THE INTERMEDIATE SOCIO-ECONOMIC DEVELOPMENT REGION:

A CASE STUDY OF NORTH CAROLINA

A Thesis

by

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August 1990

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ABSTRACT

THE INTERMEDIATE SOCIOECONOMIC DEVELOPMENT REGION:

A CASE STUDY OF NORTH CAROLINA

(August 1990)

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Regional development theory has evolved essentially from traditional considerations of the bipolar model. This is a model that focuses on center-periphery relationships. The development continuum idea, on the other hand, suggests a gradation of development from the most positive in the growth core regions to the least positive in the peripheral regions. This thesis uses county data, through variable selection, integration and grouping, to verify socioeconomic development conditions which are best described as a gradation along the continuum.

The study hypothesizes that within the system of regions, there exists a spatially definable intermediate region which links growth center and periphery along a socioeconomic development continuum.

Methodologically the study consists of four parts. First, a literature search yields a pool of relevant study variables. Secondly, multiple regression analysis is used to narrow the variable pool to those key variables found

most relevant in the State of North Carolina. Then, underlying common factors existing within the key variables are extracted by using factor analysis. This helps explain socioeconomic differences in a comprehensive way and allows the derivation of factor scores with which to locate each county on the development continuum. Finally, a cluster analysis is applied to regionalize the counties into three development regions, Growth Core/Urban, ISER, and Periphery. The resulted spatial pattern is further generalized into the ISER Model which integrates the Socioeconomic Development Index derived from the factor scores.

The ISER Model shows the degree of gradation, in terms of development rankings from the most positive growth core/urban center to the ISER, and then to the least positive peripheral regions. It also shows a developmental distance decay function, illustrating interregional connections and the generation of spread effects from the core to the nearby ISER, and then to the distant periphery.

The ISER Model provides a way of perceiving the reality of socioeconomic development, as conditions evolve along a continuum and through space. The model and the findings also call for further detailed study to facilitate regional planning applications.

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CHAPTER I

GEOGRAPHY AND SOCIOECONOMIC DEVELOPMENT

Introduction

The world in general is confronted with many serious problems. One problem is social and economic inequality in its various forms.[1] As one travels through different neighborhoods, buys things that others cannot afford, or simply lies on the beach while others are working, it is clear that we live in an unequal world. While one portion of the greater social order talks about enjoying the good life, another portion struggles for survival. The understanding of inequality is increased by expanding one's view outside of local environs, sometimes across state and even country boundaries. The awareness of the existence of inequality makes us question the fairness and justness of the world political and economic order. This leads to the recognition that understanding inequality, especially in its geographic dimension, is a necessary departure for government planning action which aims to promote development of disadvantaged areas.

Most people are sensitive to the extremes of inequality because they are easier to see and describe, as, for example, extraordinary contrasts in living conditions, whether within or between countries. Describing the world

in extremes is reflected in economic development theory which places traditional emphasis on the discrete region, (i.e., metropolitan center versus rural periphery).[2] In reality, the world is not organized so simplistically. Although development proceeds at a dynamic pace, individual countries develop at different rates. Everything has its degree of intensity. In addition to hot and cold, there is also the lukewarm range. Likewise, in terms of economic development as a process which identifies changing conditions, it is not appropriate to divide the world merely into center or periphery.

Geographers are interested in spatial relationships. Therefore, it is relevant to ask what, beyond centers and peripheries, is left in the landscape. In most cases there is intervening space. But what is this area to be called? Where is it? What is this region's specific characteristics and identities? How is it different from either center or periphery? Does it have a role in regional development as a part of an integrated system of regions, and thus contribute to improved regional policy and planning? This thesis will address each of these questions. It is my contention that the intervening region between center and periphery is of considerable importance in economic and applied geography, especially where it may be shown to be functioning as a region intermediate in development. This

will further the understanding of the spatial pattern of development, as well as the implications of this pattern for development problems and regional policy. A resulting contribution will be the perspective of regional development as a geographic gradation or continuum, as opposed to the traditional bipolar condition.

The State of North Carolina provides an illustration of the research context. In the later 1970s, a Balanced Growth Policy was adopted by Governor Jim Hunt's administration. This decision was accompanied by a state-directed effort to shifting growth away from the larger cities and towards rural regions badly in need of economic development. Subsequently, a report by the North Carolina Center for Public Policy Research saw the effort as "... an inadequate statewide development policy that offers little guidance for the management of urban growth while encouraging unrealistic expectations about industrial development in rural areas".[3] The issue is whether emphasizing only the two extremes, the center and the periphery, is an appropriate view of regional policy and planning.

Economic development is a dynamic process that impacts the character and quality of both local and regional conditions of life. Because different regions are impacted in different ways and at different intensities, various

regions and localities are apt to be found at different stages of development. The idea of development in terms of gradations is initial to the concept of an intermediate developed region which in spatial relationships may lie between center and periphery. Identifying the existence of this region, exploring its dimensions, and assessing it in terms of planning policy is the major purpose of this study. It is believed that promoting development in the intermediate region will relieve the problems of government coordinated development in a disadvantaged peripheral area where the base for economic development is not adequate. Additionally, promoting development in the intermediate region will strengthen ties to the periphery to which, by proximity, it has stronger linkages and thus greater influence than would a more distant center. Thus, the balanced growth objective can be attained, but from a different perspective.

Literature Review

A careful review of the relevant literature also shows the necessity and importance of researching the intervening region, henceforth discussed as the intermediate socioeconomic development region (ISER).

Two classical spatial models demonstrate the idea of distance decay as well as the urban hierarchy in its

geographic setting. Both models are essential concepts in spatial relationship theory. Von Thunen's Isolated State Theory established an early ideal of economic activities and their spatial relationships. His thesis is that the intensity and importance of economic activities decline with distance from the central city.[4] Von Thunen's classical model evolved during the Industrial Revolution.

Urbanization and the functional specialization that accompanied industrialization intrigued the German geographer, Walter Christaller, who developed Central Place Theory. In his model, towns and cities are centrally located in their hinterland, and their serving distance and size of their areas of influence depend on the functional scale of the town and the city. For example, a low order-functioning small town usually contains fewer activities than the high-order large city which serves a larger area.[5]

Regional development theory has traditionally emphasized the bipolar model, a center versus periphery relationship.[6] In this model, the distance function and development hierarchy have been of lesser concern. There are several possible reasons. First, development levels are difficult to measure, especially when different scales are considered. Second, variables seem to work for one region, but not for another.[7] Third, complete and compatible

data are hard, sometimes impossible, to obtain, thereby making the delineation of regional development by hierarchy or gradation difficult, and attempts at comparative analysis futile.

The heartland and hinterland concept best pictures center and periphery relationship during the colonial period. A heartland evolved as a great "... nucleation of industry and national market, the focus of large-scale national-serving industry, the seedbed of new industry responding to the dynamic structure of national final demand, and the center of high levels of per capita income ...."[8] Simultaneously a hinterland's comparative advantage was based on an extractive resource-dominant economy to which the heartland reached out to satisfy its own input requirement. It is this basic dominance and dependence relationship that divides the world, nationally and internationally, politically and economically, into two parts, according to early regional development theorists.[9]

Over the years, the view of a dominant bipolar relationship has changed gradually to reflect the level of development of the world, nation, or region. Regional convergence is thought more likely to happen in wealthier nations. Myrdal hypothesizes, for example, that backwash and spread effects are stronger in more developed

countries.[10] This is attributed to the fact that higher levels of education, improved transport and communications, and "... a more dynamic communion of ideas and values ..." facilitates development and reduces obstacles to the operation of spread effects.[11] This argument was also stated by John Friedmann, who in 1966 made a case study of Venezuela. He theorized that when the nation passes the take-off phase, matures industrially, and enters an era of high mass consumption, interregional inequalities will diminish as the primacy of the single core region is reduced, and an interdependent system of cities is established.[12] This implies that development patterns can be differentiated regionally based on national stage of development.

Interestingly, Friedmann's argument did not shift the focus away from the bipolar view of development in the more advanced countries. This is evidenced by the worldwide regional planning application of Growth Pole Theory in the late 1960s and 1970s.

Perroux described the growth pole as a set of economic forces that has capacity "... to induce the growth of another set."[13] Berry adds that this involves the simultaneous filtering of innovations that bring growth down the urban hierarchy and the spreading of the benefits occurring from the resulting growth, both nationally from

core to hinterland regions and within these regions from their metropolitan centers outwards to the inter-metropolitan periphery.[14] The concept of the growth pole implies an operating distance decay function through a filtering and spreading process. A "center" which is able to be a development pole, is presumably economically mature, and thus self-generating. Although Growth Pole Theory incorporates the notion of a continuum through the initiation of spatial diffusion processes, a lack of a clear understanding and statement of development as a geographic gradation and of its spatial relationships can be the reasons that application of the Growth Pole Theory did not meet the expectation.

Applying the growth pole idea to regional planning, the politician and the planner attempted to achieve more balanced growth by locating resources in peripheral areas in order to create a new "center." Emphasis was on disadvantaged regions in the expectation that public support and government intervention to subsidize and promote growth centers in these lagging regions would impact the geographic surroundings.[15]

Unhappily, it is difficult to find any "case" where the promoting of peripheral development has met with success.[16] Rather, there is a common feeling of disappointment, when one compares expectations of short

term success with longterm efficiencies of such planning efforts. Several scholars argue that the policy strategy pursued in many countries during the 1960s and 1970s is "... pushing and pulling enterprises at random into retarded and disadvantaged regions when the conditions for generation of spread effects are not present."[17]

None of the above theories attempt to explain or understand the relative level of development for a particular region to which a development policy is applied. Center and periphery theories tend to omit and/or undervalue the character and regional development role of the intermediate area.

Hansen dealt with several problems in peripheral areas. He also introduced the idea of using "intermediate areas" to induce peripheral development. He said "it should be emphasized that to argue against the growth of large metropolitan agglomerations is not to argue for a policy of rural industrialization, because there are generally more efficient alternatives in intermediate areas."[18]

Recently, as a result of American-Swedish joint research, Persson presented a paper where an "urbanized rural area" is defined as "... a type of region where there is an acceptable population base for most types of daily basic services and an ordered - even if limited - wage labor market, although at the same time conditions are poor

for advanced services for both households and businesses."[19] He also provided a map of the urbanized rural areas in Sweden, where these areas clearly appear as intermediate between urban growth cores and peripheral regions.

The idea of a spatial development continuum provided by Gade views the landscape of social economic development as a continuous gradation from the "... most positive in the metropolitan regions to their least positive in the peripheral regions ...," as opposed to seeing economic development as just two opposite poles.[20] The ideal continuum, in a spatial context, would be a smooth transition from the centers to the periphery. In the reality, "peaks" and "valleys" exist (Figure 1.1). These represent cities at different levels of the urban hierarchy dispersed through the landscape, as well as areas experiencing socioeconomic depression.

No region exists in a vacuum, all are somehow interconnected. If one views regional planning problems from the continuum perspective, the region in the center of the continuum would be a critical section to explore. Elevating quality of life and economic opportunities in the middle part helps reduce regional disparity.[21] It is this socioeconomic development region whose growth is affected by metropolitan urban diffusion and through which

the periphery is tied to urban centers and economic opportunities.

The above literature survey identifies several points relevant to this study: 1. a bipolar view of development may not be a suitable departure for analyzing spatial patterns, especially in developed countries; 2. an understanding of development levels as well as spatial relationships, may influence regional policy and planning; 3. gradation of development may reflect spatial patterns generally representing the distance-decay function from center to periphery; and 4. the concept of the intermediate development region needs further study, especially within the theoretical notion of a development continuum.

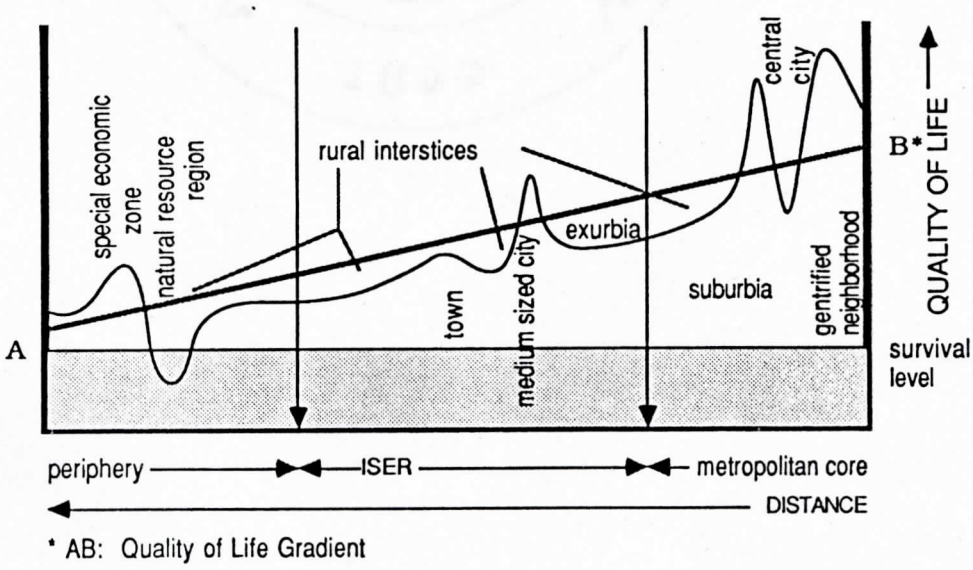


Figure 1.1 The Spatial Defined Socioeconomic Continuum (Gade, 1990)

Study Objectives

The previous discussion suggests the need for further research of the intermediate development region. Objectives of further study should include:

1. socioeconomic development characteristics as they vary over the landscape;
2. delineation of the geographic space located between large metropolitan urban centers and the more marginally developed peripheral regions;
3. defining and mapping the Intermediate Socioeconomic Development Region (ISER);
4. providing understanding of the role of the ISER in the process of regional development within the system of regions, and developing a model of these relationships; and
5. identifying the possible policy and planning applications of the ISER model.

Research Hypothesis and Methodology

It is hypothesized that within the system of regions, there is an ISER which is spatially definable. Further the ISER can be demonstrated to link growth center and periphery along a socioeconomic development continuum.

The methodology applied to develop this hypothesis consists of three parts. First, a pool of relevant

variables are selected through the appropriate literature search. Secondly, multiple regression analysis is used to narrow the variable pool to those found most relevant in the State of North Carolina. This dual stage variable selection procedure is covered in Chapter II. The third step is to extract the underlying common factors existing within the key variables by using factor analysis. This statistical process helps to exclude miscellanous factors irrelevant in explaining socioeconomic differences on the county level. It also allows the use of factor scores to locate each county on the development continuum. The process and analysis of results are included in Chapter III.

To further group counties with similar socioeconomic development, a cluster analysis is applied. This step helps identify the ISER from the growth center and periphery, and separate subregions within a region, based on the essential notion of the relative internal homogeneity of a region or a subregion. This is discussed in Chapter IV. Further refining and application of the ISER model to regional geography research and to regional development policy and planning is included in the final chapter.

The Data and Its Sources

The timing of this study, prior to the release of new decennial census data in mid 1990, makes it difficult for the collection of current statistics. Therefore, analysis is restricted to use of data from the 1980 U. S. Census and from the 80s decade (Appendix 1).

The study unit is at the county level. This may not be the best scale for showing gradual changes across the landscape. County data may show a discrete spatial pattern between adjacent counties; for instance, jumping from a growth center to a closely positioned disadvantaged periphery. In fact, the condition of change is spatially more gradual. However, it is important that various socioeconomic data available only for the county unit be used in analysis. It is statistically convenient that the state includes exactly 100 counties.

The Study Region

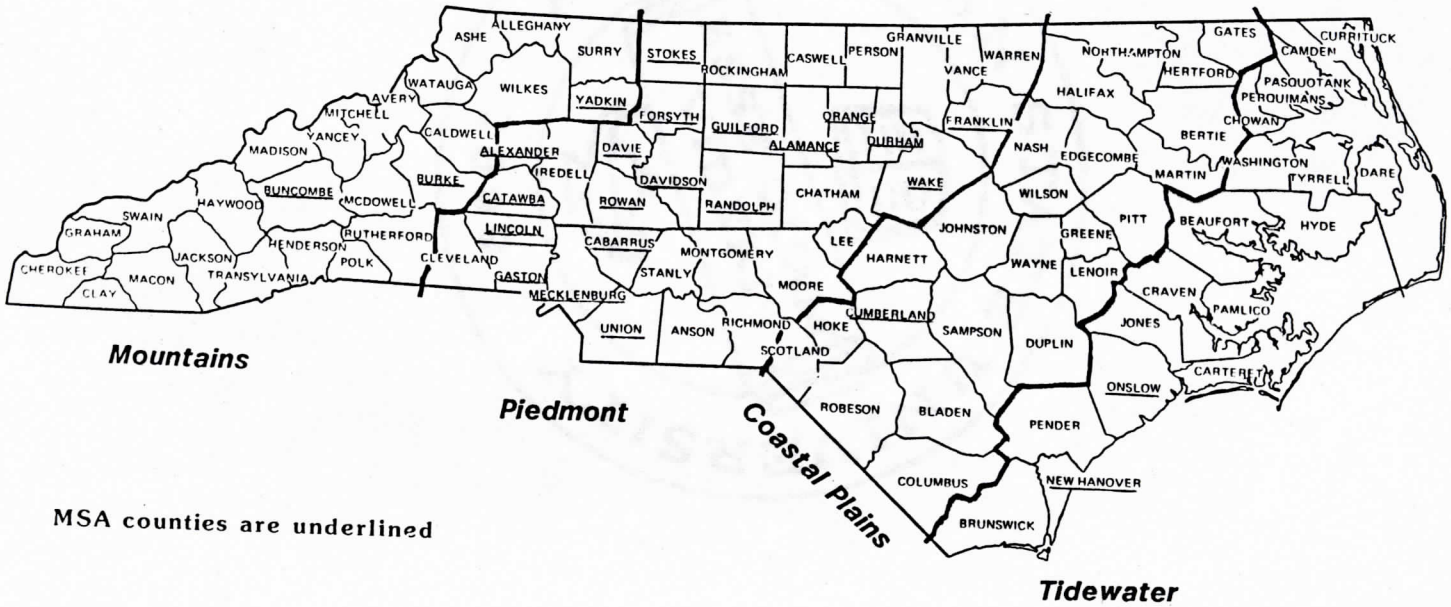
To achieve stated objectives, an empirical study area is desired. North Carolina was chosen for this research due to the author's relative familiarity with the state. Also the state offers a variety of physical and socioeconomic conditions and development differences.

North Carolina lies between 34 and 26.5 degree north latitude. It fronts the Atlantic Ocean to the east and

includes the highest mountain peak in Eastern United States to the west. The state physically consists of four parts, from east to west: Tidewater, Coastal Plain, Piedmont, and Mountain regions (Figure 1.2). North Carolina has more variation in its 500 mile east-west direction than in its 100-150 mile north-south direction. For example, barrier islands and sounds are along the entire coast. Moving westward, the flat swampy tidewater region gives way to the slightly raised coastal plain region, then into the irregular rolling hills and valleys in the piedmont region. The western part of the state is dominated by the southern Appalachian Mountains which rise abruptly from the Piedmont along an escarpment known as the Blue Ridge Front.[22] The elevational changes provide a wide range of variation in climate, from the subtropical coast beaches to the winter ski resorts in the mountains. The physical condition of the state provides easy transportation access through the Piedmont. The Piedmont is also a major transport corridor connecting the northeastern and southeastern United States. This accessibility influenced the early emergence of the industrial and urban Piedmont.[23]

Concerning settlement patterns, North Carolina has no nationally dominant primate cities; instead it has a multinucleated Urban Crescent located in the Piedmont. This is comprised of a spectrum of more or less distinctive

NORTH CAROLINA COUNTIES AND PHYSICAL REGIONS



MSA counties are underlined

Figure 1.2

small-to-medium sized urban clusters. Along the Urban Crescent, there are five central cities with populations over 100,000 in 1980: Charlotte, Winston-Salem, Greensboro, Durham, and Raleigh. In addition to the major Metropolitan Statistical Areas (MSAs) in the Piedmont, there are five much smaller MSAs -- Buncombe and Burke counties in the Mountains, Onslow, New Hanover and Cumberland counties in the Coastal Plain and Tidewater regions (Figure 1.2). Thus, the state offers a centralized, developed arc of growth nodes in the heart of the state as well as outlying urban centers in the less economically developed western and eastern parts of the state.

The central cities function traditionally as the centers of economic development, and they comprise the most complex manufacturing and service activities in the state. On the other hand, the trends of development toward the periphery of central cities is evidenced by the relocation of many manufacturing industries. The exurban location trend is further aided by the decentralization of offices and retail businesses.[24] Suburbanization has occurred throughout MSAs. By the mid 1970s, the growth rate of the nonmetropolitan areas of the state exceeded that of the metropolitan areas. The state thus provides a good example for the study of the ISER as a region affected by urban diffusion while extending opportunities to the periphery.

The regional economic base of the eastern portion of the state is strongly agricultural oriented. Agriculture is less important in the Mountains, while tourism is significant in the both Mountains and Tidewater. The large public investment in military bases in the Coastal Plain and Tidewater regions also provides job opportunities for local residents.

The traditional industries of textiles, apparel, tobacco, furniture, and food processing are located primarily in the Piedmont. A post 1970s industrial revolution brought many electrical and electronic machinery, nonelectrical machinery, fabricated metals, and other manufacturing industries to the state, primarily the Piedmont area, but with quite dispersed patterns.[25]

Demographically, North Carolina comprises a diversity of population. Blacks are concentrated in the Coastal Plain, especially in its northeastern portion. Most Native Americans are living in southwestern mountain counties and in Robeson County in the Coastal Plain. Population distributions are also influenced by large university and military base installations. Tourists and retirees significantly impact population components as well.

Finally, the state's continuously low socioeconomic rank in the nation, thirty-sixth in per capita income in 1986, for example, point to an additional problem

concerning development. On the one hand, to close the income gap between the state and the nation, industrial diversification is pushed since higher wage industries are thought by many to be a key. On the other hand, there is an attempt to locate job opportunities in rural areas, thus providing more equally spread development. But diversification may not be consistent with rural industrialization, especially in the short term, due to distance disadvantages and initial narrowness of any rural economic base. In fact, not much success has been seen in terms of recruiting high wage industries into rural areas.[26] To promote the state's economic development standing in the nation, as well as to ensure balanced development in the state, the ISER may provide a meaningful alternative for regional policy and planning consideration.

Notes

[1]David M. Smith, Where the Grass is Greener: Living in an Unequal World (Baltimore, Maryland: The Johns Hopkins Press, 1979).

[2]Ole Gade, "Dealing with Disparities in Regional Development: The Intermediate Socioeconomic Region," a Paper Delivered at the Annual Meeting of the Association of American Geographers, Toronto, Canada, April 21, 1990; Jane Chang and Jeff Jones, "The Intermediate Socioeconomic Region: A North Carolina Case Study," a Paper Delivered at the Annual Meeting of the Association of American Geographers, Toronto, Canada, April 21, 1990.

[3]Doris Mahaffey and Mercer Doty, Which way now? - Economic Development and Industrialization in N. C. (Raleigh, NC: N.C. Center for Public Policy Research, 1979), Summary.

[4]Brian Berry et al., Market Centers and Retail Location: Theory and Applications (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1988); J. Brady Foust and Anthony R. deSouza, The Economic Landscape: A Theoretical Introduction (Columbus: Bell & Howell Co., 1978).

[5]Harm J. de Blij and Peter O. Muller, Geography, Regions and Concepts (New York: John Wiley & Sons, 1988); J. Brady Foust and Anthony R. deSouza, The Economic Landscape: A Theoretical Introduction (Columbus: Bell & Howell Co., 1978).

[6]See Note 2 above.

[7]Donald V. McGranahan et al., Contents and Measurement of Socioeconomic Development (New York: Praeger Publishers, 1972).

[8]Brian Berry, Growth Centers in the American Urban System Volume I (Cambridge, Mass.: Ballinger Publishing Company, 1973), 1.

[9]Charles Gore, Regions in Question: Space, Development Theory and Regional Policy (London: Methuen & Co. Ltd., 1984).

[10]G. Myrdal, Economic Theory and Underdeveloped Regions (London: Duckworth, 1957).

[11]See Note 10 above, 34.

[12]John Friedmann, Regional Development Policy: a Case Study of Venezuela (Cambridge, Mass.: MIT Press, 1966).

[13]Francois Perroux, "The Pole of Development's New Place in a General Theory of Economic Activity," Regional Economic Development, ed. Benjamin Higgins and Donald Savoie (London: Allen & Unwin, Inc., 1988), 49.

[14]See Note 8 above.

[15]Brad Stuart, Making North Carolina Prosper: A Critique of Balanced Growth and Regional Planning (Raleigh, NC: The North Carolina Center for Public Policy Research, Inc., 1979).

[16]Niles M. Hansen, Rural Poverty and the Urban Crisis (Bloomington/London: Indiana University Press, 1970), 232.

[17]Benjamin Higgins and Donald Savoie, "Conclusions," Regional Economic Development, ed. Benjamin Higgins and Donald Savoie (London: Allen & Unwin, Inc., 1988), 379.

[18]See Note 16 above, 8.

[19]Lars O. Persson, "Urbanisation Processes in Peripheral Regions in a Welfare State," a Paper Prepared for PIMA Group Seminar in AAG Annual Meeting, Toronto, April 18-26, 1990, 7.

[20]Ole Gade, "Dealing with Disparities in Regional Development: The Intermediate Socioeconomic Region," a Paper Delivered at the Annual Meeting of the Association of American Geographers, Toronto, Canada, April 21, 1990, 2.

[21]See Note 20 above.

[22]Ole Gade and Daniel Stillwell, North Carolina: People and Environments (Boone, NC: Geo-App Publishing Co., 1986).

[23]See Note 22 above.

[24]See Note 22 above.

[25]Doris Mahaffey and Mercer Doty, Which way now? - Economic Development and Industrialization in N. C. (Raleigh, NC: N.C. Center for Public Policy Research, Inc., 1979).

CHAPTER II

SOCIOECONOMIC DEVELOPMENT INDICATORS

Introduction

To locate North Carolina counties along the state's development continuum, a quantitative measurement is needed. The fact is that there is no single indicator which best shows socioeconomic development. This problem is further complicated by the lack of a clear and agreeable definition of socioeconomic development, which would be usable worldwide.[1] Nonetheless the objective for this chapter is to select a set of socioeconomic variables that is appropriate for illustrating the distributional patterns of development in North Carolina.

The selection of development indicators is guided by the general conception of development and the long-standing image in the public eye of both growth centers and peripheries. In 1965 the United States Public Works and Economic Development Act authorized the Secretary of Commerce to designate multistate regions that contain common problems of economic distress. The major factors used in considering whether a region has lagged behind the nation as a whole in economic development are: 1. a rate of unemployment substantially above the national rate; 2. a median level of family income significantly below the

nation median; 3. a level of housing, health, and educational facilities substantially below the national level; 4. an economy that has traditionally been dominated by only one or two industries, which are in a state of long term decline; and 5. a substantial rate of outmigration of labor or capital or both.[2]

The above description of lagging regions provides the basic structure for measuring development. In contrast, the growth pole is described as "... generating propulsive effects in the forms of higher employment and incomes ...."[3] Berry viewed growth centers as having "... an attractive living environment ..." and "... good access, especially to a regional metropolis."[4]

There has also been a lot of research done using various indicators to demonstrate social economic development in general. A Swedish study of regional development inequality used quantifiable variables, such as building permits, unemployment, taxable income, school construction, migration, age, education, and commutation.[5] Along similar lines of investigations, other indicators are used.[6]

So unemployment, income, education, and health, therefore, seem to be the commonly considered aspects of development. In addition, population mobility in terms of commutation, migration and accessibility to a metropolis,

are important considerations. These will form the core of a pool of reference variables from which a group of key variables are selected based on their statistical interrelationships, mapped patterns and other evidence of their intercorrelative significance.

Reference Variables

The comprehensive nature of socioeconomic conditions necessitates a look at development in a holistic way. This study selected a relatively large set of variables in order to cover as many aspects as possible. Twenty-two variables are listed in Table 2.1. Although not exclusive and by no means a complete data set, they cover aspects which may be grouped into five categories: 1. population characteristics; 2. employment opportunities and structure; 3. financial well being; 4. living environment; and 5. mobility opportunity.

Population character variables provide indicators of human resource development. People benefit from development and on the other hand also represent a resource for development. Employment categories give the basic structure of economic activity. The unemployment rate gives spatial differentiation in job opportunities. Financial well-being, particularly per capita income, is viewed as a general measure of development.[7] The living environment category

Table 2.1 Pool of Reference Variables*

1. Population Character	Sex Ratio 1984
	Old Age Dependency 1986
	Youth Dependency 1986
	Education Attainment 1980
2. Employment Opportunity	Unemployment Rate 1982
	Nonmanufacturing Employment Change 1977-87
	Service Employment Percentage 1987
3. Financial Ability	Per Capita Income 1987
	Poverty Percentage 1979
4. Living Environment	Physician Rate 1985
	Infant Mortality Rate 1983-87
	Retail Sales 1982
	Home Ownership Rate 1980
	Incomplete Plumbing and Overcrowding Rate 1980
	Serious Crime Rate 1985
5. Population Mobility	In Commuters 1980
	In Commuting Rate 1980
	Out Commuters 1980
	Out Commuting Rate 1980
	Net Commuters 1980
	Net Migration Rate 1980-86
	Population Change 1980-86

* Definitions are listed in Appendix 1.

is represented by health care, service provisions, housing quality, and crime rate. Finally, the mobility opportunity category provide the dynamic indicators which show existing economic opportunities and growth potentials.

County data ranges over several years for several reasons: first, it is impossible to find data for exactly the same year for the reference variables listed in the pool; second, this study intends to include recent data as much as possible. Since this study aims to describe a general pattern of state's socioeconomic development, then single indicator variations between years, if not overwhelmingly large, are not considered an impediment to accurate analysis.

Among the variables selected above, some are excluded after a initial analysis. Those are Sex Ratio, Infant Mortality Rate and Home Ownership Rate. All of these provide mixed signals in the context of the research objectives.

One other variable is problematic but still retained. Serious Crime Rate data have not been adjusted for underreporting. This may affect comparability among the counties, although the map for each county does show a very understandable gradation from the metropolitan area to the periphery. It is included because it shows the character of the city from another angle; crime is very much an urban

phenomenon and has contributed to a negative urban image and decreased the desirable amenities in the city.

Dependent and Independent Variables

Upon the deletion of some of the reference variables, the remaining set of variables still need to be compressed to the point that they contain only the most significant, but relatively independent variables illustrating, individually as well as in combination, the state's socioeconomic development. A multiple regression analysis is conducted to reduce the pool to a selection of key variables.

Per Capita Income is selected as a dependent variable. Although there is no best single indicator to give the whole development picture of a region, Per Capita Income is a measure of development in common use, long accepted as a unique variable to describe regional development equity.[8] From a regional planning and policy perspective, the desirability of achieving a fair income distribution, along with promoting rapid growth, is a dominant theme. A fair distribution of income represents the idea of equally sharing the benefits of development regardless where people live. Gore notes that "... in general, regional theorists have equated interregional equity with interregional income equality ..."[9] As

Richardson points out that "... most analyses use average Per Capita Income within a prescribed geographical area as the basic indicator."[10] In North Carolina's case, Gade used Per Capita Income as a leading variable to address spatial differences in development.[11]

This lays the basis for using Per Capita Income (PCI87) as a dependent variable with the remaining nineteen included as the independent variables. The immediate objective is to arrive at a grouping of key variables most likely to represent in a holistic way the state's socioeconomic development condition.

The following equation best explains the relationship of the dependent and the independent variables (See Appendix 1 for abbreviations):

$$PCI=a+b_1*RESALE+b_2*POV+...+b_i*UEMR+...+b_{19}*PHYS$$

where a = Intercept

b_i = Parameter, $1<=i<=19$.

The multiple regression routine will provide a set of variables that are most likely to explain variability in the dependent variable.[12] The result (Table 2.2) includes seven variables at the 15 percent significance level with a coefficient of multiple determination of 0.81. That is, these seven variables combine to explain 81

Table 2.2

Summary of Stepwise Regression Procedure

For Dependent Variable PCI87

Step	Variable Entered	Number In	Partial* R^2	Model R^2
1	POV79	1	0.5035	0.5035
2	RESALE82	2	0.1940	0.6975
3	PHYS85	3	0.0665	0.7639
4	ODP86	4	0.0153	0.7792
5	UEMR82	5	0.0198	0.7990
6	IPOR80	6	0.0071	0.8061
7	ED80	7	0.0115	0.8176

*A simple correlation matrix is provided in Appendix 2.

percent of the variability in PCI87. They cover a wide variety of aspects, including financial well-being, population age characteristic, education attainment, job opportunity, housing condition, health welfare and service amenity. They include at least one of the variables in each of the previous five categories except the mobility dimension. But it should be noted that an extremely high correlation of 0.95 between the Retail Sales and In Commuters makes the two variables virtually interchangeable to the point that once Retail Sales is omitted, In

Commuters would be included in the regression model in its position.

These seven variables, together with PCI87 are now selected as the key indicators of socioeconomic development for the purpose of this study.

To better understand the variation of socioeconomic development across the landscape in North Carolina, it is important to investigate each individual key indicator before trying to combine them to the dimensions to be discussed in depth in Chapter III.

Key Indicators of Socioeconomic Development

Per Capita Income, 1987

The personal income of an area is defined as the income received by, or on behalf of, all the residents of that area. It consists of the income received by persons from all sources: participation in production, government and business transfer payments, and from government interest. Per Capita Income (PCI) is total personal income divided by resident population.[13] It is believed to be a good and reliable indicator of development, and thus, provides a reasonable representation of geographic differences of the existing socioeconomic continuum of development.

In 1987 the state's average PCI was $13,322 which is fourteen percent lower than that of the United States. The range varies from the lowest of $8,101 in Tyrrell County to the highest of $17,709 in Wake County (Figure 2.1).

The map of this variable by county gives a clear pattern of variation across the state. A concentration of high income in the state's largest urban centers is shown. The counties containing the urban agglomerations of Raleigh, Durham, Chapel Hill, Greensboro, Winston-Salem and Charlotte, located in Wake, Durham, Orange, Guilford, Forsyth and Mecklenburg counties, respectively, have the highest per capita incomes. In addition, Polk is influenced by recent high income retirees, and the exurban county of Davie also falls into this high per capita income category.

Similarly, but to a lesser degree, a large concentration of wealthy retirees in Henderson County also pulls the income level up. This is also the case for Moore County where Southern Pines' golf resorts and other leisure activity amenities provide the attractions to retirees. The impact of resorts on income levels is also seen clearly in Dare County where the beach, ocean and sound bring a large amount of income to its relatively small population base. In the PCI category ranging from $12,501 to $15,000, the largest concentration is located in exurban counties adjacent to the Piedmont Urban Crescent. Buncombe and New

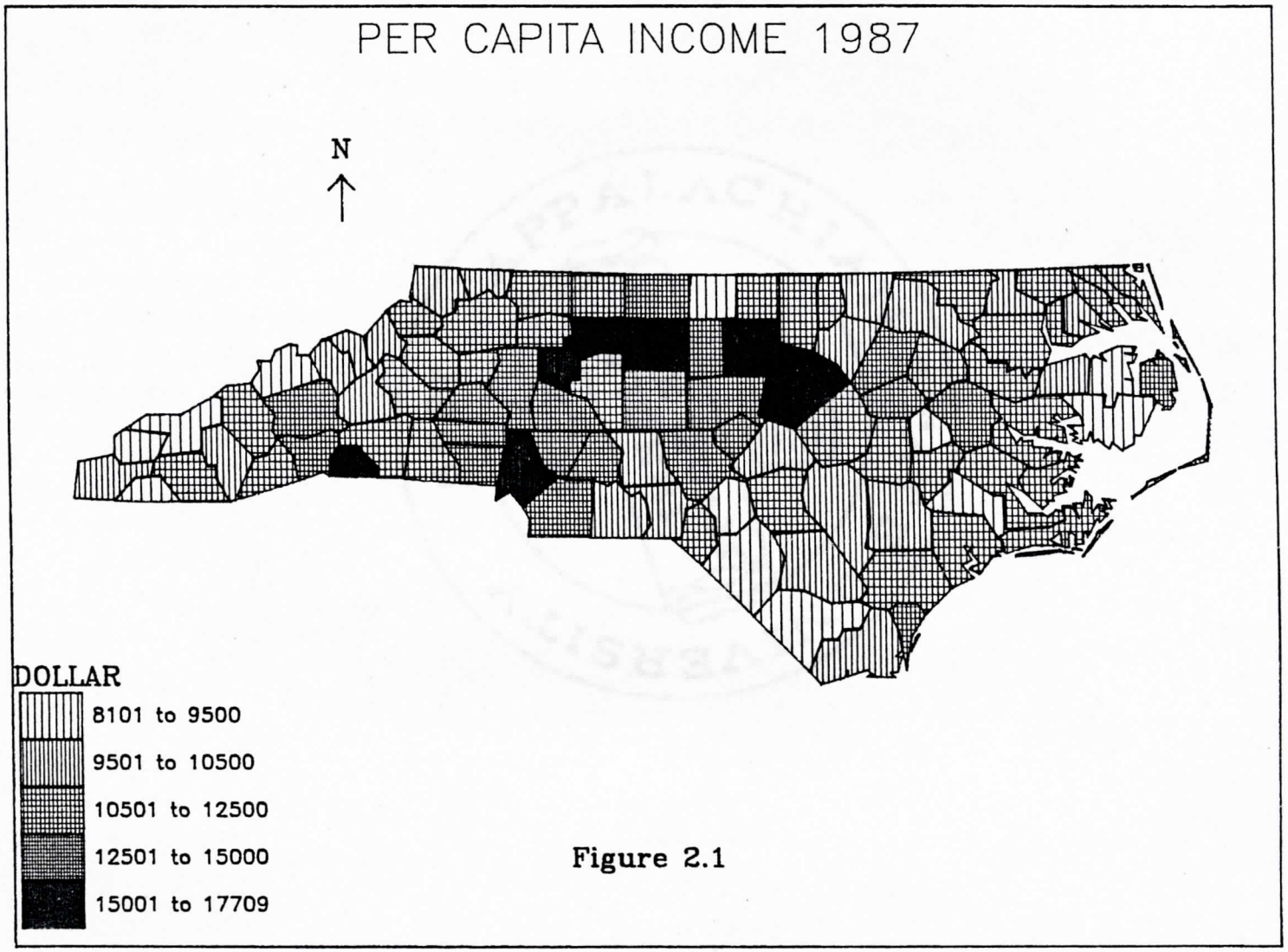

PER CAPITA INCOME 1987
N
DOLLAR
8101 to 9500
9501 to 10500
10501 to 12500
12501 to 15000
15001 to 17709

Figure 2.1

Hanover counties with their Mountain and Tidewater urban centers, Asheville and Wilmington, respectively, ranked high by income level in the state. Other high ranging counties include Catawba, Iredell, Lee, Nash, Wilson and Pitt counties. These represent medium-size manufacturing centers where diversified economic opportunities are more plentiful. All of the above counties either have their own urban growth center or are influenced by tourism and retirees. They rank high in income but the population base is not as large as in most of the counties in the first rank. In essence the centralized growth centers are positioned at one extreme of the development continuum, at least by the use of this single indicator.

On the other hand, counties located mostly in the Mountain, Coastal Plain and Tidewater regions serve as the other extreme of the income continuum. They are all weak in economic base, although some of them are impacted by seasonal and limited tourism. In addition, they are further away from the central economic opportunities of the Piedmont. Among the counties that fall into this lowest range in the Coastal Plain, most have large racial minority concentrations. These include Hoke, Robeson, Columbus, Bladen, Halifax and Hertford counties. There are also some counties in the Piedmont that fall into this range but these are generally excluded from the scope of the "Urban

Crescent" by their great distance from the large urban centers. Noticeably, Caswell County ranks low although it is relatively close to big urban centers. This is largely due to the absence of its own population center and lack of significant interstate highway penetration. The major activities are low-skill and low-wage industries.

Away from the Piedmont core of high income, the level of PCI gradually declines to the medium ranges into which the counties surrounding the large urban centers fall. In the other direction, the counties adjacent to the income periphery join the medium ranges too. In the Mountain, Coastal Plain and Tidewater regions, anomalous counties do exist within this general pattern. This includes Watauga County with its large public university complementing its otherwise seasonal tourist economy. Also, Cumberland, Onslow, Craven and Wayne counties in eastern North Carolina contain large military installations and bases which seem to have influenced higher overall incomes in these otherwise rural and agricultural counties.[14]

The mapped pattern demonstrated in Figure 2.1 points out the gradation in Per Capita Income levels within the state along a continuum of the high to the medium and to the low range counties. The continuum derives something of spatial definition by the greater concentration of high income counties in the center of the state and the general

decrease in income with increasing distance from the core.

PCI is the result of a multiplicity of factors as is shown in the multiple regression where it is correlated to other variables. Therefore, it is appropriate to evaluate the relationship between dependent variable PCI and the independent variables entered into the regression model.

The counties with high per capita income are also likely to be characterized with higher high school graduate percentages, retail sales, as well as high physician rate (Table 2.3). This set of relationships illustrates good services provision, attainment of minimum job skills and being relatively well off financially. It provides the associated indicators of upper level development.

Table 2.3

Per Capita Income 1987 and its Correlates

Pearson Correlation Coefficients

Positive Correlations		Negative Correlations	
ED80	0.69	POV79	-0.71
RESALE82	0.68	UEMR82	-0.52
PHYS85	0.47	IPOR80	-0.49
		ODP86	-0.21

Source: Appendix 2.

Conversely, low income seems to associate with high rate of poverty, unemployment, incomplete plumbing and overcrowded housing condition. Also, it is slightly correlated to old age dependency. This set of relationships is expected. North Carolina's low per capita income exists largely because of its low wage and low skill industries and prevailing agriculture in those counties where the economic base is weak and thus vulnerable, especially during the recession periods.[15] Thus, poor living conditions and limited job opportunities are tied to a low income population.

Though Per Capita Income does show as a good indication of regional development disparity, one should avoid falling into the trap of assuming that the presence of either high or low incomes is a perfect indicator of a county's development vitality. Income needs to be evaluated in combination with other variables to help understand a county's overall status, socially and economically. As earlier indicated seven independent variables, in linear combination, explain more than 80 percent of the variation in PCI (Table 2.2). The correlation coefficient between each independent variable and PCI varies from 0.21 to 0.71. Most of them vary from 0.47 to 0.71. This medium range of correlations suggests that these independent variables also serve as supplemental indicators of socioeconomic

conditions which Per Capita Income is unable to demonstrate. It becomes important to evaluate these independent variables, especially the existing conditions that are not clearly shown in the PCI indicator.

This can be done by deriving and mapping residuals through a simple regression analysis. The residuals demonstrate the distance between actual values of one of the seven key indicators and predicted value for this key variable using PCI. The larger the distance is, the more serious the lack of correlation between PCI and the particular indicator becomes.

The variable that correlates most closely, though negatively, with Per Capita Income is the Poverty Level. This will be assessed first.

Percentage Persons below Poverty Level, 1979

Percentage of Persons Below Poverty Level (POV) is determined by the Bureau of the Census using the income of persons, living alone or with other unrelated individuals, in relation to the appropriate poverty threshold.[16] The poverty income thresholds are updated each year to reflect changes in the Consumer Price Index or inflation.[17]

Poverty is another way of stating financial status of an individual or a family. It takes relative living costs into consideration since the costs vary from place to

place.[18] It is generally expected that the incidence of poverty is disproportionately high among the old, the uneducated, female-headed families, rural people, and those employed in low-paying occupations and industries.[19] The commonly used poverty variable are the Percentage of Families below Poverty Level and Percentage of Persons below Poverty Level.[20] In this study Percentage of Persons below Poverty Level is used since these two data sets are highly correlated (r=0.98) and they indicate almost the same pattern in North Carolina.[21]

POV is used as one of the key variables since it is useful in recognizing the failure of income sharing among the wealthy and the relatively poor in the counties, which Per Capita Income (PCI) is unable to demonstrate. POV and PCI are correlated at negative 0.71. A simple regression is calculated and the POV residual for each county is plotted. The counties with extremely high or low residual values demonstrate their special features which are unable to be carried by PCI indicator.

The counties within the first category of lowest residual values are most exurban counties adjacent to the large cities (Figure 2.2). They have lower POV values than expected by their PCI standing.

The counties that fall into the highest residual category are these three types: 1. counties with large

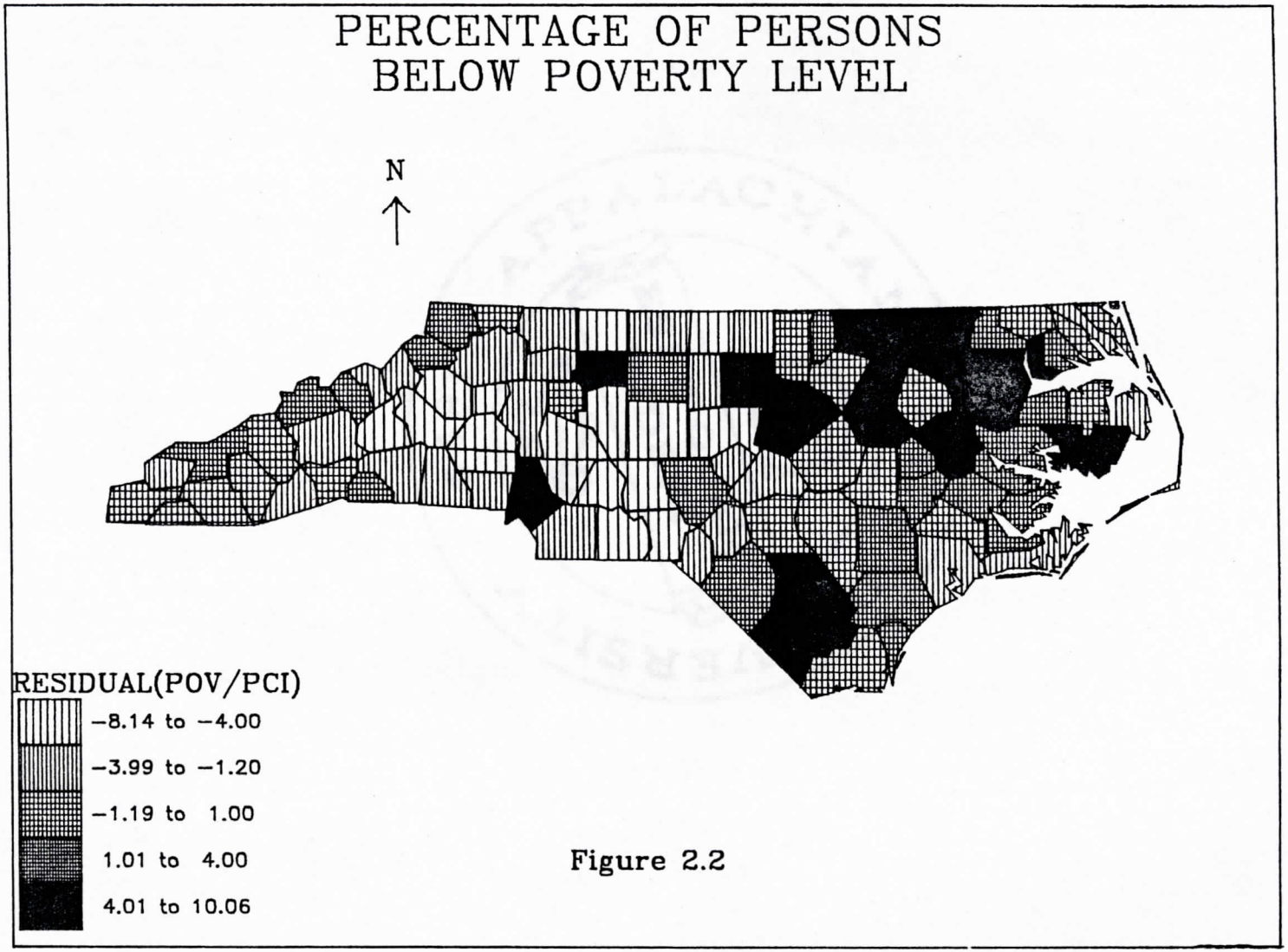

PERCENTAGE OF PERSONS
BELOW POVERTY LEVEL
N
RESIDUAL(POV/PCI)
−8.14 to −4.00
−3.99 to −1.20
−1.19 to 1.00
1.01 to 4.00
4.01 to 10.06

Figure 2.2

urban centers such as Wake, Forsyth, Durham, Mecklenburg and Orange; 2. very poor counties such as Bertie, Warren, Halifax, Northampton, Hyde, and so on; and 3. counties with a little industrial base but still heavily involved in agriculture activities such as Nash and Wilson. The POV values for these counties are higher than expected to be by studying the PCI indictor.

Therefore, the POV pattern not only partly resembles the variation in PCI but also points out some special features that PCI is unable to demonstrate. The POV indicator will contribute to this study by indicating the failure in income sharing between the wealthy and the poor within counties.

Education Attainment, 1980

The Education Attainment (ED) is measured by the percentage of persons 25 years old and over who have completed 12 years or more school education.[22] This provides a special indicator of a community or a region's social and economic vitality and potential. A skilled labor market and high education levels contribute to active innovation and high tech investment which pays much more than primary extractive activity or low-skill, low-wage industry.

Although ED is correlated with PCI at 0.69, they do not follow the exact same pattern. The residuals account for the uncorrelated part of two variables included in the simple regression. The residual map (Figure 2.3) shows the counties that fall into the highest and lowest value categories. These counties are important to mention since the counties with low residuals have lower educational attainment than expected according to their PCI. This suggests development problems in the present and future. The counties with high residuals have higher ED values than expected and therefore have greater potential for development.

There is one basic category of counties that falls into the lowest residual range. These counties usually have access to the nearby job opportunities and engage in heavy out-commuting They may be poor counties or counties that have some economic base while being close to large metropolitan areas. Examples of poor counties include Northampton and Warren counties, which are tied to Roanoke Rapids in Halifax, Bertie and Northampton counties, tied to Ahoskie in Hertford; Alleghany County is tied to Wilkes and Surry counties; and Yadkin county is tied to Forsyth. Davie, Alexander, Gaston, Rockingham and other counties are examples of exurban counties tied to large cities. In these types of counties, PCI's are not necessarily highly

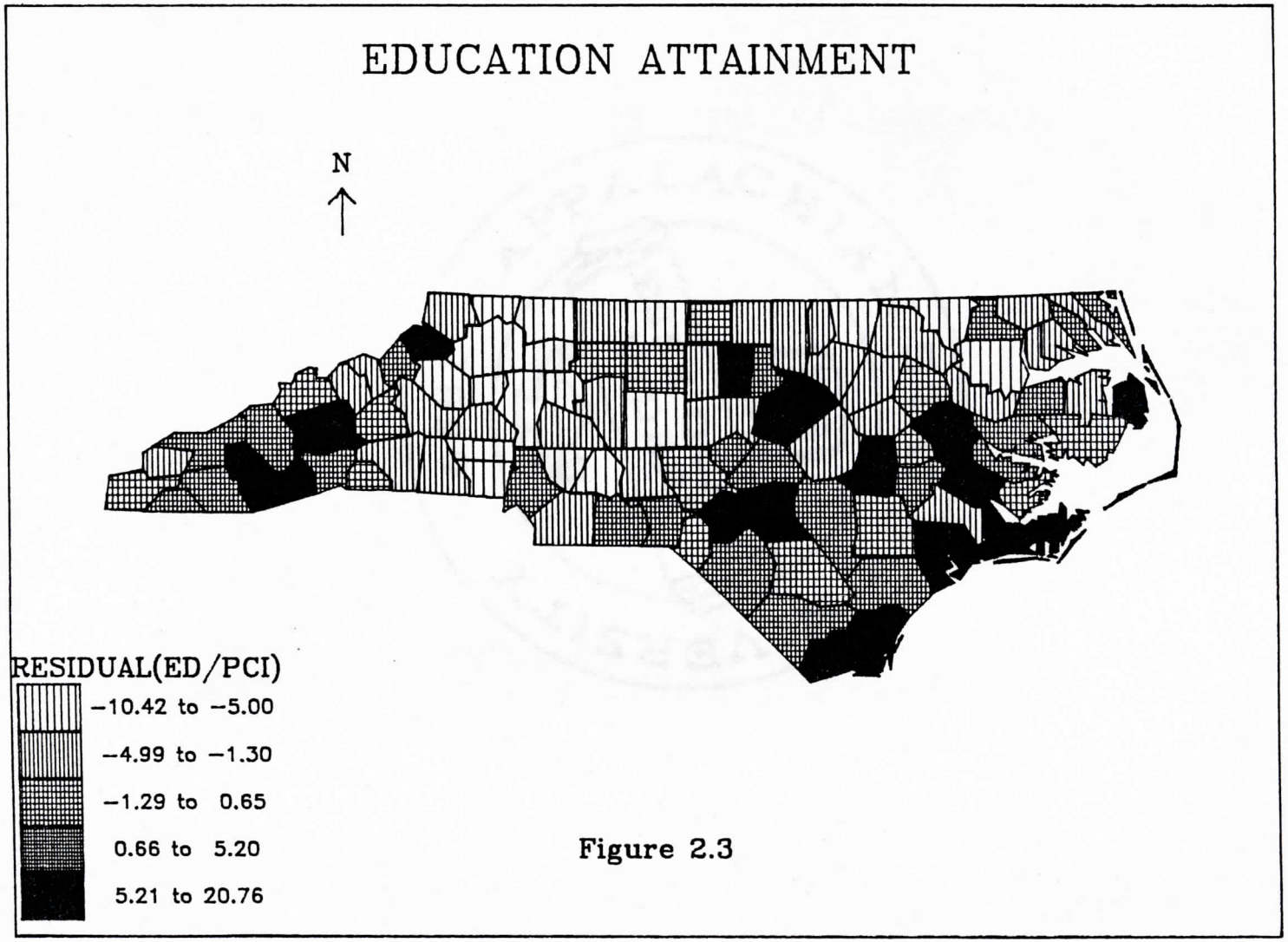

EDUCATION ATTAINMENT
N
RESIDUAL(ED/PCI)
−10.42 to −5.00
−4.99 to −1.30
−1.29 to 0.65
0.66 to 5.20
5.21 to 20.76

Figure 2.3

associated with educational level, especially where low-skill and low-wage industries are involved.[23]

The counties with high residuals are basically university or military dominated counties. Watauga, Orange, Cumberland, New Hanover, Wake, Jackson counties are examples of counties under university influence. Cumberland, Onslow, New Hanover, Craven, and Wayne counties are military-based counties. There are also some counties that seems to be influenced by well-educated retirees, such as Transylvania and Hoke counties.

Retail Sales, 1982

Retail Sales (RESALE) included merchandise sold for cash or credit at retail by establishments primarily engaged in selling merchandise for personal or household consumption and rendering services incidental to the sale of goods.[24] It is the only non-ratio variable in the key variables, but it is included for the reason that the population magnitude is important. Total retail sales illustrate the scales of the service amenities measured by the quantity and the variety of merchandises which may be accessed by the residents, although it is neither inclusive nor exclusive. People may travel into other counties to buy things. For example, the counties containing large or medium urban centers usually attract a lot of nearby

residents who either shop during the journey from work to home or just travel to the urban center to shop for the special items not available in their home counties. The tourist-oriented counties are expected to have relatively high retail sales, but it is not necessary the case. First, total retail sales heavily depend on the population size of the counties. Second, the scale of tourism, in some counties, is not overwhelmingly significant in terms of the number and duration. The seasonal feature usually limits the number of tourists and the impact to the local economy.

The counties that fall into lowest residual range (Figure 2.4) are basically the counties having nearby shopping opportunities. For example, people in the retiree counties such as Polk and Henderson may travel to Buncombe County to buy things or have the access to the services. Other exurban counties, such as Davie, Chatham, Union and Alexander, have lower retail sales also due to the influence of nearby urban centers.

There are mainly two types of counties that fall into the highest residual range. Those containing large urban centers and those with tourist impact, such as Swain County. The tourist brings higher than expected retail sales.

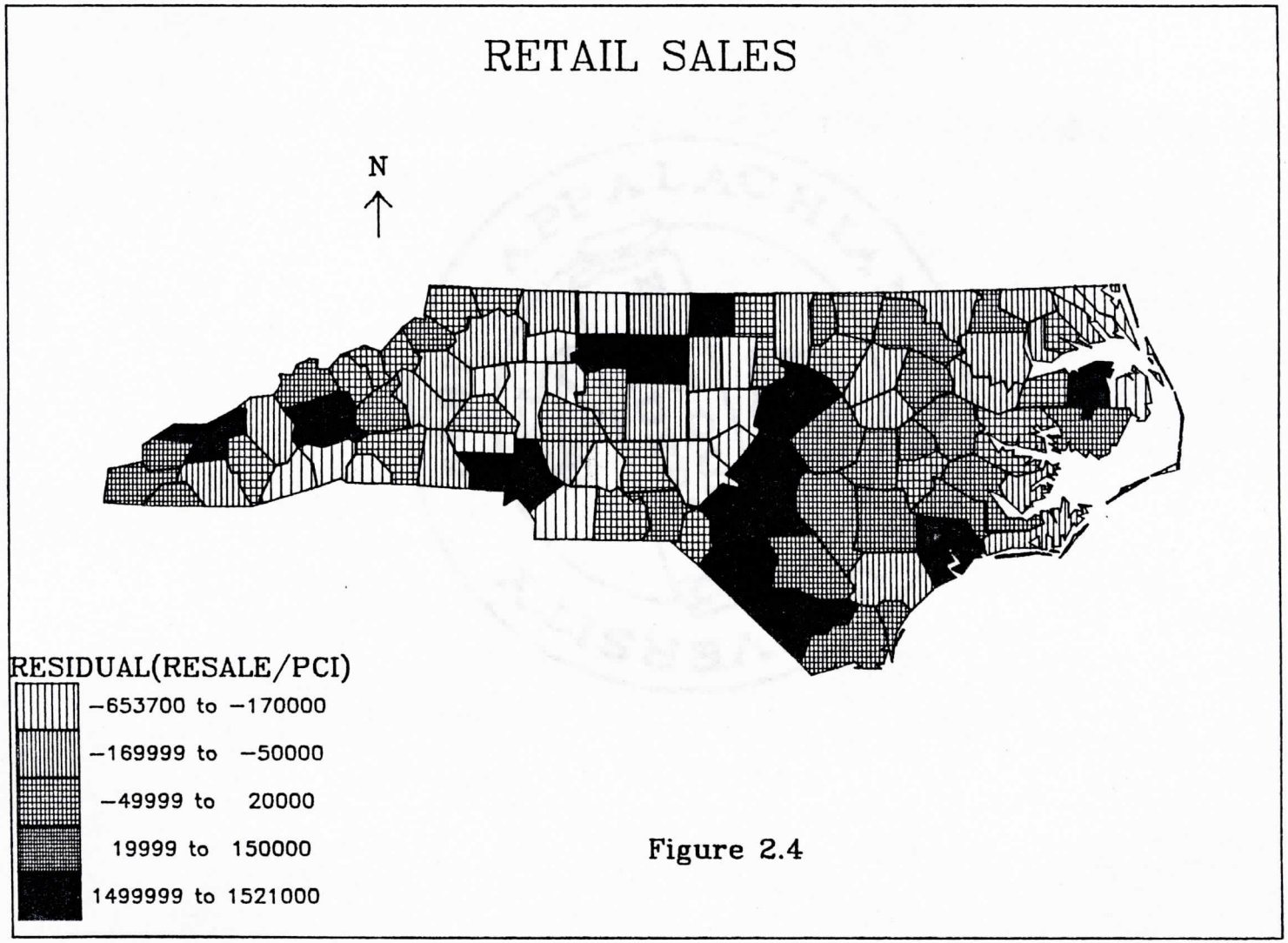

RETAIL SALES
N
RESIDUAL(RESALE/PCI)
-653700 to -170000
-169999 to -50000
-49999 to 20000
19999 to 150000
1499999 to 1521000

Figure 2.4

Unemployment Rate, 1982

Unemployment Rate (UEMR) is defined as the number of unemployed as a percent of the civilian labor force.[25] Unemployment Rate is often quoted as one of the indicators of an area's economic development[26] An area with a weak or maladjusted economic base usually experiences particular problems during economic recession periods.[27] This is the reason that 1982 data were selected for this study. North Carolina went through a recession period during the early 1980s. Unemployment also serves as an indicator of the inability of an area's economy to provide sufficient job opportunities. Usually the area experiencing economic growth provides more jobs than the economically declining or stagnant area.

The PCI pattern partly resembles the variations in the UEMR with correlation coefficient of negative 0.52. Some counties' variations in UEMR show up as having very high or very low residual values.

The counties that fall into the highest residual range (Figure 2.5) are the counties with large public universities, such as Watauga, Jackson, Pasquotank and Orange, which help to keep the unemployment rate down. There are also some counties with lower UEMR than would be expected regarding to their PCI standing. Some of them are counties with military bases, such as Onslow County.

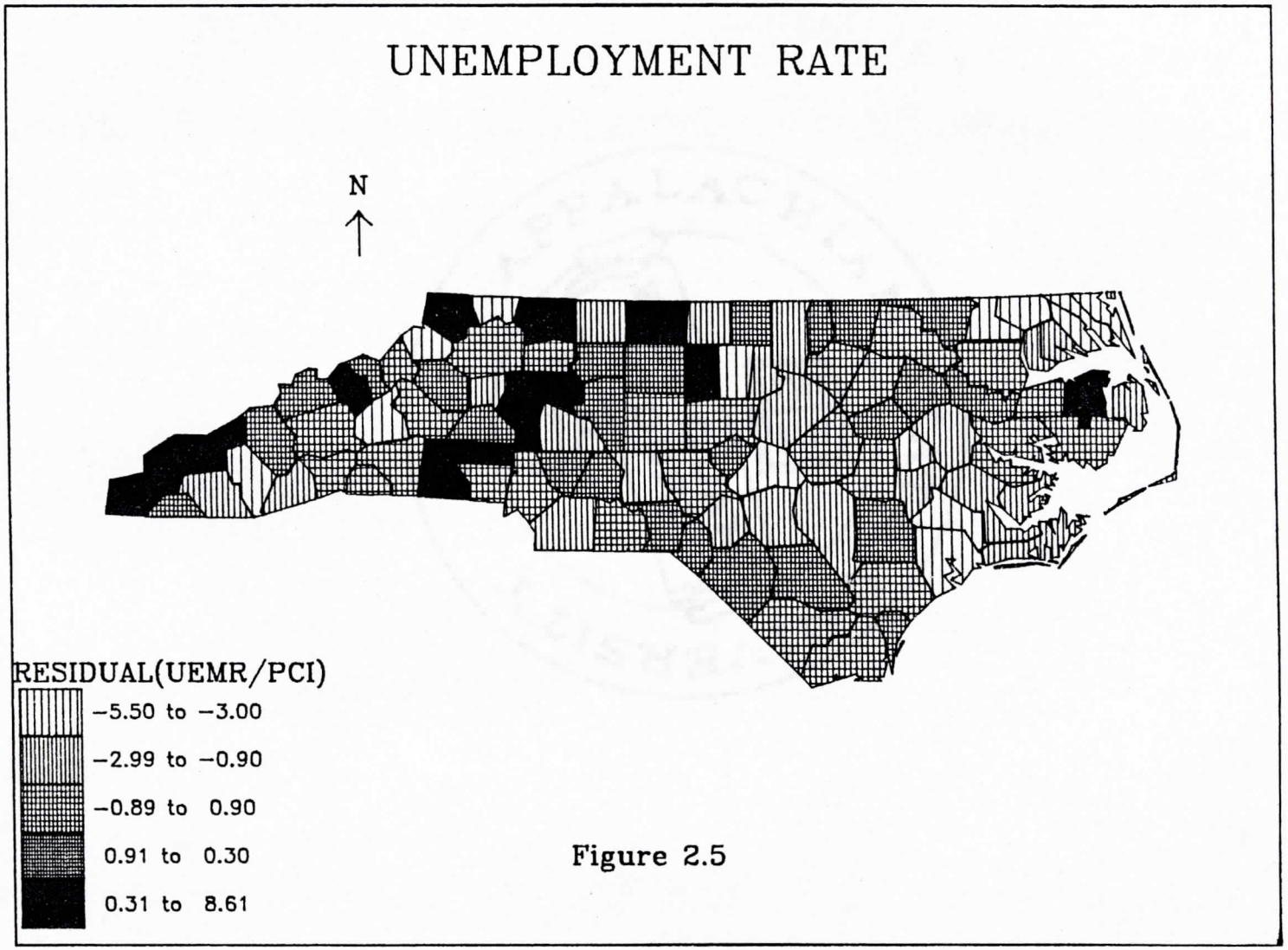

UNEMPLOYMENT RATE
N
RESIDUAL(UEMR/PCI)
-5.50 to -3.00
-2.99 to -0.90
-0.89 to 0.90
0.91 to 0.30
0.31 to 8.61

Figure 2.5

The counties that fall into the highest range are basically poor counties such as Graham, Swain, Tyrrell, Yancey, Cherokee, Ashe counties. Some of the exurban counties, such as Cleveland, Surry, Rockingham, Lincoln, and Davie, also have higher UEMR than would be expected. The reason for that is not clear, but the higher values of UEMR than expected reflect the relative instability of counties' economies.

The inclusion of this variable, therefore, will contribute to this study by considering the job sharing within county and indicating each county's economic stability, especially during the recession period.

Incomplete Plumbing and Overcrowding Rate, 1980

Incomplete Plumbing and Overcrowding Rate (IPOR) is defined as the number of housing units per 1,000 owner occupied housing units with incomplete plumbing and overcrowding (1.01 or more persons per room).[28] It is included because it highlights the living environment as an important aspect of the quality of life. The IPOR usually associates with poverty. This variable's strength and weakness is that it excludes apartment rental consideration. It excludes a university town's high rental factor, but also excludes the fact that the big cities do

include a great amount of rental apartments which are connected to the relatively poor population.

Some poor counties such as Swain, Graham, Clay, Alleghany, Macon, Mitchell, Avery and Cherokee have lower IPOR, which means better housing conditions. Retirement, seasonal housing and federal housing support provide this better than expected condition. Watauga falls into the lowest residual range due to its large number of second homeowners in this area (Figure 2.6).

Another set of poor counties have the highest residuals. These are predominantly located in the northeastern portion of the state.

This variable contributes to this study by indicating housing conditions that PCI is unable to totally predict, especially among the counties that fall into the lowest and highest residual ranges.

Physician Rate, 1985

Physician Rate (PHYS) represents the numbers of active non-federal physicians per 100,000 resident population.[29] A large cluster of wealthy population is a factor which helps attract highly paid physicians. In return, higher rates of physicians provide relatively easier access and more sophisticated services to the residents, which should be one of the characteristics of a healthy region.

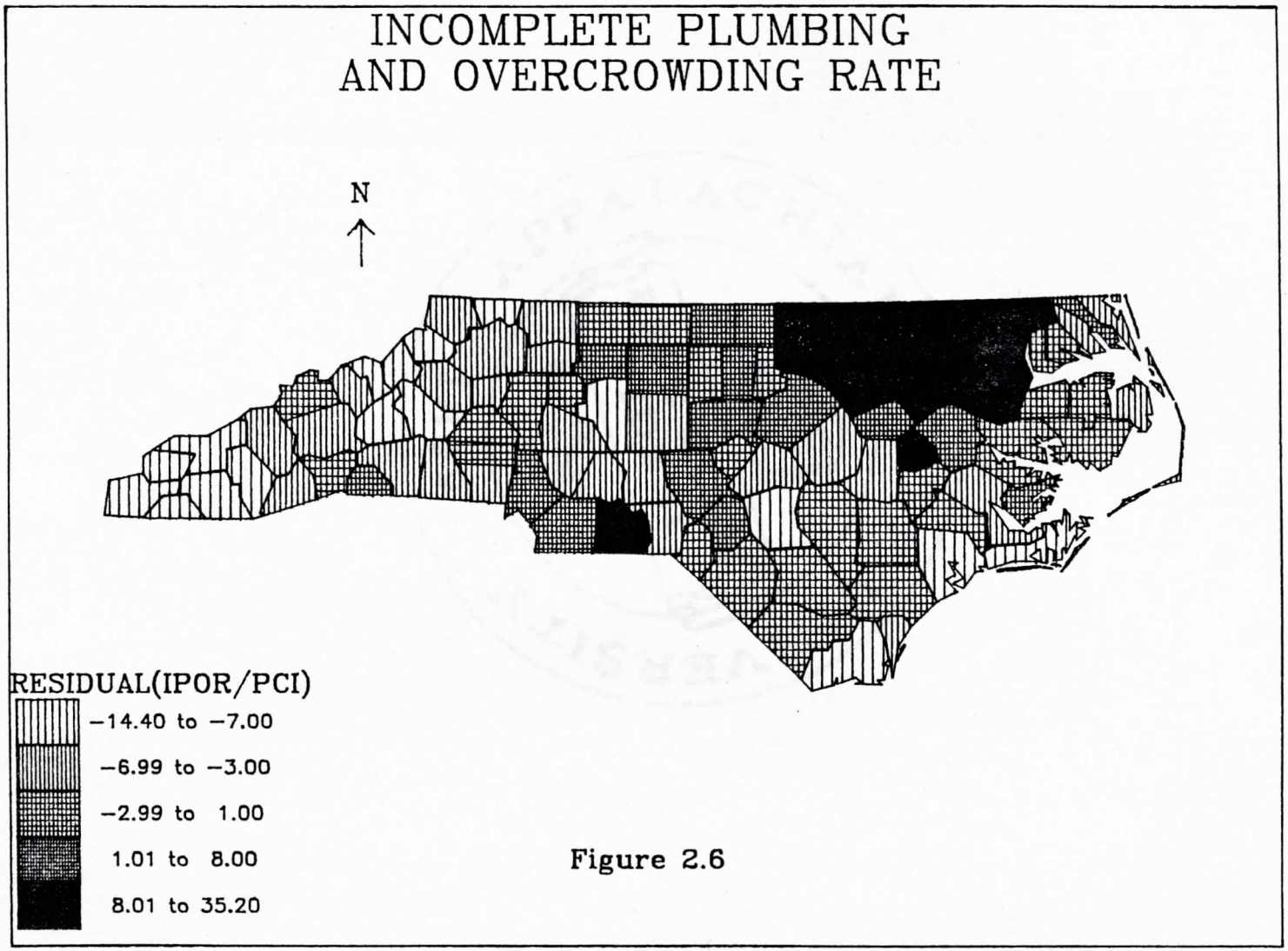

INCOMPLETE PLUMBING
AND OVERCROWDING RATE
N
RESIDUAL(IPOR/PCI)
−14.40 to −7.00
−6.99 to −3.00
−2.99 to 1.00
1.01 to 8.00
8.01 to 35.20

Figure 2.6

The extremely high or low residuals (Figure 2.7) show the counties that have unpredictable PHYS with respect to their PCI standing. The counties with large urban centers and the exurban counties fall into the lowest residual range. Thus the inclusion of this indicator will decrease the difference between the counties, which otherwise would be expected by using only PCI indicator.

Some poor counties have higher PHYS's than would be predicted. These include Avery, Swain, Mitchell, and Hertford counties. A variety of factors aid in explaining this. For example, Avery's seasonal ski industry and Swain's federal support for the Cherokees. Orange and Durham counties have much higher PHYS than expected regarding their PCI standing due to the existing medical school in these two counties,which do provide better health service than any other counties in the state. The inclusion of this indicator will increase, relatively, those counties' development standing, which otherwise would be lower.

Old Age Dependency, 1986

Old Age Dependency (ODP) compares the portion of persons age sixty-five and over (Non-productive sector) with the population of those age 15 to 64 (productive sector).

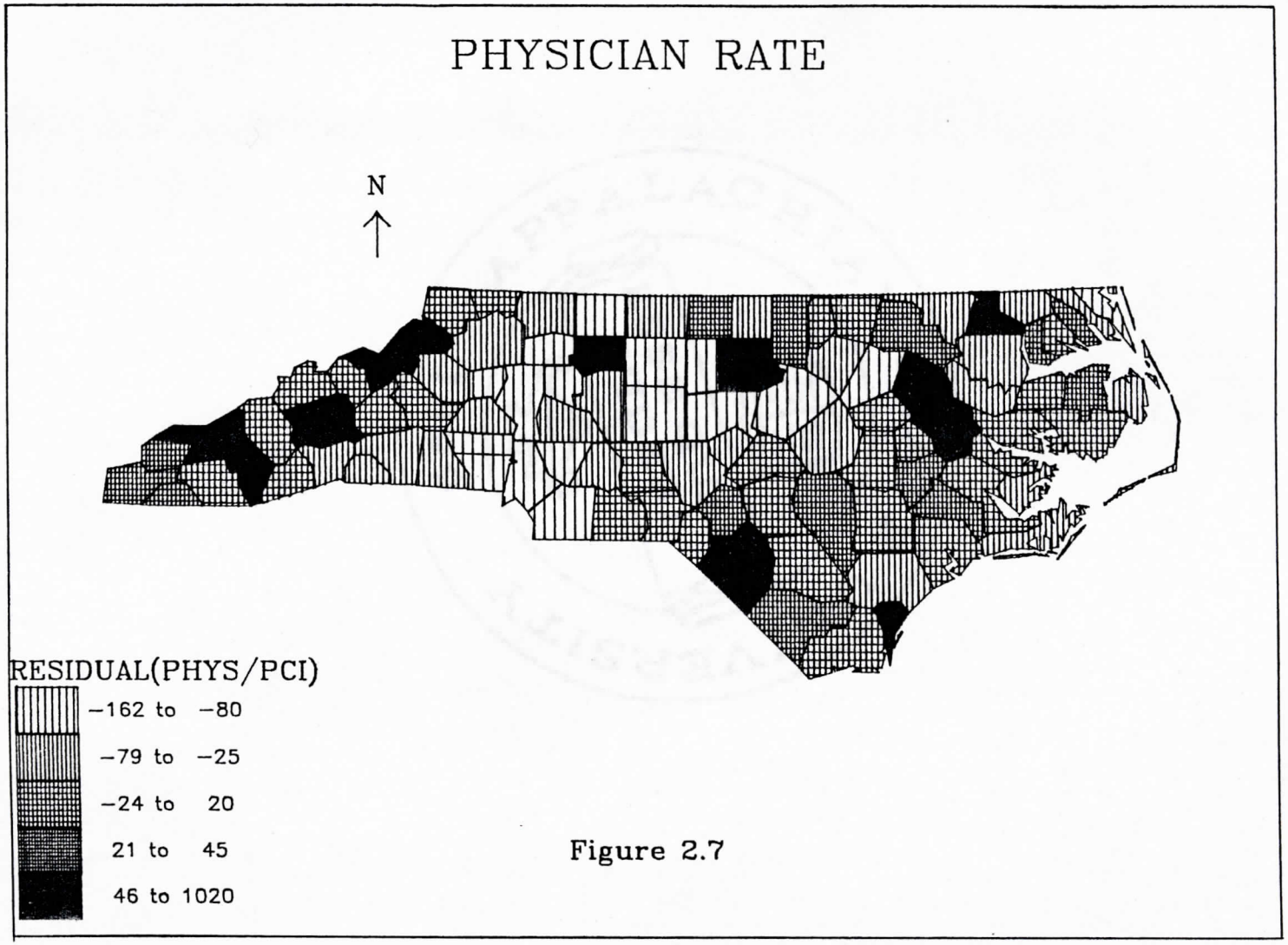

PHYSICIAN RATE
N
RESIDUAL(PHYS/PCI)
−162 to −80
−79 to −25
−24 to 20
21 to 45
46 to 1020

Figure 2.7

Delineation of counties which have a disproportionate share of older population will identify some special needs for the community. High rates of old age dependency usually serve as a negative signature for an area because of generally recognized pattern of age-selective outmigration in the declining community. That is not totally the case for some counties in 1980s, at least in North Carolina. This state, with its beach in the east and pleasant summer in the western mountains, attracts a great amount of wealthy retirees, especially from Florida. They bring in funds for construction and to some degree promote the services. This pulls up the standing of the counties in the development ranking. But generally speaking, high old age dependency indicates a high portion of the population in the non-productive sector, which in most cases presents problems, except for some of the wealthy retiree counties in the state.

The ODP correlates with PCI at negative 0.21. Thus, large portion of variation in ODP has not been predicted by PCI. The counties with higher ODP than expected are poor counties in the western mountains and east coast, such as Cherokee, Mitchell, Tyrrell, and Hyde (Figure 2.8). The retiree counties, such as Henderson and Polk counties have much higher ODP than expected. A lower ODP is also found in

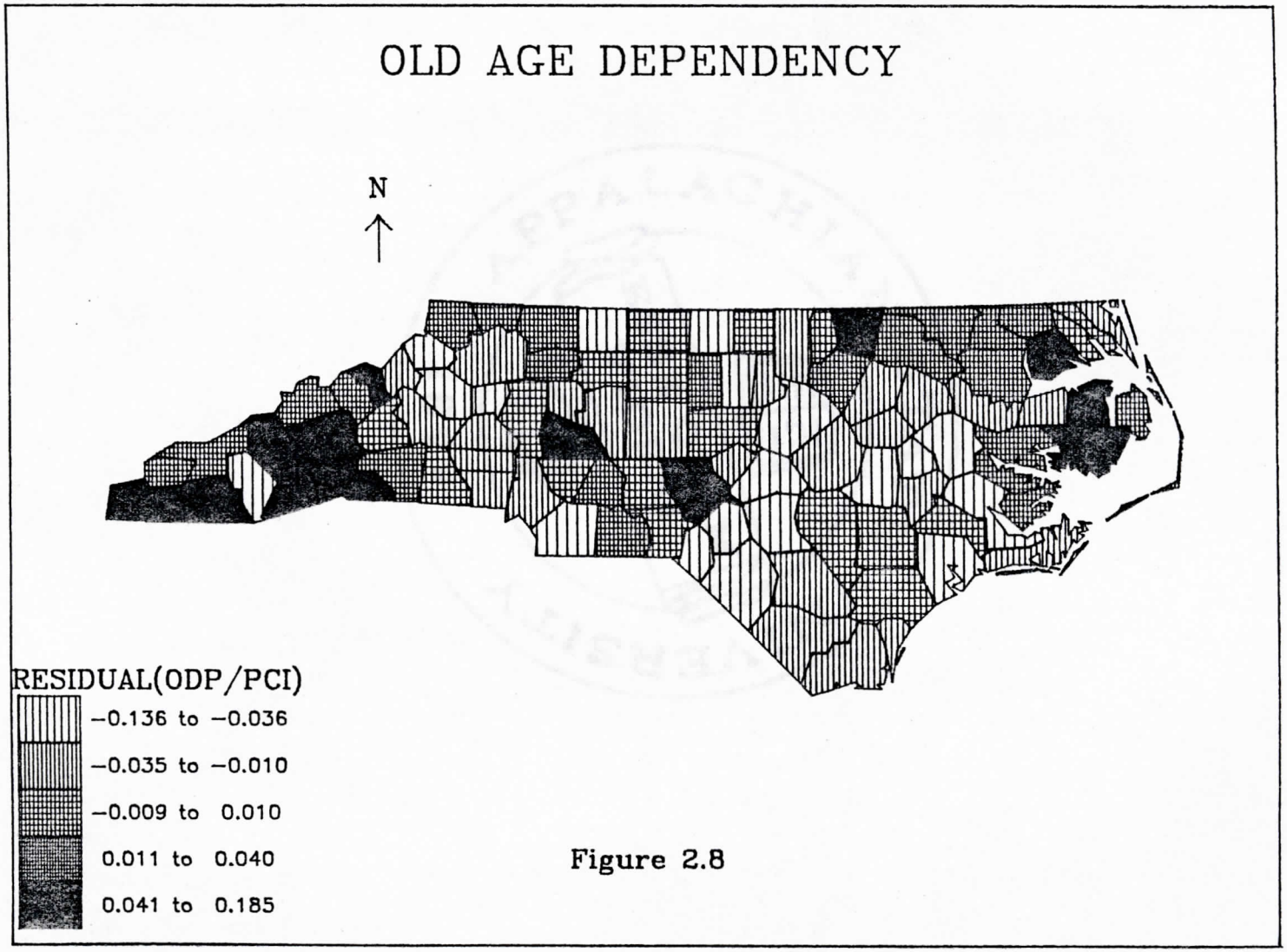

OLD AGE DEPENDENCY
N
RESIDUAL(ODP/PCI)
−0.136 to −0.036
−0.035 to −0.010
−0.009 to 0.010
0.011 to 0.040
0.041 to 0.185

Figure 2.8

counties with large public universities or military base installations.

The inclusion of this indicator will help to recognize the counties with large non-productive population which is generally viewed as negative side for development. Although in some counties the wealthy retirees do bring in job opportunities, especially old age related services, the economic base is not stable.

Major Findings and Conclusions

This chapter has first selected Per Capita Income as a general measure of development. To cover wider aspects of socioeconomic development, a pool of reference variables was selected. Multiple regression was conducted, using PCI as the dependent variable and the reference variables as independent variables. Seven socioeconomic development variables were found to explain more than 80 percent of the variations in PCI. Further study of residuals, the observed range between actual value of each seven indicators and that predicted by PCI, demonstrates that these seven variables serve as supplemental socioeconomic development indicators to PCI. Thus, eight variables, Per Capita Income, Percentage of Persons below Poverty Level, Educational Attainment, Retail Sales, Unemployment Rate, Incomplete Plumbing and Overcrowding Rate, Physician Rate,

and Old Age Dependency, are selected as the key socioeconomic development indicators for this study.

To more confidently locate the counties along the development continuum and thus help to delineate the Intermediate Socioeconomic Development Region, a suitable methodology is needed to combine the key variables. This is the topic of next chapter.

Notes

[1]Donald V. McGranahan et al., Contents and Measurement of Socioeconomic Development (New York: Praeger Publishers, 1972).

[2]Niles M. Hansen, Rural Poverty and the Urban Crisis (Bloomington/London: Indiana University Press, 1970), 107.

[3]Benjamin Higgins, "Francois Perroux," Regional Economic Development, ed. Benjamin Higgins and Donald Savoie (London: Allen & Unwin, Inc., 1988), 45.

[4]Brian Berry, Growth Centers in the American Urban System Volumn I (Cambridge, Mass.: Ballinger Publishing Company, 1973), 185.

[5]Bengt Johannisson et al., Urbaniserad Glesbygd (Stockholm: Allmanna Forlaget, 1989).

[6]Fernand Martin, "The Influence of Unemployment Insurance Benefits upon the Social Cost of Labor in Lagging Regions," Regional Economic Development, ed. Benjamin Higgins and Donald Savoie (London: Allen & Unwin, Inc., 1988), 244-68; Andre Raynauld, "Regional Development in a Federal State," Regional Economic Development, ed. Benjamin Higgins and Donald Savoie (London: Allen & Unwin, Inc., 1988), 225-43; John Vanderkamp, "Regional Disparities: a Model with Some Econometric Results for Canada," Regional Economic Development, ed. Benjamin Higgins and Donald Savoie (London: Allen & Unwin, Inc., 1988), 269-96; Ole Gade, "Regional Development in a Southern State: The North Carolina Experience, 1970-1988," Development in Marginal Areas, ed. Gerhard Gustafsson (Karlstad: Karlstad University Press, 1989).

[7]See Note 1 above.

[8]Donald V. McGranahan et al., Contents and Measurement of Socioeconomic Development (New York: Praeger Publishers, 1972).

[9]Charles Gore, Regions in Question: Space, Development Theory and Regional Policy (London: Methuen & Co. Ltd., 1984), 53.

[10]H. W. Richardson, "Aggregate Efficiency and Interregional Equity," Spatial Inequalities and Regional Development, ed. H. Folmer and J. Oosterhaven (Leiden: Nijhoff, 1979), 162.

[11]Ole Gade, "Regional Development in a Southern State: The North Carolina Experience, 1970-1988," Development in Marginal Areas, ed. Gerhard Gustafsson (Karlstad: Karlstad University Press, 1989).

[12]Gerald M. Barber, Elementary Statistics For Geographers (New York: The Guilford Press, 1988).

[13]North Carolina State Data Center Newsletter, July 1987 (Raleigh, NC: Office of State Budget and Management, 1987).

[14]Jane Chang and Jeff Jones, "The Intermediate Socioeconomic Region: A North Carolina Case Study," a Paper Delivered at the Annual Meeting of the Association of American Geographers, Toronto, Canada, April 21, 1990.

[15]Ole Gade and Daniel Stillwell, North Carolina: People and Environments (Boone, NC: Geo-App Publishing Co., 1986).

[16]Statistical Abstract of the United States 1980 (Washington, DC: Bureau of the Census, 1980).

[17]William P. O'Hare, The Rise of Poverty in Rural America (Washington, DC: Population Reference Bureau, Inc., 1988).

[18]Richard L. Morrill and E. H. Wohlenberg, The Geography of Poverty in the United States (New York: McGraw-Hill, Inc., 1971).

[19]Robert M. Solow, "Poverty and Economic Growth," Focus (Madison, Wisconsin: Institute for Research on Poverty, 1990).

[20]See Note 17 above.

[21]Donna Gunderson, "Income measures and the Quality of Life Differences in North Carolina Counties," a Paper for the Accessibility of Graduate Education for Minorities Program, Prepared June-July, 1990, Department of Geography, Appalachian State University, Boone, NC.

[22]County and City Data Book 1988 (Washington, DC: U.S. Census Bureau, 1988).

[23]See Note 15 above.

[24]Census of Retail Sales 1982 (Washington, DC: U.S. Census Bureau, 1982).

[25]North Carolina Labor Force Estimates, 1983 (Raleigh, NC: Labor Market Commission of North Carolina, 1983).

[26]Fernand Martin, "The Influence of Unemployment Insurance Benefits upon the Social Cost of Labor in Lagging Regions," Regional Economic Development, ed. Benjamin Higgins and Donald Savoie (London: Allen & Unwin, Inc., 1988), 244-68; William P. O'Hare, The Rise of Poverty in Rural America (Washington, DC: Population Reference Bureau, Inc., 1988); Doris Mahaffey and Mercer Doty, Which way now? - Economic Development and Industrialization in N. C. (Raleigh, NC: N.C. Center for Public Policy Research, 1979).

[27]See Note 15 above.

[28]The North Carolina Almanac (Nashville, TN: Rutledge Hill Press, 1988).

[29]County and City Data Book 1988 (Washington, DC: U.S. Census Bureau, 1988).

CHAPTER III

REGIONAL SOCIOECONOMIC DEVELOPMENT CONTINUUM: A FACTOR ANALYTIC APPROACH

Introduction

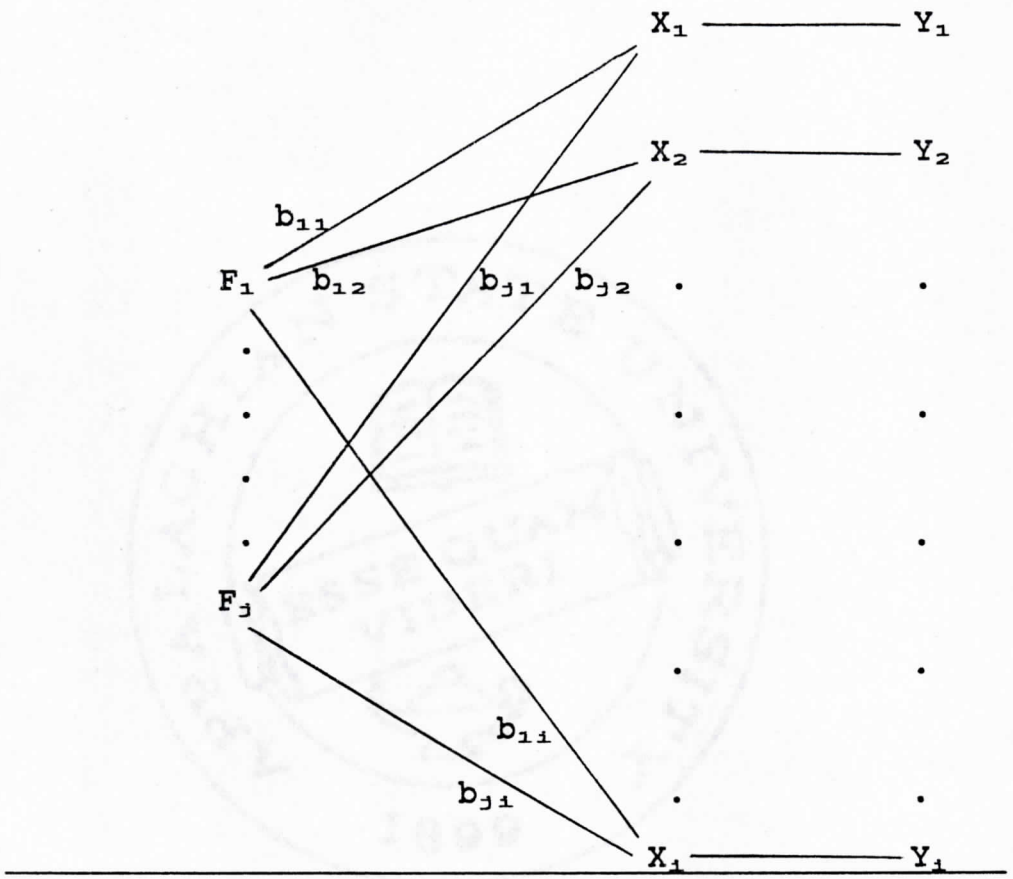
In the previous chapter we illustrated individual patterns of variables expressing various aspects of socioeconomic development across the state. It is a more difficult procedure to aggregate these patterns and to develop an understanding of more general characteristics of socioeconomic differences. Fortunately, over the past 20 years, factor analysis has been increasingly used by social scientists to reduce dimensionality. The objective of this chapter, then, is to aggregate the eight key variables to fewer dimensions using factor analysis. The resulting dimensions will further help define a socioeconomic development continuum.

Factor analysis refers to a variety of statistical techniques whose common objective is to represent a set of variables in terms of a smaller number of hypothetical variables.[1] It assumes that the observed variables are linear combinations of some common underlying factors, and thus the underlying common factors are responsible for the covariation among the observed variables. To visualize the

Figure 3.1

Path Model for a i-Variable,

j-Factor Model--The Orthogonal Case



Source: revised from Kim, 1978.

relationship between observed variables and source variables, refer to Figure 3.1.

The basic model is expressed as following:

$$X_i = b_{ji} * F_j + Y_i$$

where X = i dimensional observed variables

b = factor loadings

F = j dimensional underlying common factors

Y = unique factors.[2]

This representation shows directly that, for the case of uncorrelated and standardized factors, the common factor loading, b_{ji}, expresses the correlation between the jth factor and the variable X_i.[3]

Underlying Common Factors

The eight key socioeconomic indicators provide the observed variables for dimension reduction. There are three basic procedural steps involved in factor analysis. They are, the preparation of a correlation matrix, the extraction of initial factors and the rotation to a terminal solution.

The correlation matrix contains all possible correlations between the eight key variables (Appendix 2). The matrix supplies the necessary data for extracting underlying common factors.

Among the several methods of extracting common factors, the principal component analysis is the technique used in this study. The basic purpose of this method is to account for the total variation among North Carolina's 100 counties in eight-dimensional space by forming a new set of orthogonal and uncorrelated common factor.[4] Each member

of the new set of common factors is a linear combination of the original set of the key variables. The linear combination was generated in such a manner that each successive common factor accounts for a smaller portion of total variation. The number of factors is always the same as the number of source variables, unless it is arbitrarily omitted since the first several common factors explain the most variation in the variables. The common factors extracted for the key variables are provided in Table 3.1.

Table 3.1

Initial Factor Extraction

Principal Component Analysis

	Eigenvalue	Proportion	Cumulative
Factor 1	3.978969	0.4974	0.4974
Factor 2	1.111765	0.1390	0.6363
Factor 3	0.875833	0.1095	0.7558
Factor 4	0.696680	0.0871	0.8329
Factor 5	0.645359	0.0807	0.9136
Factor 6	0.411243	0.0514	0.9650
Factor 7	0.177562	0.0222	0.9872
Factor 8	0.102589	0.0128	1.0000

The first two common factors indicate the most significant independent patterns of relationships that exist among the eight variables. The first accounts for most of the variance in the data, 49.74 percent. The second has its value of 13.90 percent. It is appropriate to use these two factors to illustrate the regional development pattern since it explains a total of 63.63 percent of the variance existing in the eight key variables.

The final procedure involves rotation of the initially extracted eight factors to a terminal solution. This will remove the restriction posed on the initial solution: 1. underlying factors are orthogonal to each other, and 2. the first factor accounts for as much variance as possible, the second factor accounts for as much of the residual variance left unexplained by the first factor, and so on. Thus, after rotation a simpler and more interpretable result will emerge.[5] The rotations include orthogonal and oblique rotation. Table 3.2 gives the rotated factor pattern through PROMAX rotation, the commonly used oblique rotation method.[6]

The degree to which each variable is involved in each factor is measured by loading. The higher the loading, the more the variance of a variable can be explained by that factor. Grouping of variables with high loadings on a factor are used to describe the character of the factor.

Table 3.2

Factor Loadings of the Development Key Indicators

For PROMAX Rotated General Factors*

Variable	Factor 1	Factor 2
ED80	0.70595	
POV79		0.93617
RESALE82	0.52865	
IPOR80		0.94716
ODP86	-0.62715	
PCI87		-0.59488
UEMR82	-0.75946	
PHYS85	0.75853	

Variance Explained by Each Factor

Factor 1	Factor 2
2.609156	2.481578

* Only loadings greater than 0.50 are shown.

The first factor loads most heavily on PHYS and ED but most negatively on UEMR. This factor can be interpreted as a dimension reflecting "Professional Skill Development" (PSD) with the usual associations to a job availability and a population's ability to handle a job's skill requirements. As discussed before high retail sales in a county usually registered with high in-commuters who travel

to specified counties for job opportunities. Old age dependents are likely to have less skill or the skill available has nothing to do with attaining job requirements.

Factor scores can be calculated for each county.[7] For this factor the higher the score, the better the standing in the PSD.

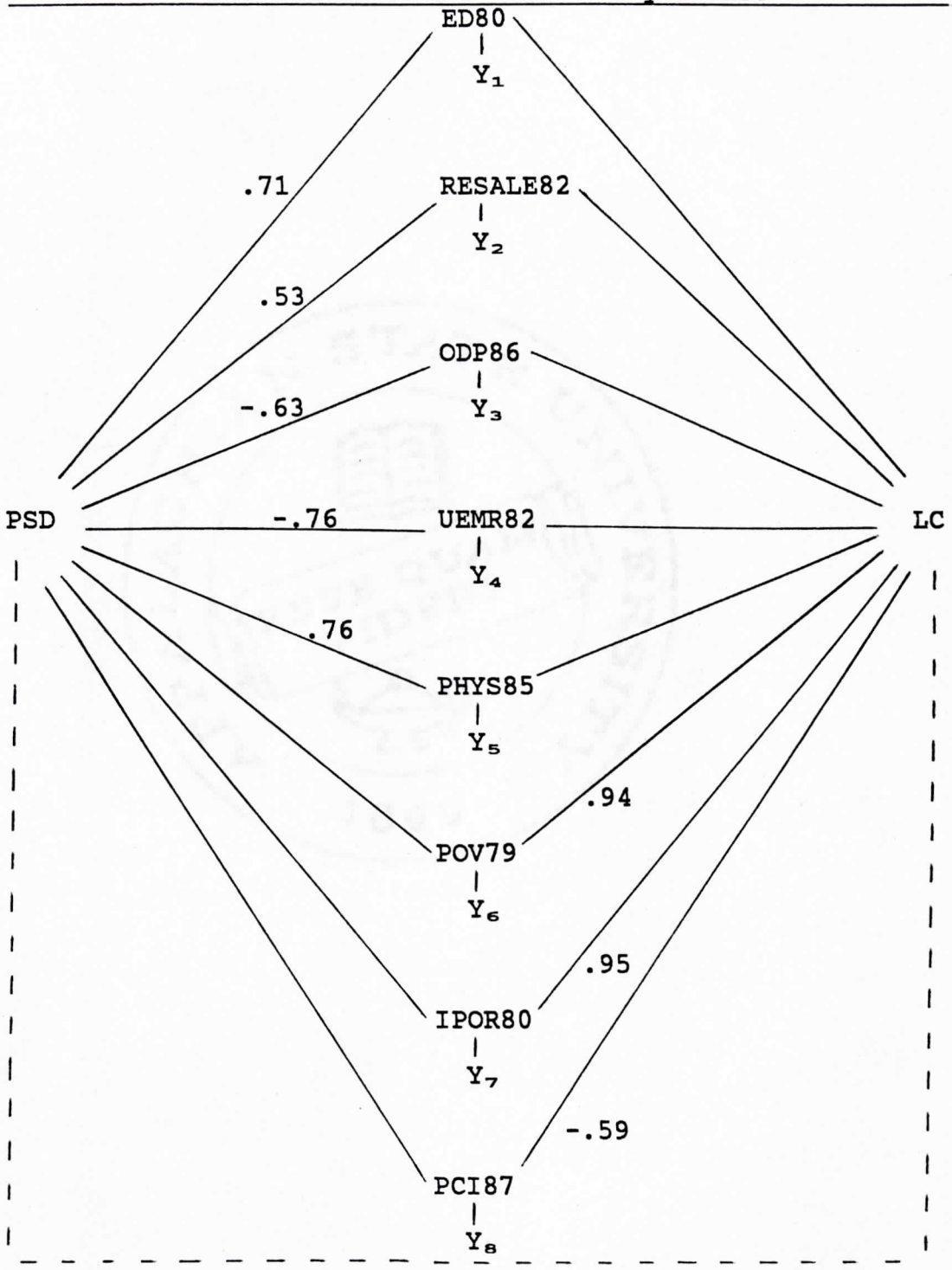
Factor 2, on the other hand, loads heavily with POV and IPOR, and negatively with PCI. This factor suggests another dimension defined here as "Living Conditions" (LC). The financial stability is a key factor here and it affects the population's ability to have an affordable home. For this factor the higher the score, the worse is the standing in the LC.

A model provided in Figure 3.2 illustrates the relationship between underlying common factor 1, factor 2, and the eight key variables.

Professional Skill Development Dimension

Factor 1 is viewed as Professional Skill Development dimension (PSD) for the reasons discussed earlier. Counties found with high scores (Appendix 3) on the PSD reflect a combination of high physician rate, high level of educational attainment, and a low unemployment rate, as well as a low old age dependency and good basic service

Figure 3.2 Path Model for a Eight-Variable, Two-Factor Model--The Oblique Case



*Yi is unique factor which affects only related variable.

amenities. So the higher the factor score 1, the better is the county's professional skill development standing.[8] It is most clearly shown in Piedmont counties containing large cities. Other counties within the highest range are the counties either with public university or military installation.

The middle-range counties are located in all of the four physical regions of the state. They are located adjacent to the urban metropolitan counties in the Piedmont, though the counties along the Virginia border did not fall within the same category (Figure 3.3). In addition, they are also found in the southeastern mountain and foothills area, especially the wealthy retiree counties such as Polk and Henderson counties and the metropolitan Buncombe County. In the eastern part of the state, there are two major clusters. One is comprised of the counties around Pitt and Wilson counties, where people are better prepared and jobs are more plentiful than most of the agricultural dominated counties in the Coastal Plain. Another is the cluster of northeastern counties which appear influenced by the Virginia metropolitan area of Norfolk. Dare and Carteret counties have high scores too. This is due to their high standing in many of the contributing variables.

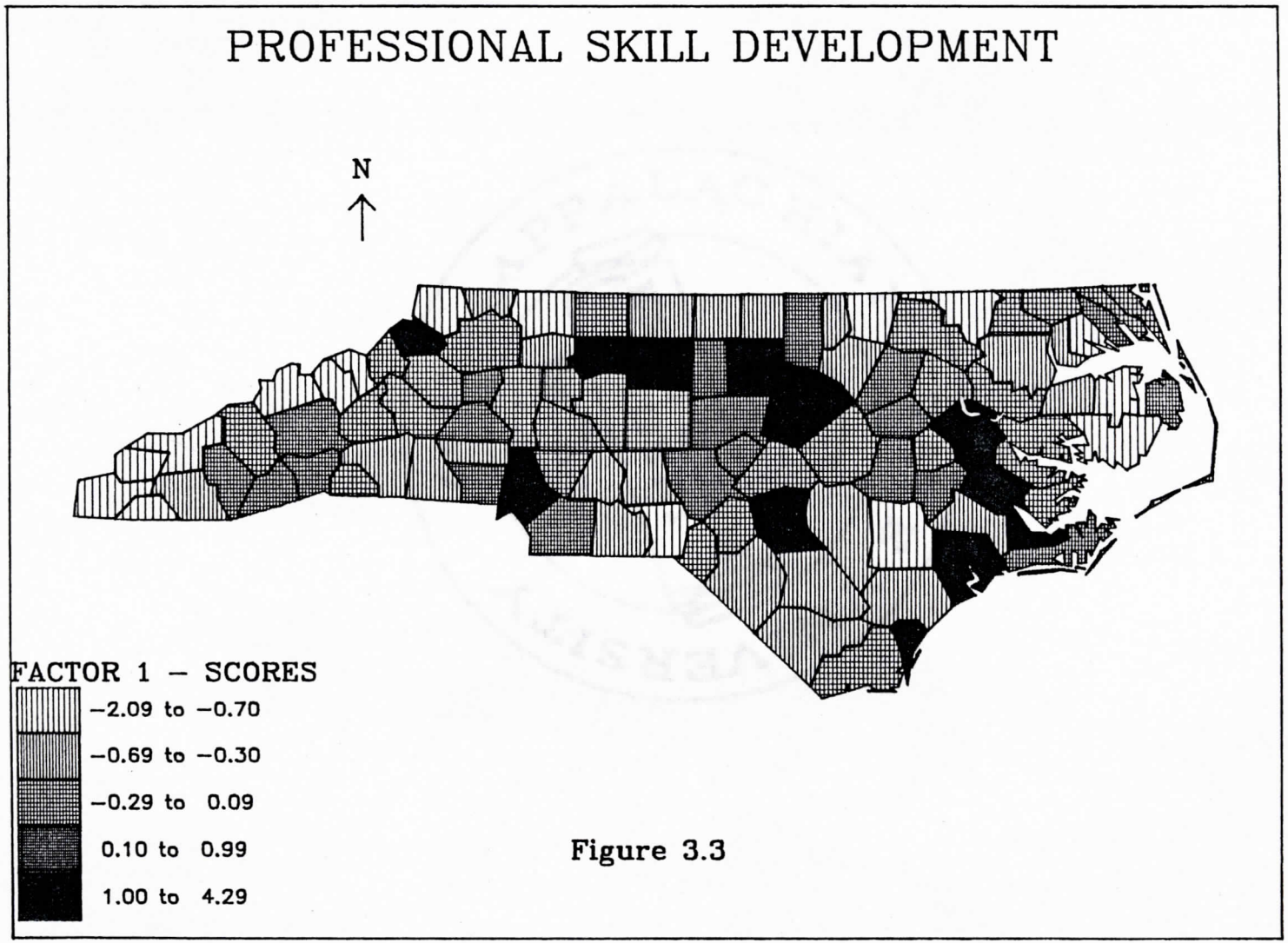

PROFESSIONAL SKILL DEVELOPMENT
N
FACTOR 1 – SCORES
–2.09 to –0.70
–0.69 to –0.30
–0.29 to 0.09
0.10 to 0.99
1.00 to 4.29

Figure 3.3

The counties that fall within the lowest PSD range are located mostly in the eastern areas with high concentration of minority population, especially blacks and Native Americans, and in the western mountains. The population in the western Mountains appears to have the lowest preparation for jobs and the economy there does not provide much in the way of diversified opportunities.

This professional skill development dimension is one of the important underlying common factors that account for the socioeconomic development variation measured by the eight key variables.

Living Conditions Dimension

Living Conditions Dimension (LC) is correlated to PSD with a correlation coefficient of negative 0.504. This is interpreted as high PSD scores being likely associated with low LC scores (Appendix 3). Another way of stating this is that high professional skill development is more likely correlated with better living conditions.

A high factor score 2 gives a combination of high poverty, poor housing condition and low income. So the lower the score 2, the better is the county development standing.

The LC yields a more distinct spatial pattern indicated by the gradual shift from the center Piedmont of

negative values to high scores in both the western and the eastern counties (Figure 3.4). The spatial continuum is clearer in the LC than in the PSD. There are several clusters here that need to be discussed. First is the cluster in the western Piedmont where the furniture, textile and apparel industries employ a large number of low-skill workers, thus bringing up the per capita income and lowering the poverty percentage.[9] This also helps the residents to build better homes in the area. Another cluster with negative LC is again comprised of the retiree counties in the western Mountains. The counties in the eastern part of the state generally score high, especially in the minority concentrated area where most of negative development disadvantages are present. The military related counties rank in the middle for this score as a result of very restricted economic activities involved.

Although the two dimensions illustrate different patterns from different angles, by themselves they do not present a very satisfactory solution to the delineation of the Intermediate Socioeconomic Development Region until the development continuum is specified.

A Socioeconomic Development Continuum

"Contemporary conditions of socioeconomic development suggest the existence of a continuum in quality of life

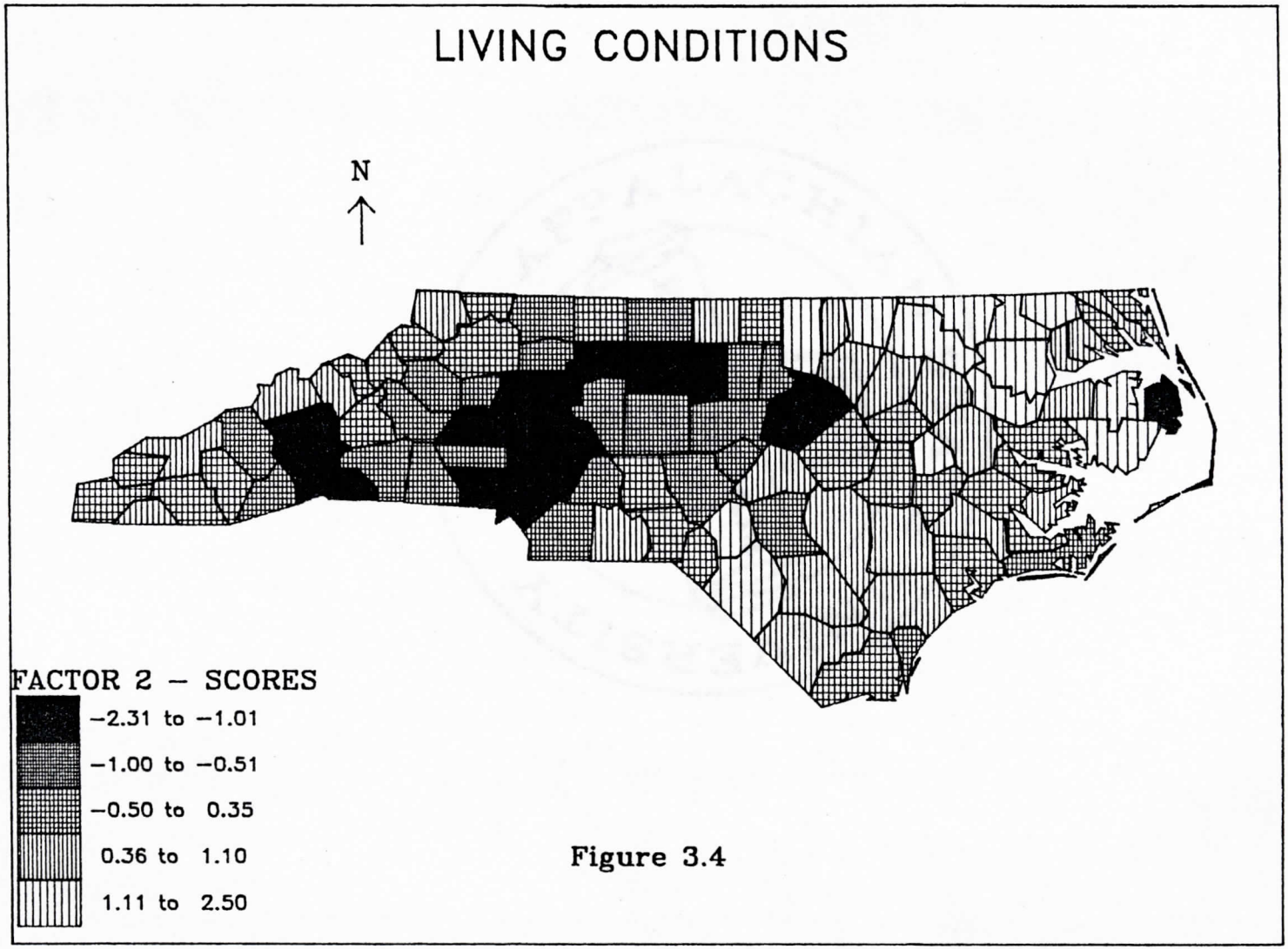

LIVING CONDITIONS
N
FACTOR 2 – SCORES
–2.31 to –1.01
–1.00 to –0.51
–0.50 to 0.35
0.36 to 1.10
1.11 to 2.50

Figure 3.4

conditions from their most positive in the metropolitan regions to their least positive in peripheral regions."[10] This socioeconomic development continuum exists in the context of socioeconomic variations measured by the identified key variables.

When scores of PSD and LC are calculated for each county, a graph (Figure 3.5) of PSD score against LC score are plotted. The graph shows a relatively continuous plot of the counties' position on this two-dimensional space from the upper left corner to the low right. It is clearly more reasonable to view this gradation pattern of development as a continuum as opposed to a center-periphery pattern. A best fit regression line through the plot dots is calculated. This line provides the general trend around which the counties are located in the two-dimensional space. Since these two dimensions explain more than 60 percent of variance existing in the socioeconomic key variables, the regression line will here be interpreted as a development continuum.

Along this development continuum the counties at the upper left corner have the highest PSD scores and lowest LC scores; thus, they have the highest level of socioeconomic development within the state. These counties are likely to be defined as growth centers. In contrast, the counties located at the low left end have the most negative

SOCIOECONOMIC DEVELOPMENT CONTINUUM

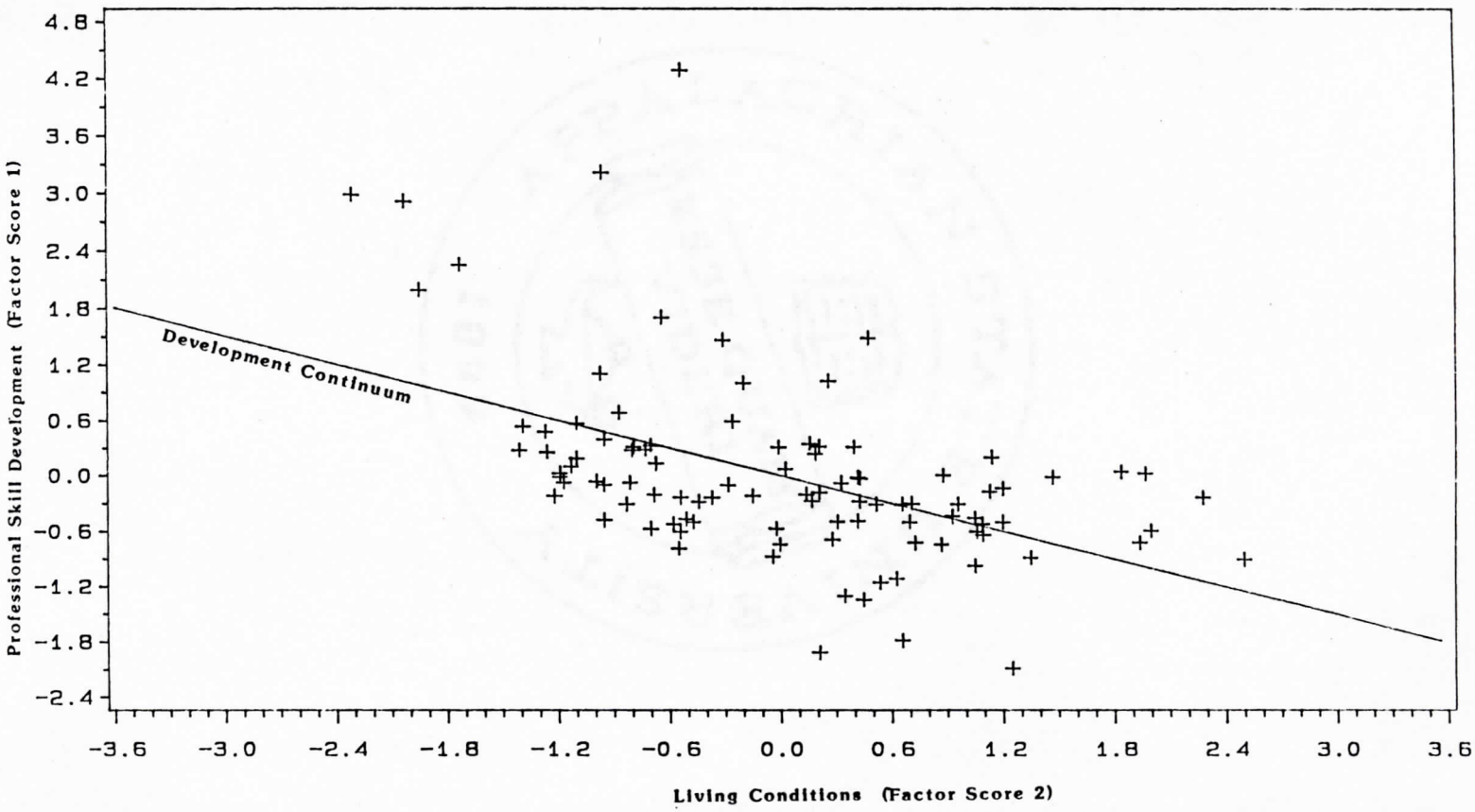


FIGURE 3.5

development. This places them in a peripheral position. The counties located in the middle of the continuum connect growth centers and peripheries in terms of socioeconomic development level. This continuum portion includes the counties that in the aggregate comprise the ISER. It is now important to look at the spatial relationship, in particular where these middle range counties are located. Do they, for example, provide geographic or locational meaning to the terms, center, intermediate and periphery? This will be addressed with the identification of the ISER counties in Chapter IV.

Major Findings and Conclusions

This chapter extracts two underlying common factors, through the use of factor analysis, from the key socioeconomic development variables discussed in the Chapter II. These factors are interpreted as two development related dimensions, professional skill development (PSD) and living conditions (LC). The higher the PSD score, the better is the development level. The lower the LC score, the better is the county's development standing. In the two-dimensional space, PSD and LC scores are negatively correlated. By combining the two, a socioeconomic development continuum is identified.

Therefore, in this two-dimensional space each county has its own standing. This provides the basis for the following process of county clustering that will lead to the identification of the Intermediate Socioeconomic Development Region.

Notes

[1]Jae-On Kim and Charles W. Mueller, Introduction to Factor Analysis (London: Sage Publications, 1978).

[2]See Note 1 above.

[3]See Note 1 above.

[4]Mark L. Berenson et al., Intermediate Statistical Methods and Applications (Englewood Cliffs, New Jersey: Prentice-Hall, 1983).

[5]See Note 1 above.

[6]See Note 1 above.

[7]Jae-On Kim, "Factor Analysis," Statistical Package for the Social Sciences, ed. Norman H. Nie et al. (New York: McGraw-Hill, 1975), 489.

[8]See Note 7 above.

[9]Ole Gade and Daniel Stillwell, North Carolina: People and Environments (Boone, NC: Geo-App Publishing Co., 1986).

[10]Ole Gade, "Dealing with Disparities in Regional Development: The Intermediate Socioeconomic Region," a Paper Delivered at the Annual Meeting of the Association of American Geographers, Toronto, Canada, April 21, 1990, 2.

CHAPTER IV

THE INTERMEDIATE SOCIOECONOMIC DEVELOPMENT REGION: A CLUSTER ANALYTIC APPROACH

Introduction

In Chapter III, we were able to define the location of the 100 North Carolina counties along a socioeconomic development continuum. In this chapter we need to group the counties along the continuum, thus providing the basis for regionalizing the three stages of development for this study, the Growth Core/Urban Center, the Intermediate Socioeconomic Development Region (ISER), and the Periphery. From this we can then proceed to assess the specific characteristics of each stage and, following the mapping of the counties by development category, we will explore the implications of their spatial relationships.

Cluster Analysis

Grouping of the counties can be done through cluster analysis. Objects with similar characteristics are likely to be located closely on their n-dimensional attributes spaces (Figure 4.1), if these attributes successfully capture the principal features of the objects.[1] When the objects have their own registration on the n-dimensional

attributes space, it is possible to use a statistical procedure identifying object similarity.

Cluster analysis is viewed as a dimensional-free classification procedure that attempts to subdivide or partition a set of heterogeneous objects into relatively homogeneous groups.[2] Thus the outcome of cluster analysis is the development of a classification scheme that provides the sequence of groupings by which a set of objects is divided. So a cluster is a set of one or more objects that are similar to each other. As seen in Figure 4.1, a cluster can comprise one county or as many as are being evaluated. The statistical sequence of groupings is revealed usually in a tree diagram in Figure 4.2. In figures 4.1 and 4.2, two classifications were needed and thus five counties were grouped into two clusters (Figure 4.1), with the cutoff distance being 16.0 (Figure 4.2).

Cluster analysis has previously been used in geographic analysis. As early as the 1960s Berry applied clustering to geographic regionalization.[3] Morrill also used cluster analysis to group U. S. states into different demographic regions.[4] Recently, it has been utilized in remote sensed image processing to classify different landuses and landcovers.[5] It has been a very useful statistical tool where the analytical need is to minimize the variation within the group and maximize the differences

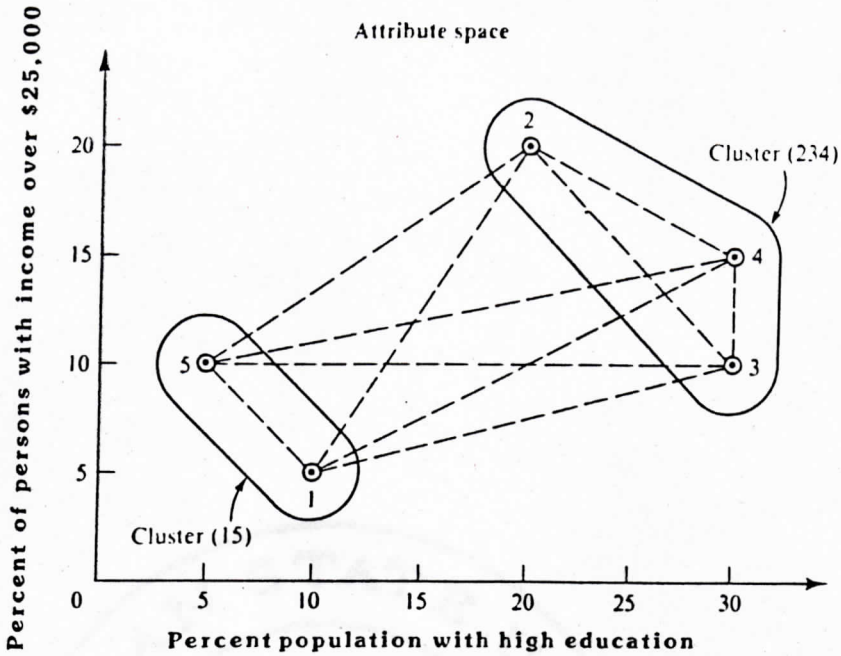


Figure 4.1 County Cluster Example (revised from Romesburg,1984)

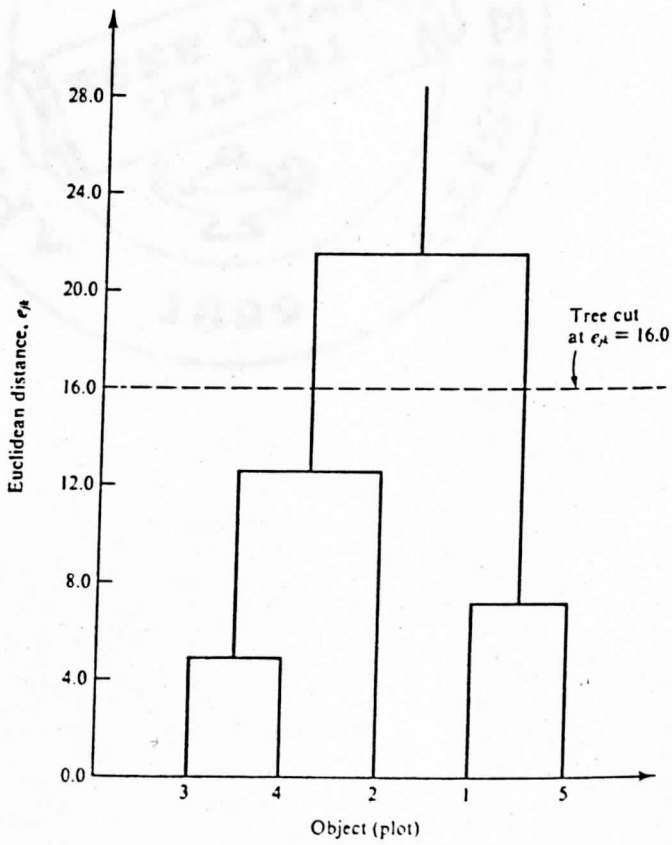


Figure 4.2 Tree Diagram of Clusters (revised from Romesburg, 1984)

between groups and thus arrive at a statistically meaningful classification of objects or regions. It is important to note that cluster analysis does not derive a simple statistical ranking for the objects included in each class.

A great number of methods are available for conducting a cluster analysis. Among the methods listed in SAS and other computer statistic packages, Centroid Hierarchical Cluster Method is selected because it appears to best serve the particular study needs.[6] The Centroid method uses generally concepted Euclidean distance between any two cluster's centroids or means:

$$D_{kl} = \|\overline{X}_k - \overline{X}_l\|^2$$

where D_{kl} = any distance measure between Cluster C_k and C_l

$\overline{X}_k$ = mean vector for cluster C_k

$\overline{X}_l$ = mean vector for cluster C_l

$\|\overline{X}_k - \overline{X}_l\|$ = Euclidean length of the distance of $\overline{X}_k$ and $\overline{X}_l$.[7]

The smaller the distance between two clusters, the better is the chance for combining.

Defining Counties by Level of Development

Clustering resulting from the Centroid Hierarchical Cluster method provides meaningful details in the context

of socioeconomic development analysis. When eleven clusters are used, three main regions emerge, Growth Core/Urban Center, ISER, and Periphery. There are four clusters in the Growth Core, two in the Urban Center, two in the ISER, and three in the Periphery, as identified in Figure 4.3. Developmental conditions seem to improve as one views the diagram from the lower right to the upper left.

Growth Core/Urban Center Region

Although six counties in the Growth Core are distinctive counties with advanced development, there are also many differences among them. Mecklenburg and Wake are clustered as the most developed counties, while Guilford and Forsyth are grouped as secondary counties. Durham with its highly advanced manufacturing base is a lot different from the largely university-dominated economy in Orange County. Both are grouped by themselves. Yet all fall into the Growth Core cluster.

In the Urban Center, with 31 percent of the counties, there are Urban Center 1 (24 percent) and Urban Center 2 (7 percent). Urban Center 1 consists of a. counties with retiree population in the mountains; b. heavily tourist involved counties; and c. counties with a certain minimum level of manufacturing capability and located close to the

REGIONALIZING NORTH CAROLINA COUNTIES

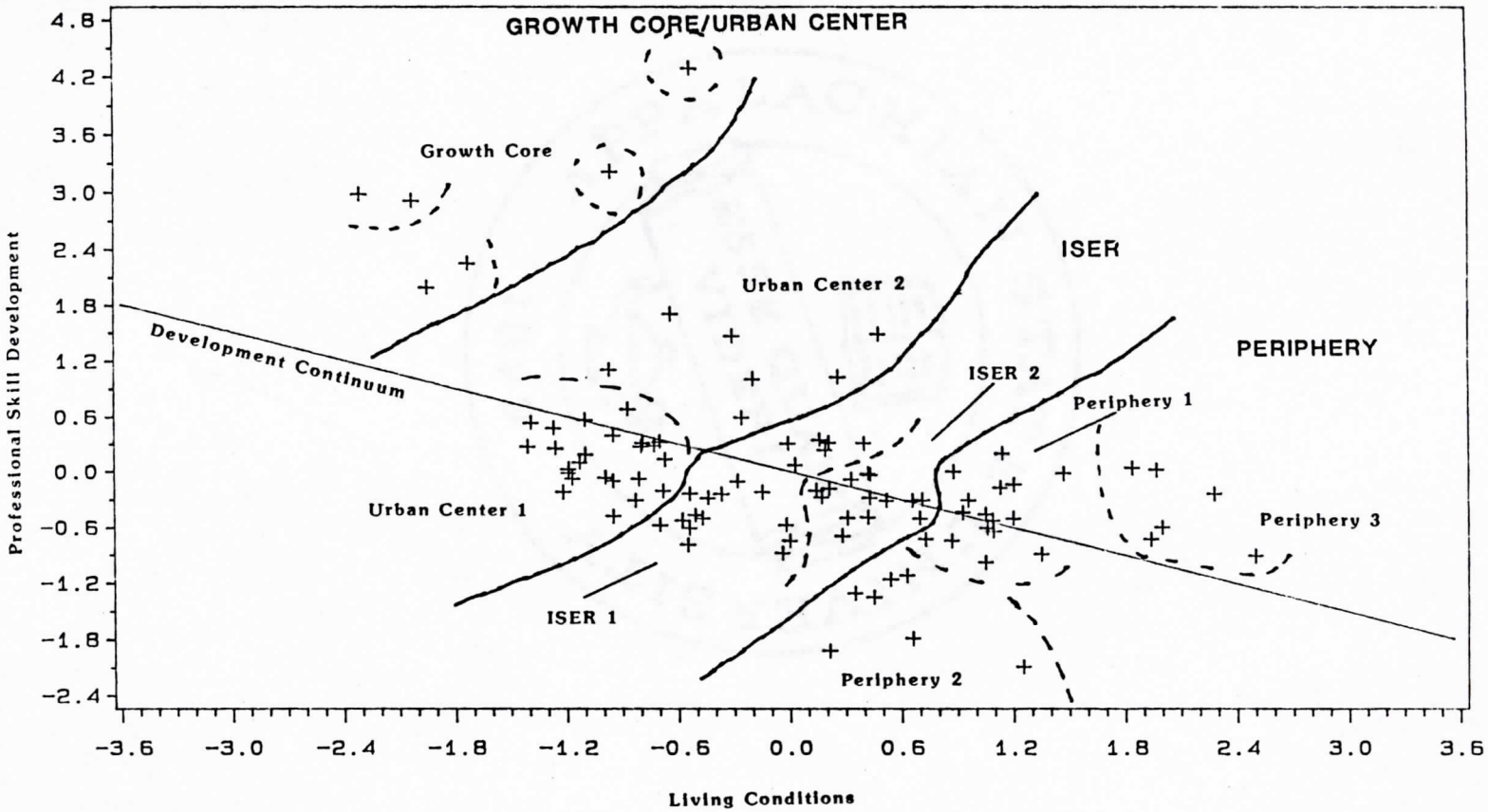
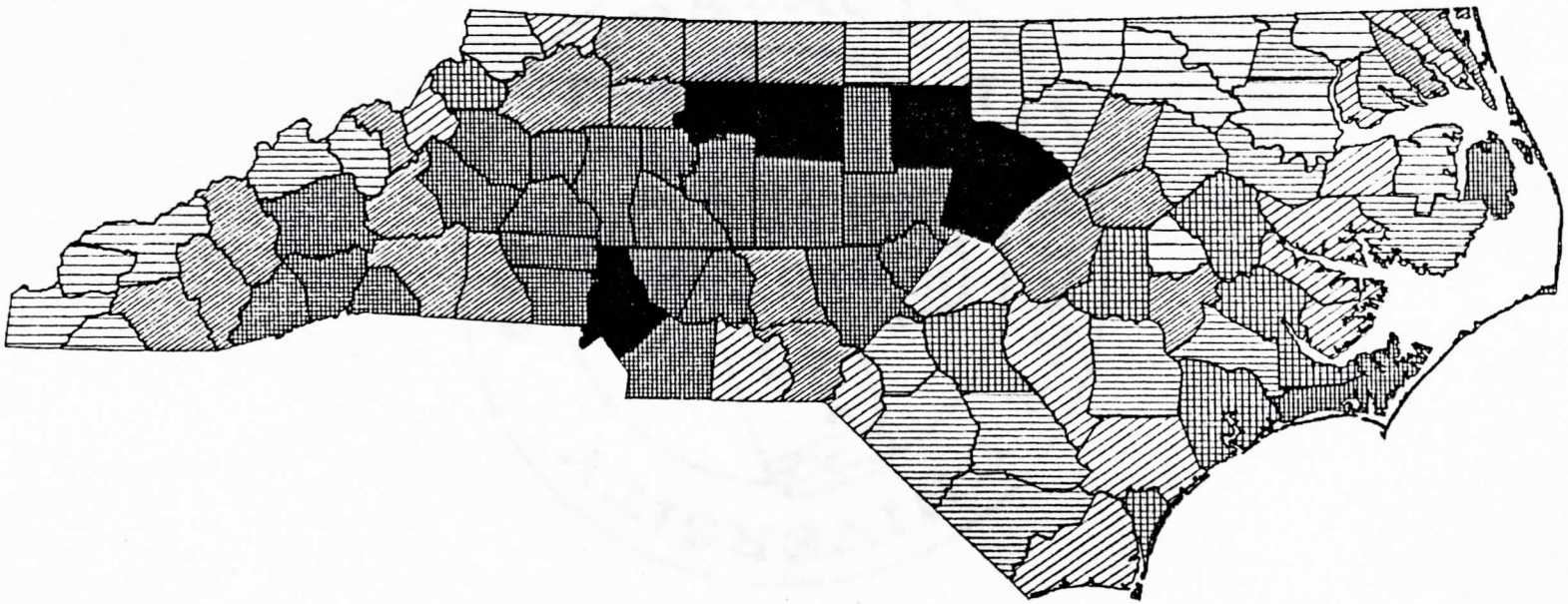


FIGURE 4.3

Growth Core to which these counties are tied by commuting (Figure 4.4). Buncombe functions as a center for job opportunity to its surrounding counties, and so does Catawba County. Dare County with its summer tourist season attracts labor force from the adjacent counties. Lee County is some distance away from the Core, but its economic base provides job opportunities for adjacent less developed counties. Harnett, for example, has more than 1,000 commuters to Lee County. Transylvania's high commuting ratio is caused by over 1,000 in-commuters from Henderson County. Most counties in this group have less in-commuters than out-commuters (commuting ratio < 1.0:1).[8]

The counties in Urban Center 2 are located mainly in the eastern part of the state (Figure 4.4). These counties are the site of large public investments such as military bases or large universities. Cumberland, Onslow, Wayne, and Craven counties each contain military bases which attract large amounts of both capital and population into otherwise predominantly rural and agrarian areas. Likewise, large public universities play a similar role in Watauga, Pitt, and New Hanover counties. Cumberland, New Hanover and Pitt counties, however, also contain urban centers such as Fayetteville, Wilmington, and Greenville. Although seven counties in this cluster do not function at the scale of the core counties, they do, to some degree, act as the

SOCIOECONOMIC DEVELOPMENT REGIONS



REGION

- Growth Core
- ISER 1
- Periphery 2
- Urban Center 1
- ISER 2
- Periphery 3
- Urban Center 2
- Periphery 1

FIGURE 4.4

centers to their less developed surrounding counties. Cumberland, Craven, New Hanover, Onslow, and Watauga all provide job opportunities for the surrounding counties.[9]

Intermediate Socioeconomic Development Region (ISER)

In the ISER with 34 percent of the counties, there are ISER 1 (20 percent) and ISER 2 (14 percent). For the most part, ISER 1 counties contain smaller cities and towns with much smaller manufacturing bases than the Urban Center counties. Their industries are mainly textile and apparel oriented, as is most apparent in Surry, Rockingham, Cleveland, Rutherford, Montgomery, McDowell, Richmond, Lenoir, and Nash counties. Some counties have relatively strong seasonal tourist bases such as Jackson, Currituck, Johnston, Haywood, and Yadkin counties. Retirees's influence on the local economy are seen in counties such as Mitchell, Macon, Jackson, and Haywood. Jackson and Pasquotank counties also contain public universities which are locally important, but are considerably smaller in enrollment and investment than the ones connected to the previously mentioned Urban Center counties. Agriculture, however, still plays an important part economically in many of these counties. So, with the development continuum in mind, various factors influence the local economy but with different intensity. The counties in this cluster are

mostly located further away from the Cores (Figure 4.4) than the Urban Center counties, but close to Periphery just like the counties in the ISER 2.

ISER 2 is comprised of counties at the lower end of the intermediate development level (Figure 4.3). During the time of economic stress some or many of these counties may well show as peripheries. This is due to the lesser strength of the counties' economic base, which is in part related to their smaller population bases. There is a higher percentage of the labor force involved in primary activities such as farming and fishing than the counties in the ISER 1. There is less diversification in the manufacturing industries which mainly comprise small scale textile, apparel, lumber and wood production, as well as the food industry. Within this cluster, some counties have more diversified economies than the others. This is the condition for counties like Harnett, Beaufort, Scotland, and Sampson where some employment is connected to electric and nonelectric machinery industry. The generally weak economic bases illustrated by small scale investment and less diversification are typically severely affected by economic recessions. This economic base structure also is less attractive to private investments if no special public assistance is available. In this cluster we also notice a common phenomenon of counties located close to the Cores or

the Urban Centers. For example, Brunswick, Pender and Harnett counties benefit from accessibility to the economic and social amenities in the adjacent developed centers. Without this linkage, these counties may well be in the periphery. And yet it is clear that the smaller scale of the adjacent urban centers do not permit the degree of suburban/exurban development seen in the Piedmont counties, though Brunswick County comes closer to this Piedmont effect. By location, the counties in this cluster are closely connected to the peripheries.

Periphery Region

The centroid cluster method groups the rest of the counties in the state into three clusters within the periphery region, with 29 percent of the counties, Periphery 1 (6 percent), Periphery 2 (7 percent), and Periphery 3 (16 percent).

Periphery 1 seems to stand at the upper level of development in the periphery region. It spreads into all four physical regions in the state (Figure 4.4). In this cluster, there are some counties that are more developed than others. Vance, Edgecombe, Granville, Franklin, Columbus, and Robeson counties have larger industry bases than the remainder. They still fall into the periphery category due to their very negative scores in the key

variables we selected in this study. These are also the counties with larger populations.

Periphery 2 contains the counties with minimum economic bases and, except for Tyrrell County, are located in the western mountains. The major industry base is lumber and wood production.

Periphery 3 is confined to the Coastal Plain, except for Warren County in the Piedmont, in an area of heavy black population concentration (Figures 4.3 and 4.4). Uneven distribution in income is reflected in high poverty level and poor housing condition. This group of counties is at the lowest level of the living condition dimension. High unemployment, low educational attainment combine as additional factors that slow the pace of this area's development.

In summary, the clustering of the counties with similarity show a spatial gradation from the most developed Growth Core to the well developed Urban Center, then, outward to the surrounding ISER which is more closely linked to the Periphery, where the lowest level of development occurs. The strong commuting linkage between Growth Core and Urban Center counties suggests the accessibilities of less developed counties to the more developed counties' social and economic opportunities and amenities. To a lesser degree, ISER and Periphery counties

are also affected or linked to the Urban Center, especially when they are close by. The linkage, influence and exchange of opportunity, amenity and information between the adjacent counties contribute to the spatial gradation of development over the landscape. In fact, to the existence of a development continuum (Figure 4.3), this also suggests the difficulty of Peripheral development when they are by distance far away from the Growth Core. Internally, the Periphery usually has less social and economic foundation for rapid growth. Therefore, when regional planning aims to promote balanced development and assist regions desperately needing development, we may consider an alternative: utilizing the intermediately developed region as a funnel for development into the periphery. The ISER, after all, is physically close to the periphery and generally more developed.

ISER and Periphery Comparison

The ISER and Periphery counties are named by their relatively standing along the development continuum, which is defined using the key variables. Among these variables we note that the population mobility dimension is not included. Population mobility indicators are probably the most dynamic measures of an area's social and economic condition, since people have the potential to move for

better opportunities and improved cultural environments. Thus, a comparison of mobility indicators between Periphery and ISER is helpful.

Generally, ISER has higher population change rates than the periphery, which is largely due to its higher net migration (Table 4.1). Rural, but not isolated living environments, seem to provide a large attraction for Americans. In the ISER, more than 80 percent of the counties received immigrants compared to less than 70 percent in the Periphery. Among them, 34.4 percent of the counties in the ISER experienced rapid increase, a rate almost three times higher than that of the periphery. The existing differences of social and economic amenities and opportunities between more developed ISER and less developed Periphery contribute to the population growth variation. The ISER seems to have more potential for population growth than the Periphery.

Comparing the population size and population density of the two also points to the ISER's advantage over the Periphery for growth. The average population size for ISER is 36,849, and Periphery 25,415. The ISER's population density is 57 percent higher than the Periphery. Large population size provides the tax base and the threshold for various economic activities and service amenities.

Table 4.1

ISER Periphery Comparison

	ISER	Periphery
Population Change (%)	5.84	4.82
Proportion of Counties by Degree of Population Change, 1980-1986		
Decrease & No Change (<=0.0)	5.9	3.4
Moderate Increase (0.0-10.0)	80.4	86.3
Rapid Increase (>=10.0)	14.7	10.3
Net Migration (Co. Average)	1,253	441
Proportion of Counties by Degree of Net Migration 1980-1986		
Decrease & No Change (<=0)	18.6	40.7
Moderate Increase (0-1500)	47.0	58.2
Rapid Increase (>=1500)	34.4	11.1
Population (Co. Average) 1980	36,847	25,415
Person Per Square Mile 1986	82.9	52.8

While the population base and population growth points to the advantage of ISER over Periphery, a further investigation illustrates the close connection between the two development regions. The research of this connection is

implemented by studying another mobility indicator, commuting data. The connection is largely due to the proximity of two regions and also due to the uneven provision of job opportunities. Despite the fact that both ISER and Periphery are at the lower part of the development continuum and they usually need external support for job opportunities, the ISER generally has more jobs provided to the in-commuters than that of the periphery. In the ISER, 11 out of 34 counties have a commuting ratio larger than 1.0:1, almost two times more than the periphery[10] But the commuting patterns do not always show a clear direction from the Periphery counties to the ISER counties. The very low educational attainment in the southwestern mountain counties and the northeastern heavily black counties prevent the population from having many job opportunities and the unemployment rate in these areas remain the highest in the state. In some cases, in-commuters from the ISER counties even take over the jobs available in the Periphery. Jackson and Clay both have more than 500 out-commuters commute to the poorer counties, Swain and Cherokee, respectively, for jobs. More education is needed for the very isolated population and also external support for investments which provide more job opportunities.

In conclusion, in addition to the proximity to the development cores and urban centers, ISER counties have

clear development advantages over the Periphery counties in terms of larger population size, higher population growth rate, and stronger economic base for further development.

Major Findings and Conclusions

Using cluster analysis, North Carolina's 100 counties have been divided into three clusters, representing the three different levels of development, Growth Core, ISER, and Periphery. Growth Core consists of the most dynamically growing counties which are the growth cores or second level development centers in the state. The ISER comprises the counties with intermediate development standing along the development continuum. These counties' economic bases are weaker and less diversified than the Growth Core, but overscore the Periphery, which stands at the lower end of the development continuum. Spatially, North Carolina counties show a strong gradation of development level from the most developed counties in the Piedmont to the counties nearby with the intermediate development standing, and then to the least developed peripheral counties in the westernmost mountains and in the eastern part of the state. As the distance from the Piedmont Growth Core increases, the development level decreases. This distance decay function suggests the strong interregional relationship due to proximity. This leads to a recommendation of this study

that ISER serve as development funnel through which the Periphery benefits from the opportunities nearby. The comparison of the ISER and Periphery also points out the development advantages of the ISER over the Periphery. Thus, this study provides an alternative for periphery development which has long been the regional planning concern of balanced development across the state.

Notes

[1]H. Charles Romesburg, Cluster Analysis for Researchers (Belmont, CA: Lifetime Learning Publications, 1984).

[2]Mark L. Berenson et al., Intermediate Statistical Methods and Applications (Englewood Cliffs, New Jersey: Prentice-Hall, 1983).

[3]Brian Berry, "Grouping and Regionalization," Quantitative Geography, ed. W. L. Garrison and D. Marble, Northwestern University Studies in Geography, No.13, 1967.

[4]Richard L. Morrill, "Regional Demographic Structure of the United States," The Professional Geographer, 1 (1990), 38-53.

[5]John R. Jensen, Introductory Digital Image Processing (Englewood Cliffs, NJ: Prentice-Hall, 1986).

[6]SAS Institute, SAS User's Guide: Statistics (Version 5 Edition) (Cary, NC: SAS Institute Inc., 1985).

[7]J. H. Ward, "Hierarchical Grouping to Optimize an Objective Function," Journal of the American Statistical Association, 58 (1963), 236-44.

[8]See Note 6 above.

[9]See Note 6 above.

CHAPTER V

THE ISER MODEL

Introduction

Regional development theory has evolved essentially from traditional considerations of the bipolar model, that focuses on center-periphery relationships. The development continuum idea, on the other hand, suggests a gradation of development from the most positive in the growth core regions to the least positive in the peripheral regions. This thesis uses county data, through variable selection, integration and grouping, to verify the existing socioeconomic development conditions which are best described as a gradation along the continuum. It suggests that regional development bipolar relationships are not the appropriate way of visualizing the real world condition, at least for this study case. A visual way showing the basic development relationships among the counties in North Carolina is developed using the results derived from the previous chapters. This chapter, therefore, will evolve a model showing spatial relationships among regions and counties, thus, identifying the possible policy and planning applications of the model.

ISER Model

Operationalizing the ISER Model

To simplify spatial patterns presented in Figure 4.4, a hypothetical model is developed in Figure 5.1, which portrays the basic relationships among regions. A Socioeconomic Continuum Index (SCI) is integrated into the ISER Model to permit the development ranking of counties within each region. As noted in Chapter IV, cluster analysis does not permit a county ranking. The SCI is derived from the two factor scores (Appendix 3), Professional Skill Development (PSD) and Living Conditions (LC), using the formula:

$$SCI = PSD + (-LC).$$

As stated in Chapter III, the counties with high PSD tend to have low LC, remembering that in this instance a low LC score represents county with a high quality of life. This provides an index that position the counties quantitatively along the development continuum. In the model, the SCI lies along the vertical axis (Figure 5.1). Horizontally, the distance scale remains elusive and statistically unmeasured. The resulted SCI rankings correspond well to the outcome of the cluster analysis (Appendix 3). If the SCI cutoffs of -1.25, 0.40, and 2.35, respectively, are used, four groups occur as Periphery, ISER, Urban Center, and Growth Core, with precisely the same constituent

counties as contained within the clusters and regions defined through cluster analysis in Chapter IV.

This operationalized model shows the degree of gradation, in terms of how rapidly the ranking change from the growth cores to the peripheral regions. It also, though more hypothetically, shows a distance decay function, illustrating interregional connections and generation of spreading effects from the Growth Core to the nearby ISER and then to the distant Periphery. Some anomalies exist as initially suggested in the model provided in Chapter I (Figure 1.1). The Urban Center 2, containing the large university or military base, pumps up along the spatially defined continuum (Figure 5.1). The counties in the Urban Center 2 largely benefit from the public investment and become centers within the periphery, but with their narrow economic base, they do not function as effectively as the first ranked growth core counties. The derived model and the findings in this study contribute to the theoretical structure of regional development. It may also lead to the further study for regional planning application.

Application of the ISER Model

Theoretical Considerations

The ISER model provides a way of perceiving the reality of socioeconomic development, as conditions evolve

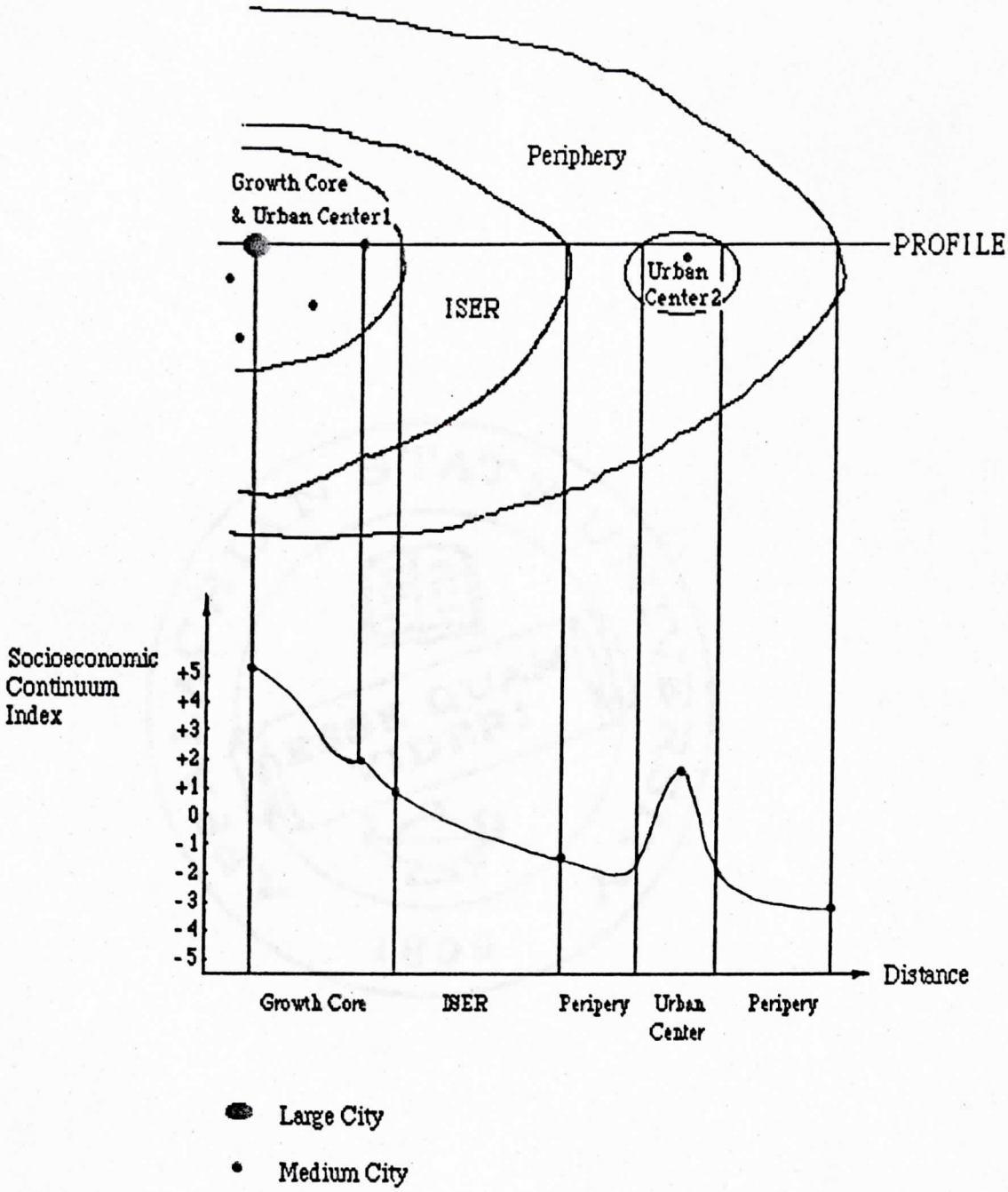


Figure 5.1 The ISER Model

along a continuum and through space. In this way, the model complements and extends the approaches to regional development thought initiated by Myrdal, Friedmann, and Berry, as discussed in Chapter I. It supports the initial notion of the existence of a socioeconomic development continuum as developed by Gade. The validity of the ISER model is tested by the North Carolina empirical case, which may be tested in other states or other countries, given comparable data availability. The variations existing in different study regions may lead to comparisons of socioeconomic development conditions, an assessment of the underlying growth and change mechanisms, and provide a point of departure for a more enlightened regional policy formulation.

Regional Policy Implications

The ISER model achieves two major research objectives: 1. it illustrates the developmental inequality over the landscape and allows this to be measured in terms of the development continuum (SCI); 2. it shows a spatial pattern resembling the result of a distance decay function from the most developed Growth Core to the interveningly located ISER and then to the least developed Periphery. The ISER model points out that development may be seen as a gradation, both from the view of county development ranking

and in terms of the counties' spatial relationships. In this broad based perspective anchored in reality, the ISER may be seen to spatially connect the Center and the Periphery. In this way, the ISER functions as the channel for the Periphery to reach the socioeconomic opportunities existing in the development centers. Assistance to development in the ISER, on the one hand, may promote the region itself. On the other hand, it may relieve the hardship of development in a very disadvantaged periphery where the socioeconomic base is generally poorer than the ISER. It also benefits the nearby Periphery by providing easy access to the opportunities and amenities in the ISER. Thus, the ISER model provides an alternative to regional planning which aims to promote balanced growth, as well as overall efficient and rapid growth in the state.

Problems in Applications of the ISER model

The ISER model is derived from the previous statistical analysis which involves socioeconomic indicators selection, common factors extraction and cluster grouping. The weakness of the model may be reflected in the the choice of indicators and temporal difference in the variables. For example, the variables selected may not have been the best indicators of socioeconomic development for each county, or the year that the data are used may have

had some abnormal impact on the findings, and so on. As discussed in Chapter 2, however, efforts were made to eliminate this problem. As to the ISER model itself, the horizontal distance is still hypothesized and remained unmeasured, obviously calling for further research.

Major Findings and Conclusions

The selection of socioeconomic development key indicators is basically implemented by using Per Capita Income as a general measurement of development. To cover wider aspects of socioeconomic development, seven other variables are selected from the pool of reference variables by conducting a multiple regression analysis, within which the Per Capita Income is the dependent variable. These seven variables explain more than 80 percent of variations existing in the Per Capita Income (PCI). In addition, they bring in various aspects that PCI is unable to indicate but are important to provide an improved understanding of socioeconomic conditions in North Carolina. Thus, eight variables, Per Capita Income, Percentage of Person Below Poverty Level, Educational Attainment, Retail Sales, Unemployment Rate, Incomplete Plumbing and Overcrowding Rate, Physician Rate, and Old Age Dependency are selected as the key socioeconomic development indicators for this study. These eight key indicators cover the various aspects

of socioeconomic development, including financial well-being, population age characteristics, educational attainment, job opportunities, housing conditions, health service and other service amenities.

To aggregate these various aspects of development, a combining process is completed by using factor analysis. This method extracts the common underlying factors that explain the covariation existing in the eight key development indicators. The major two common factors are interpreted as a Professional Skill Development dimension and a Living Conditions dimension. In this two-dimensional space, the plot of factor scores for each county shows up as a general trend that the higher a county's Professional Skill Development standing, the better are the Living Conditions of this county. Thus, the Development Continuum is defined through a best fit line expressing this trend. The ranking of North Carolina's 100 counties shows a clear gradation in terms of the socioeconomic development levels along this Development Continuum.

To generalize the counties into the development regions, a cluster analysis is conducted. The 100 counties are grouped into three clusters representing the three different levels of development, Growth Core/Urban Center, ISER, and Periphery. The Growth Core/Urban Center consists of the most dynamically growing counties comprising

essentially the development core in the state. The ISER includes the counties with intermediate development standing along the Development Continuum. These counties have weaker and less diversified economic bases than the Growth Core/Urban Center counties and greater external economic assistance is needed. But they generally overscore the Periphery counties in many of the socioeconomic aspects covered by the key development indicators. The ISER counties also have other development advantages over the Periphery in terms of larger population size, higher population growth rate, and stronger economic base for further development. The grouping of counties into the three regions as well as their subregions reveals a strong spatial gradation of development level from the most developed counties in the Piedmont to the counties nearby with intermediate development standing, and then, to the least developed peripheral counties in the westernmost mountains and in the eastern part of the state. As the distance from the Growth Core county increases, the development level decreases. This can be generalized into a model expressed in Figure 5.1. North Carolina, as a particular study case, has a cluster defined as Urban Center 2 which stands at the low end of the Growth Core. The counties in Urban Center 2 do not function as effectively as the counties that fall in the Growth Core.

Their spatial filtering and spreading effect is weak. As a result, no ISER county located between the Urban Center 2 and Periphery. But the gradation in terms of Socioeconomic Continuum Index (SCI) is still clear.

This thesis contributes toward an improved understanding of development patterns in North Carolina by 1. providing a series of methodologies of selecting key socioeconomic development indicators; 2. aggregating indicators to fewer dimensions thus generating a development continuum; and 3. classifying counties into relatively homogenous regions in order to more objectively identify the Intermediate Socioeconomic Development Region. The ISER model contributes to the literature of regional development theory as a counter to the traditional bipolar dichotomy by identifying development conditions to exist along a continuum through space. It, thereby, also provides a direction for regional development policy formulation. Finally, while the ISER model provides a basic idea that the ISER functions as a development funnel, it calls for further detailed economic geography studies to facilitate guiding public and private investments toward the ISER region for the benefit of peripheral/marginal region development.

BIBLIOGRAPHY

Barber, G. M. Elementary Statistics For Geographers. New York: The Guilford Press, 1988.

Berenson, M. L. et al. Intermediate Statistical Methods and Applications. Englewood Cliffs, New Jersey: Prentice-Hall, 1983.

Berry, B. J. L. "Grouping and Regionalization." Quantitative Geography, Part 1, ed. W. L. Garrison and D. Marble. Northwestern University Studies in Geography, No.13, 1967.

Berry, B. J. L. Growth Centers in the American Urban System Volume I. Cambridge, Mass.: Ballinger Publishing Company, 1973.

Berry, B. J. L. et al. Market Centers and Retail Location: Theory and Applications. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1988.

Census of Retail Sales 1982. Washington, DC: U.S. Census Bureau, 1982.

Chang, J. and J. Jones. "The Intermediate Socioeconomic Region: A North Carolina Case Study." A Paper Delivered at the Annual Meeting of the Association of American Geographers, Toronto, Canada, April 21, 1990.

County and City Data Book 1988. Washington, DC: U.S. Census Bureau, 1988.

De Blij, H. J. and P. O. Muller. Geography, Regions and Concepts. New York: John Wiley & Sons, Inc., 1988.

Foust, J. B. and A. R. deSouza. The Economic Landscape: A Theoretical Introduction. Columbus: Bell & Howell Co., 1978.

Friedmann, J. Regional Development Policy: A Case Study of Venezuela. Cambridge, Mass.: MIT Press, 1966.

Gade, O. "Dealing with Disparities in Regional Development: The Intermediate Socioeconomic Region." A Paper Delivered at the Annual Meeting of the Association of American Geographers, Toronto, Canada, April 21, 1990.

Gade, O. "Regional Development in a Southern State: The North Carolina Experience, 1970-1988." Development in Marginal Areas, ed. G. Gustafsson. Karlstad: Karlstad University Press, 1989.

Gade, O. and D. Stillwell. North Carolina: People and Environments. Boone, NC: Geo-App Publishing Co., 1986.

Gore, C. Regions in Question: Space, Development Theory and Regional Policy. London: Methuen & Co. Ltd., 1984.

Gunderson, D. "Income Measures and the Quality of Life Differences in North Carolina Counties." A Paper for the Accessibility of Graduate Education for Minorities Program, Prepared June-July, 1990, Department of Geography, Appalachian State University, Boone, NC.

Hansen, N. M. Rural Poverty and the Urban Crisis. Bloomington/London: Indiana University Press, 1970.

Higgins, B. "Francois Perroux." Regional Economic Development, ed. B. Higgins and D. Savoie. London: Allen & Unwin, Inc., 1988: 193-224.

Higgins, B. and D. Savoie. "Conclusions." Regional Economic Development, ed. B. Higgins and D. Savoie. London: Allen & Unwin, Inc., 1988: 375-84.

Jensen, J. R. Introductory Digital Image Processing. Englewood Cliffs, NJ: Prentice-Hall, 1986.

Johannisson, B. et al. Urbaniserad Glesbygd. Stockholm: Allmanna Forlaget, 1989.

Kim, J. "Factor Analysis." Statistical Package for the Social Sciences, ed. N. H. Nie et. al. New York: McGraw-Hill, 1975.

Kim, J. and C. W. Mueller. Introduction to Factor Analysis. London: Sage Publications, 1978.

Mahaffey, D. and M. Doty. Which way now? - Economic Development and Industrialization in N. C. Raleigh, North Carolina: N.C. Center for Public Policy Research, Inc., 1979.

Martin, F. "The Influence of Unemployment Insurance Benefits upon the Social Cost of Labor in Lagging Regions." Regional Economic Development, ed. B. Higgins and D. Savoie. London: Allen & Unwin, Inc., 1988: 244-68.

McGranahan, D. V. et al. Contents and Measurement of Socioeconomic Development. New York: Praeger Publishers, 1972.

Morrill, R. L. "Regional Demographic Structure of the United States." The Professional Geographer 1 (1990): 38-53.

Morrill, R. L. and E. H. Wohlenberg. The Geography of Poverty in the United States. New York: McGraw-Hill, Inc., 1971.

Myrdal, G. Economic Theory and Underdeveloped Regions. London: Duckworth, 1957.

North Carolina Labor Force Estimates, 1983. Raleigh, NC: Labor Market Commission of North Carolina, 1983.

North Carolina State Data Center Newsletter, July 1987. Raleigh, NC: Office of State Budget and Management, 1987.

O'Hare, W. P. The Rise of Poverty in Rural America. Washington, DC: Population Reference Bureau, Inc., 1988.

Perroux, F. "The Pole of Development's New Place in a General Theory of Economic Activity." Regional Economic Development, ed. B. Higgins and D. Savoie. London: Allen & Unwin, Inc., 1988.

Persson, L. O. "Urbanisation Processes in Peripheral Regions in a Welfare State." A Paper Prepared for PIMA Group Seminar in AAG Annual Meeting, Toronto, April 18-26, 1990.

Raynauld, A. "Regional Development in a Federal State." Regional Economic Development, ed B. Higgins and D. Savoie. London: Allen & Unwin, Inc., 1988: 225-43.

Richardson, H. W. "Aggregate Efficiency and Interregional Equity." Spatial Inequalities and Regional Development, ed. H. Folmer and J. Oosterhaven. Leiden: Nijhoff, 1979.

Romesburg, H. C. Cluster Analysis for Researchers. Belmont, CA: Lifetime Learning Publications, 1984.

SAS Institute. SAS User's Guide: Statistics (Version 5 Edition). Cary, NC: SAS Institute Inc., 1985.

Smith, D. M. Where the Grass is Greener: Living in an Unequal World. Baltimore, Maryland: The Johns Hopkins Press, 1979.

Solow, R. M. "Poverty and Economic Growth." Focus. Madison, Wisconsin: Institute for Research on Poverty, 1990.

Statistical Abstract of the United States 1980. Washington, DC: Bureau of the Census, 1980.

Stuart B. Making North Carolina Prosper: A Critique of Balanced Growth and Regional Planning. Raleigh, NC: The North Carolina Center for Public Policy Research, Inc., 1979.

The North Carolina Almanac (1980 Census Data). Nashville, TN: Rutledge Hill Press, 1988.

Vanderkamp, J. "Regional Disparities: a Model with Some Econometric Results for Canada." Regional Economic Development, ed B. Higgins and D. Savoie. London: Allen & Unwin, Inc., 1988: 269-96.

Ward, J. H. "Hierarchical Grouping to Optimize an Objective Function." Journal of the American Statistical Association 58 (1963), 236-44.

APPENDICES

Appendix 1. Definitions of Reference Variables

Per Capita Income 1987 (PCI87):
Total personal income divided by resident population.
Source: North Carolina State Data Center Newsletter, July 1989.

Poverty Percentage 1979 (POV79):
Percentage of unrelated persons below poverty level according to poverty threshold defined by U. S. Census.
Source: County and City Data Book 1988.
Statistical Abstract of the United States 1980.

Education Attainment 1980 (ED80):
Percentage of persons 25 years and over who have completed 12 years or more of school education.
Source: County and City Data Book 1988.

Retail Sales 1982 (RESALE82):
Total retail sales by $1,000, which include merchandise sold for cash or credit at retail by establishments primarily engaged in selling merchandise for personal or household consumption and rendering services incidental to the sale of goods.
Source: Census of Retail Trade 1982.

Unemployment Rate 1982 (UEMR82):
Number of unemployed as a percent of the civilian labor force.
Source: North Carolina Labor Force Estimates 1983.

Incomplete Plumbing and Overcrowding Rate 1980 (IPOR80):
Number of incomplete plumbing and overcrowding (1.01 or more persons per room) housing units per 1,000 owner occupied housing units.
Source: The North Carolina Almanac (1980 Census Data).

Physician Rate 1985 (PHYS85):
Number of active non-federal physicians per 100,000 resident population.
Source: County and City Data Book 1988.

Old Age Dependency 1986 (ODP86):
Number of persons age 65 and over as a percent of the population age 15 to 64.
Source: North Carolina State Data Center Newsletter, August 1987.

Housing Ownership Rate 1980 (HOR80):
Owner occupied housing unites as a percent of total occupied housing units.
Source: The North Carolina Almanac (1980 Census Data).

In Commuters 1980 (IC80):
The total number of workers in the reference county who reside outside the county.
Source: North Carolina Commuting Pattern: 1980 Census of Population and Housing.

In Commuting Rate 1980 (ICR80):
In commuters as a percent of the total population in the reference county.
Source: North Carolina Commuting Pattern: 1980 Census of Population and Housing.
County and City Data Book 1983.

Infant Motality Rate 1983-1987 (IMR8387):
The number of infant death under one year of age as a portion of the number of live births. Data are year average from 1983 to 1987. Data are for resident events.

Net Commuters 1980 (NCOMUT80):
The difference between persons working in the county and employed residents of the county.
Source: North Carolina Commuting Pattern: 1980 Census of Population and Housing.

Net Migration 1980-1986 (MIG8086):
Comprises net immigration from abroad, net interstate migration, and migration of persons in the armed forces.
Source: County and City Data Book 1988.

Nonmanufacturing Employment Change 1977-1987 (NMEC7787):
Nonmanufacturing employment change between 1977 and 1987 as a percent of the total nonmanufacturing employment in 1977.
Source: Civilian Labor Force Estimates for North Carolina 1987.

Out Commuters 1980 (OC80):
The total number of Workers residing in the reference county who leave the county to work.
Source: North Carolina Commuting Pattern: 1980 Census of Population and Housing.

Out Commuting Rate 1980 (OCR80):

Out commuters as a percent of the total population in the reference county.

Source: North Carolina Commuting Pattern: 1980 Census of Population and Housing.
County and City Data Book 1983.

Population Change 1980-1986 (POPC8086):

Population change from 1980 to 1986.

Source: County and City Data Book 1988.

Serious Crime Rate 1985 (SCR85):

Serious crimes known to police per 100,000 resident population as of July 1, 1985. Data on serious crimes have not been adjusted for underreporting.

Source: County and City Data Book 1988.

Sex Ratio 1984 (SEXR84):

Males per 100 females.

Source: County and City Data Book 1988.

Youth Dependency 1986 (YDP86):

The number of persons under 15 years of age as a percent of those persons age 15 to 64.

Source: North Carolina State Data Center Newsletter, August 1987.

Appendix 2. Pearson Correlation Coefficients
(Socioeconomic Key Indicators)

	PCI87	POV79	ED80	RESALE82	UEMR82	IPOR80	PHYS85	ODP85
PCI87	1.00	-0.71	0.69	0.68	-0.52	-0.49	0.47	-0.21
POV79		1.00	-0.44	-0.39	0.36	0.67	-0.16	0.24
ED80			1.00	0.64	-0.58	-0.53	0.55	-0.36
RESALE82				1.00	-0.33	-0.35	0.29	-0.35
UEMR82					1.00	0.16	-0.35	0.28
IPOR80						1.00	-0.24	0.15
PHYS85							1.00	-0.19
ODP86								1.00

Appendix 3
Factor Scores and Socioeconomic Continuum Index

County	Factor 1 (PSD)	Factor 2 (LC)	Socioeconomic Continuum Index	Regions
Warren	-0.91	2.50	-3.41	
Tyrrell	-2.09	1.25	-3.34	
Northampton	-0.73	1.94	-2.61	
Bertie	-0.60	2.00	-2.60	
Halifax	-0.24	2.28	-2.52	
Swain	-1.79	0.66	-2.45	
Hyde	-0.89	1.35	-2.24	
Graham	-1.92	0.21	-2.13	
Madison	-0.98	1.05	-2.03	
Greene	0.02	1.97	-1.95	
Clay	-1.35	0.45	-1.80	
Gates	0.04	1.84	-1.80	
Yancey	-1.12	0.63	-1.75	
Bladen	-0.64	1.09	-1.73	Periphery
Ashe	-1.16	0.54	-1.70	
Robeson	-0.50	1.20	-1.70	
Caswell	-0.61	1.06	-1.67	
Cherokee	-1.31	0.35	-1.66	
Perquimans	-0.75	0.87	-1.62	
Columbus	-0.52	1.09	-1.61	

County	Factor 1 (PSD)	Factor 2 (LC)	Socioeconomic Continuum Index	Regions
Franklin	-0.46	1.05	-1.51	
Hertford	-0.02	1.47	-1.49	
Duplin	-0.73	0.73	-1.46	
Vance	-0.44	0.93	-1.37	
Hoke	-0.14	1.20	-1.34	
Martin	-0.17	1.13	-1.30	
Jones	-0.31	0.96	-1.27	
Anson	-0.50	0.70	-1.20	
Washington	-0.30	0.71	-1.01	
Person	-0.69	0.28	-0.97	
Sampson	-0.31	0.66	-0.97	
Granville	0.20	1.14	-0.94	
Pender	-0.49	0.42	-0.91	
Edgecombe	0.00	0.88	-0.88	
Mitchell	-0.88	-0.04	-0.84	
Chowan	-0.31	0.52	-0.83	
Alleghany	-0.50	0.31	-0.81	
Richmond	-0.75	0.00	-0.75	
Pamlico	-0.28	0.43	-0.71	
Montgomery	-0.57	-0.02	-0.55	
Harnett	-0.03	0.43	-0.46	
Brunswick	0.27	0.17	-0.44	
Camden	-0.02	0.42	-0.44	
Beaufort	-0.08	0.33	-0.41	
Avery	-0.18	0.21	-0.39	ISER
Scotland	-0.20	0.14	-0.34	
Surry	-0.79	-0.55	-0.24	
Nash	0.31	0.40	-0.09	
Rutherford	-0.61	-0.54	-0.07	
Johnston	-0.22	-0.15	-0.07	
Macon	-0.50	-0.47	-0.03	
Yadkin	-0.47	-0.51	0.04	
Currituck	0.07	0.03	0.04	
Wilson	0.24	0.19	0.05	
Rockingham	-0.52	-0.58	0.06	
Lenoir	0.32	0.21	0.11	
Wilkes	-0.24	0.37	0.13	
Cleveland	-0.57	-0.70	0.13	
McDowell	-0.28	-0.44	0.16	
Stokes	-0.10	-0.28	0.18	
Jackson	0.35	0.16	0.19	
Haywood	-0.24	-0.54	0.30	
Pasquotank	0.31	-0.01	0.32	
Caldwell	-0.21	-0.68	0.47	
Stanly	-0.48	-0.95	0.47	
Lincoln	-0.31	-0.83	0.52	
Burke	-0.08	-0.81	0.73	

County	Factor 1 (PSD)	Factor 2 (LC)	Socioeconomic Continuum Index	Regions
Watauga	1.03	0.26	0.77*	
Alexander	0.13	-0.67	0.80	
Davidson	-0.10	-0.95	0.85	
Wayne	0.59	-0.26	0.85*	
Randolph	-0.06	-0.99	0.93	
Polk	-0.22	-1.22	1.00	
Pitt	1.49	0.48	1.01*	
Lee	0.29	-0.73	1.02	
Carteret	0.33	-0.70	1.03	
Transylvania	0.28	-0.80	1.08	
Chatham	0.31	-0.79	1.10	
Iredell	-0.07	-1.17	1.10	Urban Center
Rowan	-0.01	-1.19	1.18	
Craven	1.01	-0.20	1.21*	
Cabarrus	0.03	-1.19	1.22	
Davie	0.10	-1.13	1.23	
Gaston	0.19	-1.10	1.29	
Moore	0.40	-0.95	1.35	
Alamance	0.26	-1.26	1.52	
Union	0.69	-0.87	1.56	
Dare	0.57	-1.10	1.67	
Henderson	0.28	-1.41	1.69	
Buncombe	0.48	-1.27	1.75	
Onslow	1.47	-0.31	1.78*	
Catawba	0.54	-1.39	1.93	
New Hanover	1.11	-0.97	2.08*	
Cumberland	1.71	-0.64	2.35*	
Guilford	2.00	-1.95	3.95	
Forsyth	2.26	-1.73	3.99	
Durham	3.22	-0.96	4.18	Growth Core
Orange	4.29	-0.53	4.82	
Wake	2.92	-2.03	4.95	
Mecklenburg	2.99	-2.31	5.30	

* Urban Center 2 counties.

VITA

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