.35	36.16	31.61
Population Density	3.49	4.09	2542.29	2457.90	96.21	121.81	51.51
PCI	6,756	9,629.0	21,614.68	32,496	12,164.56	16,265.06	34.22

Descriptive Statistics, 1990 and 2000

Total population shows a 34% increase in population in the study area over a 10-year period (see Table 4). The race variables are categorized into African American, White, and Other population. The white population shows the only decline in population at -2%, African American population increased by 17%, and other population at 314.56%. The population class variables

are categorized into young, labor force (eco), and retiree population. The labor force population increased by 2%, the young population decreased by -5%, and the retiree population decreased by -0.8%. The education class includes the high school and college graduates. The high school population shows a significant increase at 113%. The college population shows a 21% increase. Employment is also a factor in population change and resulted in a 7% decrease.

Next, rural and urban population is examined. Rural population shows an increase by 4%, while urban population shows an increase by 35%, population density is also explored to estimate the number of people per square mile. Population density shows an increase at 34%. Lastly, per capita income is observed at 20% over the 20-year period.

Table 4: Descriptive Statistics of Variables for 1990 and 2000

Variable	Minimum		Maximum		Mean		% Change
	1990	2000	1990	2000	1990	2000	1990-2000
Total Population	1,909	2,077	1,937,094	2,253,362	58,603	69,023	34.28
White	13.69	13.31	99.94	99.56	77.73	75.52	-2.97
African American	0.00	0.00	86.24	86.13	21.13	21.25	17.82
Other	0.00	0.28	38.99	41.83	1.14	3.22	314.56
Young	13.01	12.80	31.34	28.04	22.09	20.88	-5.08
Labor Force Pop	50.82	51.39	76.58	76.97	64.00	65.49	2.43
Retiree	1.39	1.80	33.78	34.72	13.91	13.63	-0.80
High School	6.81	15.87	36.04	47.43	17.79	34.34	113.23
College	3.69	4.86	46.08	44.10	11.13	13.26	21.92
Employed	18.48	20.94	79.64	71.48	58.55	53.84	-7.99
Rural	0.04	0.11	100.00	100.00	67.57	63.84	4.11
Urban	0.00	0.00	99.96	99.89	32.43	36.16	35.50
Population Density	3.80	4.09	3029.10	2457.90	107.22	121.81	34.28
PCI	6,926.08	9,629.00	28,744.62	32,496.00	13,641.41	16,265.06	20.29

Table 5: African American (AA) dominant Counties by State

STATE	1970	2000	Change	1980	2000	Change	1990	2000	Change
Alabama	10	10	0	10	10	0	10	10	0
Arkansas	3	3	0	3	3	0	3	3	0
Florida	2	1	-1	1	1	0	1	1	0
Georgia	22	17	-5	19	17	-2	20	17	-3
Kentucky	0	0	0	0	0	0	0	0	0
Louisiana	9	8	-1	6	8	2	7	8	1
Mississippi	21	25	4	22	25	3	24	25	1
North Carolina	5	7	2	6	7	1	6	7	1
South Carolina	12	12	0	13	12	-1	12	12	0
Tennessee	2	1	-1	2	1	-1	1	1	0
Total	86	84	-2	82	84	2	84	84	0

Table 5 represents the 875 counties in the southeastern United States that are African American dominant. Alabama had the same amount of AA dominant counties in both 1970 and 2000, i.e., no change occurred in the racial shift of a county from AA to non-AA dominant or vice versa over the 30-year period. Arkansas also had the same amount of AA counties from 197o to 2000. With Florida, AA dominant counties decreased by 1 between 1970 and 2000 and had no change between 1980 and 2000. Georgia showed the highest decline of AA dominant population at -5 counties in 1970, -2 in 1980, and -3 counties in 1990. Kentucky represented the only state with no AA population present either year. Louisiana showed a decline of 1 from 1970 to 2000, an increase by 2 between 1980 and 2000, and an increase of 1 between 1990 and 2000. Mississippi and North Carolina were the only states that showed a positive increase in each time frame. Mississippi showed an increase by 4 in 2000 over 1970, an increase by 3 in 2000 over 1980, and an increase by 1 in 2000 over 1990. North Carolina's AA population increased by 2 between 1970 and 2000 and 1 in both 10- and 20-year periods. South Carolina, on the other hand, showed no increase in the periods 1970-2000 and 1990-2000. Yet, South Carolina showed

an increase by 1 in 2000 over 1980. Tennessee showed no increase in AA counties between 1970 and 2000 or 1980 and 2000, but showed an increased by 1 between 1990 and 2000.

Table 6: Urban Counties by State

STATE	1970	2000	CHANGE	1980	2000	CHANGE	1990	20000	CHANGE
Alabama	18	24	6	21	24	3	21	24	3
Arkansas	8	15	7	10	15	5	11	15	4
Florida	24	39	15	33	39	6	36	39	3
Georgia	18	36	18	22	36	14	30	36	6
Kentucky	11	15	4	12	15	3	13	15	2
Louisiana	19	22	3	21	22	1	22	22	0
Mississippi	7	12	5	12	12	0	12	12	0
North Carolina	34	46	12	40	46	6	43	46	3
South Carolina	16	24	8	20	24	4	21	24	3
Tennessee	13	25	12	18	25	7	21	25	4
Total	**168**	**258**	**90**	**209**	**258**	**49**	**230**	**258**	**28**

Table 6 shows the total number of urban counties by state. Overall, urban counties are consistently increasing. This observation is consistent with previous findings (Wenk and Hardesty, 1993). More people are leaving rural areas in exchange for urban areas. In 1970 there were 168 urban counties, in 1970 there were 209 urban counties and in 1990 there were 230 counties. Georgia shows the most increase in urban counties by 38. Louisiana showed the lowest increase of urban counties by 4.

Results of Regression Models

The results of the estimated income convergence models are based on the second objective: Examine income growth from 1980 to 2000 in the southeastern United States. The income convergence models were estimated using Ordinary Least Squares. The models were grouped into two sections (1980 and 2000) and (1990 and 2000). The convergence model was estimated in two steps. The a\bsolute convergence model (a univariate β_0) model was first tested

using only initial income to determine if there was absolute income convergence. If the R^2 value is low, the conditional income convergence model is used by including more variables to examine convergence if conditioned by other variables. Both models were employed using the stepwise method to reduce the effects of multicollinearity among independent variables.

The dependent variable is the natural log value of per capita income in 2000 to real (in year 2000 dollars) per capita income in 1980 (for 1980 and 2000 model) and 1990 (for 1990 and 2000 model) for each county in the study area. The independent variables are initial and changed conditions, which included: population, race, education, age structure, employment, population density, and travel time to work see Table 13 for a description of the variables used). The independent variables used in this study were drawn from the previous studies. These studies reported that six socioeconomic factors play important role in income growth. These factors are population, race, labor structure, age, education, and employment (Sala-i-Martin, 1996). The convergence model included initial and changed variables of African-American Population, labor force population, retiree population, high school graduates, college graduates, employed population, rural population, population density, and travel time to work including initial and changed conditions of the control variable, helps to distinguish whether income change was a result of initial conditions, changes, or both.

Results of Income Convergence between 1980 and 2000

(1) <u>Absolute Convergence, 1980 and 2000</u>

Table 7 shows the results of the absolute income convergence model testing only log of initial per capita income. This model 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.[1] 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.

Table 7: Results of Absolute Convergence Model (1980 and 2000)

Variable	β-coefficient	Std. Error	t-value
(Constant)	1.551	.215	7.216
Initial Condition (1980)			
Initial Per Capita Income 1980	-.195***	.023	-5.883

The convergence rate is calculated using $\theta = \ln(\beta+1)/t$, where t(=20) is the number of years in the time period and β is the coefficient (Rey and Montouri, 1999).

(2) Conditional Income Convergence, 1980 and 2000

Table 8 shows the results of the conditional income convergence model using the initial and changed variables. The model was significant (F-165,d*f=15*,859, p=.001). The initial and conditional variables explain a 73.8% of the total variation (adjusted R^2=.738) in per capita incomes between 1980 and 2000. The coefficient for initial per capita income level is negative and significant (β =-.962, t= -27.532) suggesting that there was conditional income convergence over the 20-year period. The convergence rate per year is 16.3%. This relationship is expected to be negative as suggested by neoclassical growth theory. Using the stepwise method, the best model shows all significant variables. Since the goal of the stepwise method is to produce a strong model by eliminating variables that are strongly correlated among each other, it has identified the variables that best predict the dependent variable and has eliminated those that contribute no significance. College population, rural population, and population density were eliminated.

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. A 1% increase in labor force population (eco) in 1980 will increase income growth by 39%. A 1% increase in retiree population in 1980 will increase income by 53%. A 1% increase in High School Population in 1980 will increase income growth by 19%. A 1% increase in employed population in 1980 will increase income growth by 49%. A 1% increase in travel time in 1980 will increase income growth by 13%. The labor population (eco) and employed population show the strongest relationship to income convergence. Whereas, the

African American population and travel time to work show the least responsiveness to income convergence.

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 and 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 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, high school graduate population, college graduates, employed population, and increased travel time. Within the changed conditions, college graduates and employed population shows the strongest relationship to income change. This observation is expected because counties with higher educated people and a large employed class are economically faster that 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.

Table 8: Results of Conditional Income Convergence Model, 1980 and 2000

Variable	β-coefficient	Std. Error	t-value
Constant	4.507	.246	18.326
Initial Condition (1980)			
Initial Per Capita Income 1980 (PCI_80)	-.962**	.024	27.532
African American Population (AA)	.155***	.000	5.951
Labor Force Population (ECO)	.399***	.001	9.569
Retiree Population (RE)	.536***	.001	14.617
High School Population (HS)	.193***	.001	6.439
Employed Population (EM)	.495***	.000	17.288
Travel Time to work (TRT)	.138***	.001	6.096

Changed Condition (1980-2000)			
Change in African American Population (ΔAA)	-.115***	.000	-5.889
Change in Eco Population (ΔECO)	.260**	.002	5.805
Change in Retire Population (ΔRE)	.490**	.002	13.113
Change in High School Population (ΔHS)	.075	.001	2.271
Change in College Population (ΔCO)	.628***	.001	17.556
Change in Employed Population (ΔEM)	.374***	.001	11.861
Change in Rural Population (ΔRPOP)	-.099***	.000	-5.178
Change in Travel Time (ΔTRT)	.116**	.002	5.217

Results of 1990 and 2000 Models

(1) Absolute Income Convergence, 1990

Table 9 shows the results of absolute income convergence model testing the relationship between income change (1990-2000) and only the log of initial (1990) per capita income. This model was significant at (F=183, *df*=1,873, p<=.001), explained at 17% (adjusted R^2=.172) of the total variation. The convergence coefficient (β value) was negative (-.416) and significant (t=-13.534) indicating income convergence of per capita income in the southeastern U.S. counties. The convergence rate is 5.3% per year. The low R^2 value indicates that a large amount of variation in average per capita income convergence is unexplained by the model. The low value also indicates that income growth may be conditional and the convergence can be explained if more variables are included to examine income convergence further.

Table 9: Results of Absolute Income Convergence Model (1990 & 2000)

Variable	β-coefficient	Std. Error	t-value
(Constant)	2.034	.137	14.843
Initial Condition (1990)			
Initial Per Capita Income 1990	-.416***	.014	-13.534

(2) <u>Conditional Income Convergence, 1990</u>

Table 10 shows the results of the conditional income convergence model using the initial and changed variables. The model was significant (F=165, d*f=12*,862, p=.001). The initial and conditional variables explain a 65% of the total variation (adjusted R^2=.652) in per capita incomes between 1990 and 2000. The coefficient for initial per capita income level is negative and significant (β =-.977, t= -23.283) suggesting that there was conditional income convergence over the 10-year period. The convergence rate was 37.5% per year. All of the changed and initial condition variables were significant. Using the stepwise method, the best model shows all significant variables. Since the goal of the stepwise method is to produce a strong model, it has identified the variables that best predict the dependent variable and has eliminated those that contribute no significance. African American population, high school population, population density, changed high school population, and changed rural populations were eliminated.

All of the changed and initial conditions were significant at the 1% level confidence interval (p<0.1) except the change in rural population and the labor force population (eco) which were significant at the 5% (p>0.5) confidence interval. All of the initial condition variables showed a positive significant relationship. A 1% increase in labor force population (eco) in 1990 will increase income by 10%. A 1% increase in retiree population in 1990 will increase by 29%. A 1% increase in employed population in 1990 will increase income by 42%. A 1% increase in rural population in 1990 will increase income by 8%. Within the initial conditions, the employed and retiree population show the most responsiveness to income change. The labor force and rural population show the least responsiveness to income change.

The change in African American population was the only changed variable negative and significant. The negative relationship suggests that a high level of income growth occurred in areas with low African and Americans. In other words, higher levels of income growth occurred in predominantly non-African American areas of the region, and in areas where the African American population was in decline over ten 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, college graduates, employed population, and population density. Within the changed conditions, employed and college graduate population show a higher level of responsiveness to income change. These findings concur with (Lim, 2004; 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.

Table 10: Results of Conditional Income Convergence (1990 and 2000)

Variable	β-coefficient	Std. Error	t-value
Constant	3.779	.167	22.695
Initial Condition (1990)			
Initial Per Capita Income 1990	-.977**	.020	-23.283
Labor Population (ECO)	.101***	.001	2.430
Retiree Population (RE)	.297***	.001	7.700
Employed Population (EM)	.425***	.000	12.867
Rural Population (RPOP)	.087***	.000	3.007
Changed Condition (1990-2000)			
Change in African American Population (ΔAA)	-.093***	.001	-4.146
Change in Labor Force population (ΔECO)	.206**	.002	4.400
Change in Retire Population (ΔRE)	.495**	.002	11.174
Change in College Population (ΔCO)	.423***	.001	17.168
Change in Employed Population (ΔEM)	.376***	.001	13.562
Change in Population Density (ΔPDEN)	.078***	.000	3.490

SUMMARY AND CONCLUSIONS

The objective of the paper was to examine income growth from 1980 to 2000 in the southeastern United States. Income convergence showed a steady increase during this study period. This observation showed that poorer counties are growing faster than relatively rich counties economically based on the positive convergence rate in both study periods.

This study used county-level data in 10 states to explore income convergence between 1980 and 2000 and 1990 and 2000. Both absolute and conditional convergence models were

estimated to accurately measure income growth. First, absolute convergence was estimated for both time periods. Then conditional income convergence models were estimated employing the initial and changed conditions of the variables for both periods. The conditional convergence model for 1980 and 2000 was the most significant model based on the R^2. This study employed cross-section data for 1980, 1990, and 2000 to determine if income convergence was present in the southeastern U.S. counties.

The income convergence model results indicate strong evidence of income convergence in the region for both 10- and 20-year periods. It is evident that poorer counties' income was growing at higher rates than wealthier counties. The conditional convergence rates were 16.3% and 37.5% for 1980 & 2000 and 1990 & 2000 models, respectively.

Education was a significant contributor to income growth in the southeastern region. Increasing levels of high school and college education in the population have improved the local labor force and increased their earning potential. Employment was another significant contribution to income growth. With more employed and/or qualified people bringing in revenue to the area, the counties are growing more economically.

There are some limitations of this study. The models were not as strong due to the relatively sparse data. Further research should be done perhaps with more appropriate variables from 1950 until 2000 to better understand the trend. Additionally, more variables could be examined such as: location of industries, road networks, wage disparity, and other social and environmental indicators.

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