EXAMINING THE ROLE OF SPATIALLY DISTRIBUTED AMENITIES IN ECONOMIC DEVELOPMENT IN ALABAMA

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Abstract:

The paper extends the work of Deller et al (2001) by introducing a spatial component in a structural growth model to capture the role of spatially distributed variables using county-level data. The premise of the analysis is that what is true at a national level may provide a partial or misleading picture when we look at particular areas. Additionally, data available at the state level can often provide richer, more precise information than what is found at the national level, so we try to explore in more depth the role of spatially distributed amenities in economic development by examining, for instance the valuable Alabama countryside features such as natural habitats, scenic landscapes and warm weather amidst a poverty of infrastructure. The estimated results demonstrate a strong relationship between quality of life amenities and economic growth; with most conforming to theory and expectations while others exhibit unexpected relationship.

Keywords: Counties, economic growth, spatial, autocorrelation.

JEL: R220, R120, O210, O470, J210

Examining the role of spatially distributed amenities in economic development in Alabama

Introduction

Even though many rural areas in the US have registered growth, others are still experiencing declining population growth, poor income distribution, poor quality of life and lagging development. Rural Alabama (78 percent of Alabama counties are designated as rural by the U.S. Census 2000) has not been immune to this trend; with counties in the Black Belt region bearing persistent poverty, unemployment, low income, low literacy levels, poor health and declining population growth (Bukenya 2002). The infrastructure and public service facilities are also wanting, as they are very expensive to provide and maintain. These counties are generally dependant on primary industry and observe the lowest incomes both in the state and the nation. The state's high economic growth is apparent in its metropolitan regions than in its rural remote countryside. A trend fostered by many foreign investors (mainly automobile companies) who have set their national base within the state since 1990.

Remoteness must not be strictly interpreted as synonym of great distance to urban centers, however. Some counties close to urban centers are remote due to topographic, cultural or technical barriers while other counties, at great distance from large population settlements may be easily accessible if transportation infrastructures are good. Several of the remote counties—by no means all—contain valuable countryside features including natural habitats, scenic landscapes, traditional farming practices, historic sites, and cultural activities. This wide range of highly prized traits, generally referred to as "local amenities" are for some of these counties the most valuable asset, a factor of comparative advantage relative to other locations. While amenities have in most cases a public good

nature, they provide some private market opportunities that contribute to economic development. In particular, amenity-based niche marketing is increasing the demand for specialty products and services hence; widening the range of those local resources considered valuable. For most of rural Alabama, natural amenities and other non-market attributes that contribute to the overall quality of life may be the way out of misery.

Thus, the objective of this paper is to examine the extent to which spatially distributed quality of life amenities influence economic development in Alabama. While some insights have been gained from previous studies (Carlino and Mills 1987; Deller, Tsai and English 2001), most of this research has ignored the role of space in regional economic development. We extend the work of Deller et al (2001) by incorporating a spatial component to capture the role of space and spatially distributed quality of life amenities on economic growth. Furthermore, we posit that what is true at a national level may provide a partial or misleading picture when we look at particular areas. Thus, data available at the state level can often provide richer, more precise information than what is found at the national level, so we try to explore the issue in more depth by examining, for instance, the valuable Alabama countryside features such as natural habitats, scenic landscapes and recreation attraction sites.

Literature Review

Increasingly, the potential for amenity-based development has been held out as a key economic development strategy for rural communities, particularly those wishing to counter the erosion of traditional rural economies; however, the prospect of such development has been a source of controversy in the literature. A variety of studies have examined the effects of amenities on the local economy (Kusmin 1994; Duffy-Deno

1997; Deller and Tsai 1999; English, Marcouiller, and Cordell 2000); business location (Gottlieb 1994; Glasmeier and Howland 1994); and on the redistribution of population from urban to rural areas (Graves 1980, 1983, Nord and Cromartie 1997; McGranahan 1999). Many of these studies have focused on tourism and recreation. Tourism is a difficult industry to define, but definitions usually include service (hotels, amusement and recreation) and retail (restaurants, miscellaneous retail) categories (Johnson and Thomas 1990; Leatherman and Marcouiller 1996a). Broader definitions have included construction and real estate sectors, as well as transportation and public utilities.

English et al (2000) identified 338 tourism-dependent counties in the nonmetropolitan United States. They found that tourism-dependent counties had higher per capital income levels in 1990, and higher growth rates from 1980 to 1990, than did non-tourism dependent counties. They did not find any differences in the poverty rate or level of income inequality between tourism-dependent and other counties. Tourism-dependent counties had a higher population growth rate during the 1980s than did counties not dependent on tourism. Deller et al. (2001) found five different dimensions of amenity attributes to be related to economic growth. Although climate had a strong influence on population change, it had a relatively minor affect on employment and per capita income growth. Henry, Barkley, and Bao (1997) express similar views while analyzing spread and backwash effects of urban growth on surrounding areas. Their research found that rural areas with higher levels of certain amenity attributes were more likely to capture positive spread effects. Those with lower levels of amenities tend to lose economic activities to the nearby growing urban centers.

Several studies have considered the effects of amenities on both employment and population change. McGranahan (1999) found that a natural amenities index (comprised

of measures of climate, topography, and surface water) is strongly related to population change across the U.S., but less so for particular regions, such as the Midwest and North-east. Within these areas, however, lake areas are especially important for attracting migrants within the region for recreation and retirement.

There have been several recent studies that have demonstrated the economic contribution of recreation spending in rural areas (Bergstrom, Cordell, Ashley and Watson 1990a; 1990b). There is a growing demand for outdoor recreation and nature-based tourism in many rural areas today. Much of the demand for recreation is a result of infrastructure improvements, job creation potential and the relatively low capital requirements for many of the businesses in this industry. Recreation has the added advantage of being perceived as "environmentally-friendly" compared to most extractive industries and manufacturing.

In a review of factors associated with the growth of local and regional economies, Kusmin (1994) concludes that most studies have found that climate influences business activity. Warmer temperatures are generally more attractive to business. She warns, however, that some of the effects of climate may be better captured by regional control variables. Several recent empirical studies tend to support this general conclusion that amenities tend to be weakly related to business location or employment growth. Gottlieb (1994) reviews much of the literature on amenity-oriented firm location and employment growth. His conclusion is that amenity factors do not have a strong influence on firm location decisions. There is a general assumption that amenities should have a much stronger influence on the location decisions of high technology firms than employers in other industries, but Gottlieb suggests there is very little empirical evidence to support this argument. Gottlieb argues that an amenity strategy for economic development makes

the most sense at a regional scale, primarily because of the commuting behavior of workers.

Duffy-Deno (1997) found that expanding wilderness areas in the western United States has no effect on the county level resource-based employment. Roback (1982, 1988) and Blanchflower and Oswald (1996) also suggest that amenities and quality of life factors are capitalized into wages and rent in a manner that could hinder economic growth policies. They argued that given mobile homogenous workers who locate in the areas to maximize utility and equally mobile profit maximizing firms in spatial equilibrium regions will offer wage rates and land rental prices that will exactly offset benefits that accrue from their natural resource amenity differences. Workers residing in low amenity regions must be compensated via higher wages compared to those locating in high amenity areas. Blanchflower and Oswald (1996) extend this result and suggest that in a world of unemployment insurance and minimal public support programs, persons in high amenity areas would even be willing to accept periods of unemployment compared to those living in low amenity regions. There is increasing evidence that regions with high levels of amenities experience lower wages and higher unemployment (Deller and Tsai 1999).

Beale and Johnson (1998) note that local governments in recreation dependent counties face especially difficult challenges. Local governments in recreational counties tend to collect more revenue and spend more relative to their local income base than do other counties. Most of these local governments are faced with higher than normal costs for infrastructure (especially highways and sewage and water systems) and personnel (such as police and fire protection). Because they are so dependent on recreational spending, economic recessions may seriously affect the ability of local governments to

meet these demands. Keith, Fason and Chang (1996) also point out that the seasonal nature of these economies present some problems for local governments due to the fiscal stress that results from short-run employment variability.

Leatherman and Marcouiller (1996b), for example, found that in a rural region of southwestern Wisconsin, tourism was found to have a "hollowing out" effect on the income accruing to middle-class households. Part of the reason for this effect may be the fact that tourism businesses provide relatively low-paying jobs that are dominated by seasonal and part-time work. Other types of industries rely more on permanent, full-time jobs. Ohman (1999) focuses on the nonmetropolitan Pacific Northwest and also considers the affects of amenities on income inequality. She found that in the 1970s, non-amenity counties tended to grow faster than other counties and had lower levels of income inequality. But in the 1980s, amenity counties had higher levels of population and income growth, but there were few differences in income inequality.

Methodology

Models of regional economic growth often focus on the interdependencies of household residential and firm location choices, which address the notion of whether "people follow jobs" or "jobs follow people" (Steinnes and Fisher 1974; Carlino and Mills 1987; Deller, Tsai, Tsahung-Hsiu, Marcouiller, and English 2001). Carlino and Mills (1987) address this causation and interdependency in their classic two-dimensional equation system; noting that households and firms are geographically mobile.[1] They emphasize that households aim to maximize utility of goods and services, location of

[1] This view is also emphasized in traditional migration literature; people migrate to capture higher wages or income while firms seek to either maximize profits or minimize costs.

residence relative to workplace and spatially distributed amenities. To capture the role of income, Deller et al (2001) extended Carlino and Mills' (1987) two-dimensional model, "people versus jobs" to a three-dimensional, "people versus jobs versus income" to explicitly trace the role of income in regional growth; however, they ignore the role of space. Our analysis extends the work of Deller et al (2001) by introducing a spatial component to capture the role of space and spatially distributed amenities using Alabama county-level data.

In essence, Deller et al (2001) assumed that utility maximizing households migrate in search of utility derived from the consumption of market and non-market goods and profit-maximizing firms on the other hand become mobile when looking for regions that have lower production costs and higher market demand. They expressed a three dimensional approach to quality of life and economic growth in a simultaneous equation system as,

$$P^* = f\left(E^*, I^* \middle| \Omega^P\right) \tag{1}$$

$$E^* = f\left(P^*, I^* \middle| \Omega^E\right) \tag{2}$$

$$I^* = f\left(P^*, E^* \middle| \Omega^I\right) \tag{3}$$

where P^*, E^*, and I^* are equilibrium levels of population, employment, and per capita income; Ω^P, Ω^E and Ω^I are vectors of variables describing measures of quality of life and amenity attributes. Following several steps of operation involving slight rearrangement of terms (see Carlino and Mills 1987; Deller et al 2001 for the full model) and replacing the unobservable equilibrium P*, E* and I*, their model takes the general form,

$$\Delta P = \alpha_{0P} + \beta_{1P} P_{t-1} + \beta_{2P} E_{t-1} + \beta_{3P} I_{t-1} + \beta_{4P} \Delta E + \beta_{5P} \Delta I + \Sigma \delta_{IP} \Omega^P \tag{4}$$

$$\Delta E = \alpha_{0E} + \beta_{1E} P_{t-1} + \beta_{2E} E_{t-1} + \beta_{3E} I_{t-1} + \beta_{4E} \Delta P + \beta_{5E} \Delta I + \Sigma \delta_{IE} \Omega^{E} \quad (5)$$

$$\Delta I = \alpha_{0I} + \beta_{1I} P_{t-1} + \beta_{2I} E_{t-1} + \beta_{3I} I_{t-1} + \beta_{4I} \Delta E + \beta_{5I} \Delta P + \Sigma \delta_{II} \Omega^{I} \quad (6)$$

where ΔP, ΔE and ΔI are regional changes in population, employment and per capita income, respectively; and P_{t-1}, E_{t-1} and I_{t-1} are initial conditions of population, employment and per capita income. Our analysis extended this model (Deller et al 2001) by incorporating a spatial component to capture the role of spatially distributed amenities on economic growth. In addition to the hypotheses tested by Carlino et al (1987) and Deller et al (2001), we test the hypothesis that growth is conditional upon geographical location, i.e., space plays an increasingly important role in regional economic growth. After introducing spatial lags into the linear form of equations 4 through 6, our estimated growth model is,

$$\Delta P = \alpha_{0P} + \rho_{1P}(W * \Delta P) + \beta_{1P} P_{t-1} + \beta_{2P} E_{t-1} + \beta_{3P} I_{t-1} + \beta_{4P} \Delta E + \beta_{5P} \Delta I + \Sigma \delta_{IP} \Omega^{P} \quad (7)$$

$$\Delta E = \alpha_{0E} + \rho_{1E}(W * \Delta E) + \beta_{1E} E_{t-1} + \beta_{2E} P_{t-1} + \beta_{3E} I_{t-1} + \beta_{4E} \Delta P + \beta_{5E} \Delta I + \Sigma \delta_{IE} \Omega^{E} \quad (8)$$

$$\Delta I = \alpha_{0I} + \rho_{1I}(W * \Delta I) + \beta_{1I} I_{t-1} + \beta_{2I} P_{t-1} + \beta_{3I} E_{t-1} + \beta_{4I} \Delta E + \beta_{5I} \Delta P + \Sigma \delta_{II} \Omega^{I} \quad (9)$$

where $\rho_{1P,}$ ρ_{1E} and ρ_{1I} are spatial autoregressive parameters; W is a spatial weight matrix and the rest of the variables are as defined before. We estimate the model by applying the maximum likelihood method for spatial lag model in S-PLUS 2000. Like Deller et al (2001) we estimate short-term adjustments (i.e., ΔP, ΔE, and ΔI) to long-term equilibrium (i.e., P^*, E^*, and I^*).

Data Sources and Description

Data are drawn from several sources including the U.S. Census Bureau, the Alabama Center for Economic and Business Research, the U.S. Department of Labor, the U.S. Department of Justice, Bureau of Justice Statistics and the Alabama Bureau of Tourism and Travel. We construct and use county growth rates in population, employment and per capita income from 1990 to 1999 as our endogenous variables. The design of the independent variables is based on previous studies (English, Marcouiller and Cordell 2000; Duffy 1997; Deller and Tsai 2001), which hypothesized four broad classifications of factors that are believed to influence regional economic growth: markets, labor, government, and amenity attributes. The list of variables in each classification is presented in Table 1 and discussed below starting with market characteristic variables.

--------- Table 1 about here ----------

Specifically, market characteristics comprise of factors that describe the region's market size and consumption ability. They include: percent of population aged 65 years and above, percent of population aged 18 years and below, population density and percent of nonwhite population. It is presumed that a high percent of nonwhite population will exert downward pressure on economic growth levels due to a contingent of social, cultural, political and economic factors. The variables in the labor category measure human capital stocks and flows, and how these variables influence market and regional economic growth. These variables include, rate of unemployment and education.

Education is measured by the percent of population aged 19 years and above with high school diploma.

Government characteristics capture government spending, which is crucial for regional growth as expenditure on infrastructure development stimulates economic activity and attracts households and investments. To capture the role of local government, we use county and city government spending data for 1986-87—the 1990 data was not available for this variable. The second government characteristic variable, road expenditure, captures infrastructure development. The variable represents the proportion of road construction and maintenance cost in 1990. Infrastructure development is necessary for access to amenities, employment, health facilities and hence, the overall development process.

Amenity characteristics include crime index, number of non-federal physicians, natural amenities, recreational amenities and access to hospital. Crime rates are defined as reported offenses per 100,000 people. Offenses are reported for the individual violent crimes of murder, rape, robbery, aggravated assault; and for the individual property crimes of burglary, larceny, and auto theft. The violent crime index aggregates the individual violent crimes mentioned above while the property crime index aggregates the individual property crimes. The overall crime index is the aggregation of the seven individual crime classifications. The number of non-federal physicians is used to measure the adequate availability of medical practitioners.

Attributes such as vegetation, open space, and built extensions to natural amenities are also key components of quality of life that play a central role in economic growth and development. Apart from the influence of quality of life on entrepreneurial location decisions, high levels of natural amenities may boost economic development in

another, less direct way. In particular, labor market theory suggests that, at the margin, employees may be willing to trade-off higher wage levels for a more amenity-rich environment. Econometric studies have shown that differences in the wage level for workers of comparable skill and experience may be significant enough to encourage some firms to locate in amenity rich areas so as to lower their labor costs (Blair and Premus 1987). To capture the role of natural amenities, we employ a natural amenity index drawn from the USDA's Economic Research Service (ERS, 1999). The index combines the attractiveness of mild climate, varied topography, and proximity to surface water into one measure—counties are scored on a scale ranging from 1 to 7 based on these attributes, with higher score representing richness in natural amenities[2].

In addition, we construct a recreational amenity scale, based on county recreational and leisure sites. The scale is constructed using the Alabama Bureau of Tourism and Travel data set. The Bureau maintains an extensive county-level data set documenting facilities and resources that support outdoor recreation activities. Many of these resources are precisely the amenities that contribute to the overall quality of life of an area and are presumed to influence economic growth—counties rich in these sites benefit from tourism and its associated economic activities. The scale is developed by generating a physical count of these sites and ranking counties based on the number of sites in each category on a scale of 1 through 5—the higher the score the richer the area

[2]David McGranahan developed the ERS natural amenities index, which he used to analyze national population trends. His analysis found that high-scoring counties tended to double their population, while the average gain for the low-scoring counties was only 1 percent, and over half lost population" in the last 25 years (McGranahan, 1999).

in terms of recreational and leisure attractions. The recreational and leisure attraction sites utilized include, boating, camping, fishing, hiking, golfing, wildlife and wilderness, botanical sites, birding, hunting, beach, horse backing, biking, and skiing.

Lastly, access to hospital is captured using the average distance from the centroid of each county to the nearest hospital (miles). The distances were calculated by the authors using ArcView GIS software and Census TIGER files. More remote places, relative to hospital location, are expected to be less attractive to residents and firms. Similarly, to identify the potential spatial autoregressive structure in the ordinary least squares residuals, we construct spatial weights matrix (W) using ArcView GIS software and Census TIGER files. The weight matrix is defined by topological information on county boundaries: $W_{ij} = 1$ if county j is contiguous to county i; 0 otherwise.

Empirical Results

The estimated results are reported in Table 2. The first column presents results for the population growth equation, the second column represents the employment growth and the third column presents per capita income growth equation. The table also reports the spatial lag terms for the economic growth equations. Overall, the spatial lag terms are not significant and suggest negative spatial association of population, employment and per capita income growth across counties in Alabama. According to Land and Deane (1992), the spatial lag coefficient is the association between the values of the dependent variable at a given location to values of the dependent variable at other locations. The spatial weights matrix is a contiguous linkage matrix; the negative coefficients suggest that counties with low economic growth are near other counties with low economic growth.

---------- Table 2 about here ----------

The initial conditions are statistically significant in population and employment equations. Notably, each initial condition has a negative relationship with its respective growth equation and statistically significant in all except in per capita income equation. The results portray rural renaissance or revitalization in the nature of growth in some Alabama counties. Counties with high growth levels at the beginning of the period tend to record a slower growth rate towards the end of the decade. Similarly, counties with low growth levels in the beginning tend to experience a much higher growth rate in the later years.

Historical growth patterns can be associated with economic growth in the state as anticipated in the central hypotheses. The 1990 per capita income variable though not statistically significant, has a positive coefficient in the population and employment equation. Similarly, initial population positively impacts on employment and per capita income growth. The initial employment level also has a positive coefficient in the population and per capita income equations. Both the initial employment and population are significant in the population and employment equations. It can be concluded that space has a role in the manner in which these conditions affect regional growth. Surprisingly, all initial conditions are insignificant in the per capita income equation, implying that their influence is minimal.

The results of quality of life variables that describe the market and consumer ability namely, the percent of young and aging population, minority population and population density are also presented in Table 2. High percent of young population

(population aged 18 years or below), has a positive sign with all economic growth variables. This is in contradiction with the study expectation, in which we hypothesized that a young population adds burden to society and should have a negative relationship with the growth variables.

An aging population is detrimental to economic growth and this explains why the population aged 65 years old and above has a negative coefficient in both population and employment growth equations. The effect of retirees in the state is manifested in the positive and significant influence in the per capita income equation. The result observed in the income equation concur with Lee and Lassey's (1980) study on what they refer to as "young-olds" recently retired elderly people, migrating into the rural areas with sufficient health and financial resources enabling them to live wherever they choose.

The percent of non-white population has a negative effect in all the growth variables and is statistically significant in both employment and per capita income equations. This supports previous studies, which have shown that non-whites are associated with low levels of employment, per capita income (Jaret, Reid and Adelman, 2003) and low populations. Similarly, the estimated coefficients for population density are negative in all equations and significant in both employment and per capita income equations. An increase in population density leads to increased unemployment and low per capita income growth. Increasing population density may also lead to congestion and poor standards of living, and the subsequent relocation of the affluent section of the population in search of quiet and open space.

Labor characterized attributes are also shown to influence economic growth. As expected unemployment has a negative influence on per capita income and employment growth, but is conspicuously insignificant in all growth equations. Unemployment leads

to low per capita income and an anticipated population exodus as people move to other regions with better employment opportunities. But this seems to be the opposite in our results, particularly the positive relationship observed in the population equation. The percentage of population aged over nineteen years old with high school diploma or above, has a positive and significant impact in all the growth equations. This echoes a general consensus that education and training are vital in economic development.

In addition, state expenditure though not significant, is positive in all the three growth equations. The positive sign confirms a fundamental policy argument that government expenditure is a key factor in economic growth. Also road expenditure is positive and insignificant. The insignificance of the two government variables implies that policy makers need to rethink the need to put more emphasis on government funding in their effort to stimulate growth in the state.

Lastly, amenity attributes appear to influence growth variables in a unique way. We anticipated that amenities attract population and firms and hence stimulate higher employment and per capita income, but the results show the contrary. First, the number of non-federal physicians in a county is expected to promote growth in population, employment and per capita income. This is true given the fact that people prefer to live and work in areas with better medical care. The presence of hospitals/clinics as measured by the number of non-federal physicians provides good health and social environment for workers and their families, and employers. This promotes job creation, productivity and improves personal income. However, the variable is not statistically significant. In addition, the coefficient for the variable measuring access to medical care (distance to hospital) is statistically not significant and negative in the population growth equation,

but positive in per capita income and employment growth equations. Thus, the results down play the significance of both health-related amenities in economic development.

Security is an important determinant of satisfaction with life. For this reason, escalating crime is expected to cause out migration as people move out of high crime areas. This is evident in the negative and significant coefficient for the crime variable in the population growth equation. Generally crime is low in Alabama, particularly in the rural counties, which might explain the positive signs observed in employment and per capita income growth equations. This finding however, is contrary to the general consensus that population and firms tend to relocate from insecure areas.

Looking at the natural amenity variable, the coefficient is positive and insignificant in the population and employment growth model; suggesting a weak positive influence. Comparable results were documented by Rosenberger et al (2002) in predicting employment in West Virginia. However, the variable is negative and significant in the per capita income. On the other hand, the recreation variable is positive in the population equation, and negative in the other growth equations; and also significant in the employment and per capita income growth.

The results of the amenity attributes in general, suggest that people are leaving areas of low amenities to live in areas that are rich in amenities even when this results in lower income. Alabamians seem to value amenities and are willing to forego high income for amenity enjoyment and benefits. These results are in contrast with most literature which suggests that high natural amenity attributes are associated with positive regional growth as in the case of Deller et al (2001) and Bergstrom et al (1990). However, the findings support Roback's (1982; 1988) work in which he found that people are much willing to move to places with lower wages and less jobs but rich in amenities of life.

Conclusion

Using a structural growth model, the paper examined the role of quality of life attributes and space on economic growth between the period 1990 and 2000 in Alabama. Economic growth is measured using change in population, employment and per capita income rates. The estimated results demonstrate a strong relationship between quality of life variables and economic growth; with most conforming to theory and expectations while others exhibit unexpected relationship. Perhaps most important is the role played by space in economic growth and development. The observed negative and insignificant coefficients for the spatial lag variables suggest low spatial association of population, per capita income and employment across counties.

Looking at the initial conditions, the results concur with our expectations that initial conditions do influence economic growth. Counties with high growth levels at the beginning of the period tend to have lower growth rates and vice versa. Such observation is strongly visible in all growth variables. Specifically, market size related quality of life attributes show strong influence on economic growth. Population density also shows an upward influence on population growth rate, but is unfavorable to employment and per capita income growth. The race factor holds true to long standing establishment that a large proportion of non-white population inhibits regional growth through low employment and per capita income. Labor characterized quality of life variables portray weak relationships with rural growth; with the exception of unemployment which demonstrates a strong relationship. Crime, the percent of population with high school diploma and the number of physicians shows a weak and insignificant influence.

Apparently, people are willing and accept lower wages in places with high natural amenities as compared to low natural amenity areas. But even though people appear to be migrating to amenity-rich areas, most jobs in these areas are low paying service delivery jobs. Because each individual attribute affect development in a unique manner, there is need for development action to be broad-based. Boosting labor characterized quality of life attributes such as education levels, roads and or health alone is not enough. The low spatial autocorrelation in the spatial model suggests low county dependency and requires that counties be treated with caution. Such policies will require treating each region as if they are different and not apply some wholesome approach.

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Table 1. List of Explanatory Variables

Category	Variable[a]	Expected Sign
Market Characteristics	% of the population aged 65 years and over	-
	% of the population aged 18 years and below	-
	% of nonwhite population	-
	Population density	+/-
Labor Characteristics	% of persons aged 19^{+} with high school diploma	+
	Unemployment rate	-
Government Characteristics	County and city government spending	+
	Road construction and repair expenditures	+
Amenity Characteristics	Number of non-federal physicians	+
	Access to hospital (distance)	+
	Crime	-
	Natural amenities	+
	Recreational amenities	+

[a] Data are based on 1990 information except government expenditure, which is based on 1986-87 period.

Table 2. Spatial Regression for State Growth Variables

Variable	Δ Population	Δ Employment	Δ Per Capita Income
Intercept	-183.1128	-256.1358	43.5880
	(390.0275)	(359.5195)	(139.3428)
Initial Conditions			
Per Capita Income 1990	81.1313	35.8826	-35.8829
	(95.2586)	(87.1436)	(34.1020)
Employment 1990	114.6235**	-83.2285**	5.3880
	(29.7182)	(26.5797)	(10.6926)
Population 1990	-153.0724**	89.7525**	10.2972
	(29.6288)	(25.9922)	(10.7158)
Market Characteristics			
% Population 18 years and below	0.8542	1.6062	2.4137**
	(1.6047)	(1.4597)	(0.5748)
% Population 65 years and over	-2.0527	-0.8100	1.2696**
	(1.6367)	(1.4464)	(0.5917)
% Non-white population	-0.2980	-0.5620**	-0.1259*
	(0.2354)	(0.2096)	(0.0850)
Population Density	-0.0410	-0.1475*	-.0943**
	(0.1129)	(0.1014)	(0.0406)
Labor Characteristics			
Unemployment rate	0.8289	-0.6793	-0.3200
	(1.2761)	(1.1958)	(0.4531)
% Pop. 19 years with High Sch. Dip.	134.3697*	102.5734*	23.4923
	(76.3342)	(67.0436)	(27.6211)
Government Characteristics			
Local expenditure	48.5553	187.4005	181.5738
	(360.0147)	(329.1302)	(128.8194)
Road expenditure	2.3778	1.9796	0.0335
	(2.4067)	(2.3145)	(0.8514)
Amenity Characteristics			
Number of non-federal physicians	0.1764	0.0611	0.4740
	(1.2235)	(1.1159)	(0.4389)
Access to hospital	-0.2275	0.4323	0.4696
	(1.2320)	(1.1729)	(0.4394)
Crime	-63.3226*	47.3797*	19.1591*
	(33.0188)	(24.9445)	(12.0478)
Natural amenity	3.7809	0.7968	-1.0746*
	(2.7006)	(2.4541)	(0.9665)
Recreation scale	0.0454	-1.3423*	-2.6446*
	(3.7100)	(3.2948)	(1.3375)
Spatial lags (ρ_i)	-0.0365	-0.1203	-0.0139
Log-Likelihood	-326	-321.1	-257.1

*, ** Represents 5 and 1 percent significance levels, respectively and standard errors are reported in parenthesis.