THE DISPERSED CITY: A REEVALUATION OF THE TRI-CITIES REGION OF EAST TENNESSEE, 1980 – 2000

By

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CHAPTER I

INTRODUCTION

Overview of a Dispersed City

This project investigates the socioeconomic activity in the Tri-Cities metropolitan area of Eastern Tennessee that includes the cities of Bristol, Kingsport, and Johnson City. The goal is to determine whether these three cities are acting as a dispersed city. A dispersed city occurs when two or more small towns, with rural areas between each town, function as one economic area. Each town supplies specific goods, services and job opportunities, encouraging people to travel from one place to another. Even though they are distinct towns, they depend on each other to form a functional economic area. Some characteristics of a dispersed city are: towns have similar population sizes, each has a specialized economic activity, the entire region has a common government such as a legislative district, and each town is well-connected to neighboring towns, providing efficient transportation routes.

Although these characteristics have been identified, the concept of the dispersed city is still mainly qualitative. There are no population limits or economic boundaries that distinguish a dispersed city from one large

un-dispersed city. In addition, these characteristics are not always absolute. Instead, they are a set of guidelines that help to categorize a cluster of smaller cities as a dispersed city. In this case, the towns have similar populations, each had an economic specialization as of 1980, they are roughly 20 miles apart, and they are well connected.

In this study, data on two of these characteristics, population and economics, have been collected. Although both are used, population will be the most important factor in deciding if the city is still dispersed. Increases in population reveal more about the state of a dispersed city since specialization continues to decrease in many parts of the nation. To accomplish this, an increase or decrease in the population and urbanized area within the geographic center of the study area is determined. An increase helps to show that the study area is gradually growing together into one city. Second, statistical methods are used to determine if the changes in the study area are significant or just represent normal growth of the urban area.

Problem Statement

The primary focus of this research is to determine if the Tri-Cities area in East Tennessee is still functioning as a dispersed city. This study is a continuation of a thesis completed in the mid -1980s (Finchum 1985). In the previous study, the primary research tool used was a shopping mall

survey to determine if residents perceived that the characteristics of a dispersed city exist. That research concluded that the Tri-Cities area did appear to be actively functioning as a dispersed city. The survey method is not implemented in this study primarily due to the distance of the author from the study area.

Since the first study was completed back in 1985, it is possible that the area has grown together and is no longer dispersed. Evaluating changes of urban development such as residential, commercial, and industrial uses will support the conclusion of whether the area is still considered dispersed. The use of Geographic Information Systems (GIS) and a statistical package displays both visually and mathematically how much the non-urban area located between the Tri-Cities has developed. Any changes that have occurred in the study area over the past twenty years are identified by the use of census data.

Census data used in this study include population, percent urban and population density. Other types of data gathered are the properties of different types of services in each city along with the connectivity of the transportation routes. Economic census data is also used in the study. The economic census is conducted every five years (ex. 1997, 2002). Reviewing both manufacturing and retail establishments determines how the economic patterns have changed over the past two decades.

Research Questions

This study examines the following questions related to the Tri-Cities area:

1) Is the study area actively functioning as a dispersed city or have the suburbs in the center of the study area matured and increased in urbanization? In effect, has one urban mass developed?
2) If the center of the study area has filled in, is the study area now turning to a more traditional sprawl in an outward direction outside of the primary study area?
3) Has the level of specialization for each of the three major cites in the study area decreased due to the urbanization of the study area?

Study Area

The area of study for this project is the Tri-Cities region of East Tennessee (Figures 1 and 2), which consists of three relatively equal sized towns: Bristol, Kingsport and Johnson City. It should be noted that Bristol is actually two political entities, Bristol, Tennessee and Bristol, Virginia. All three major cities are approximately twenty miles apart. These three cities have an average population of 47,187, and are roughly the same size and classification.

At the time of Finchum's (1985) study, all three cities specialized in

Study Area

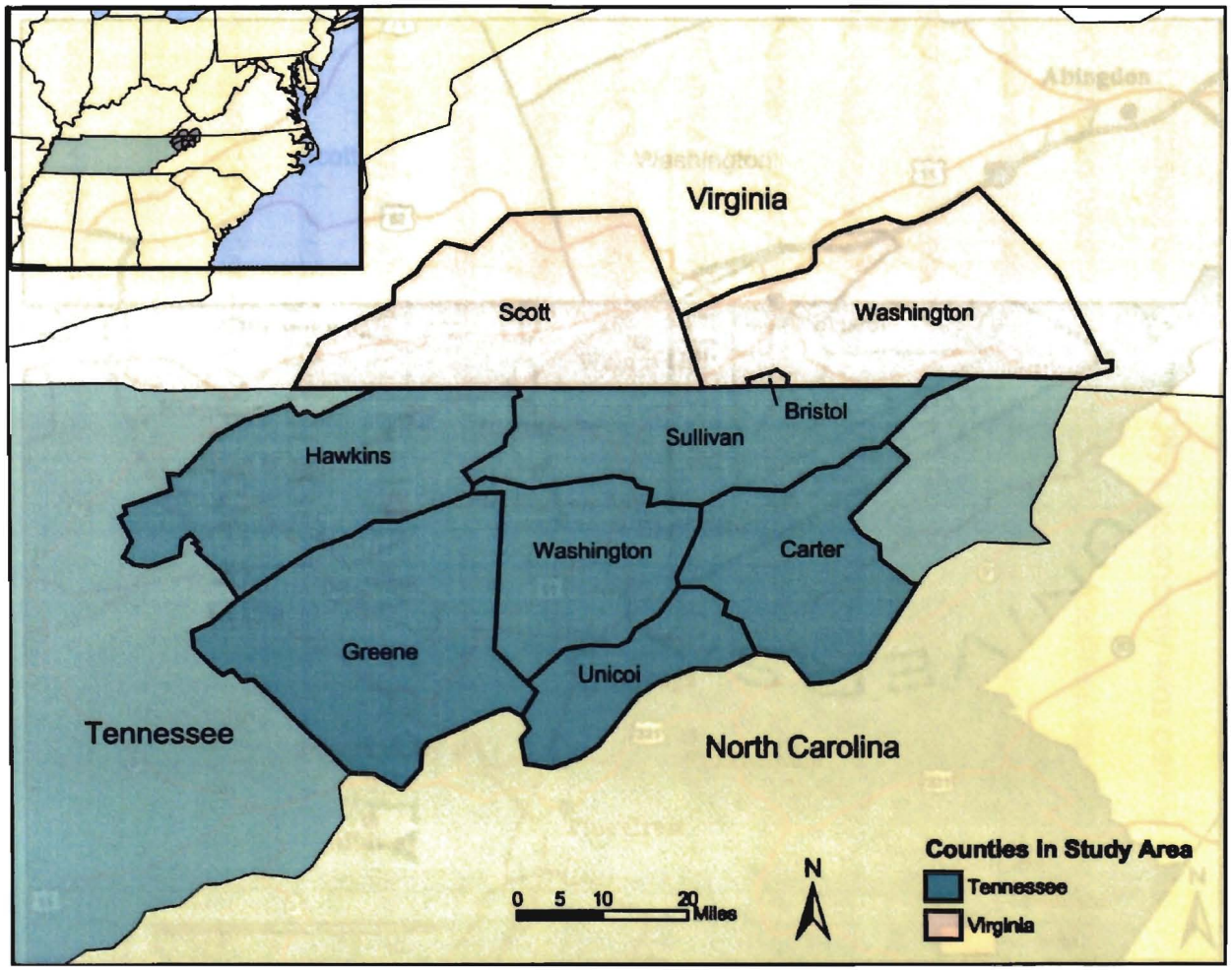

Figure 1

Study Area - Cities and Roads

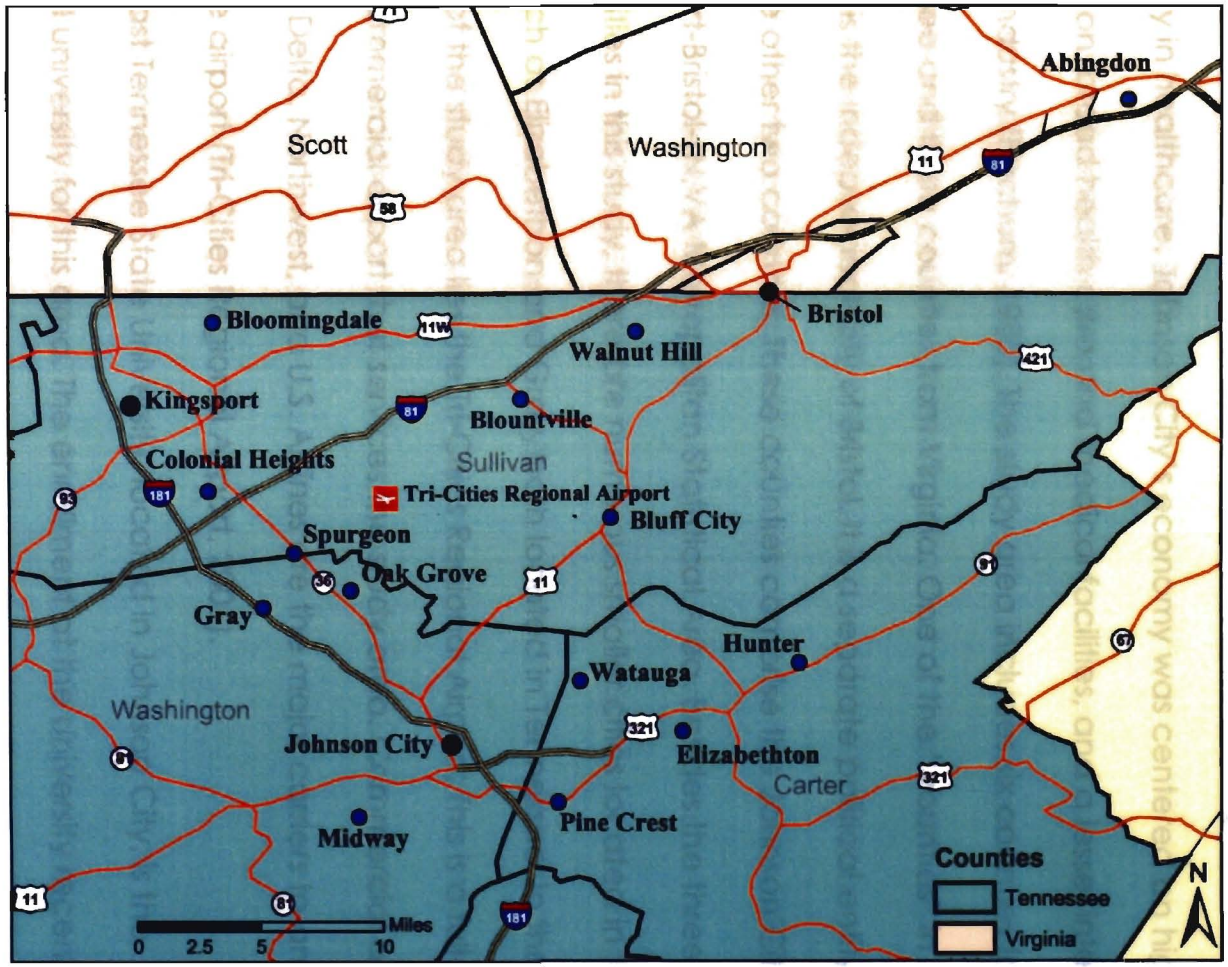

Figure 2

different goods and services. Bristol was specialized around transportation, finance, and light industry that consisted of high-technology manufacturing firms. Kingsport's economy was based primarily in heavy industry that included steel and paper manufacturing, along with a minor specialty in healthcare. Johnson City's economy was centered on higher education, broad health care and medical facilities, and a lesser interest in light industry (Finchum, 1985). The study area includes six counties from Tennessee and three counties from Virginia. One of the "counties" in Virginia is the independent city of Bristol. It is a separate political entity from the other two counties. These counties comprise the Johnson City-Kingsport-Bristol-TN,VA Metropolitan Statistical Area. Besides the three major cities in this study, there are numerous smaller cities located in the area such as Elizabethon and Gray, both located in Tennessee. In the center of the study area lies the Tri-Cities Regional Airport. This is a full-scale commercial airport that services the study area. Commercial airlines such as Delta, Northwest, and U.S. Airlines are the major carriers to and from the airport (Tri-Cities Regional Airport, 2001).

East Tennessee State University, located in Johnson City, is the regional university for this area. The enrollment at the university recently topped the 11,000 mark. East Tennessee State University offers more than 100-degree programs including bachelors, masters, Ph.D., and M.D. degrees (East Tennessee State University, 2001).

Bristol Motor Speedway, opened in 1961 and located south of Bristol, TN, is a half-mile racetrack that hosts numerous NASCAR races each year. Races at the speedway attract as many as 140,000 spectators (Bristol Motor Speedway, 2002).

The Definition of an Urban Area

Since one of the variables used in this study is the percent of urban land, it is important to define this concept. An urban area is clearly defined by the United States Census Bureau consisting of territory, persons, and housing units in: (1) Places of 2,500 or more persons incorporated as cities, villages, boroughs (except in Alaska and New York), and towns (except in the six New England States, New York, and Wisconsin), but excluding the rural portions of "extended cities"; (2) Census designated places of 2,500 or more persons; or (3) Other territory, incorporated or unincorporated, included in urbanized areas (United States Census Bureau 1995).

Hypothesis

This project investigates if the Tri-Cities area still displays the properties of a dispersed city or if the study area has functionally and physically grown together. More specifically, it examines how the Tri-Cities area has changed over the past twenty years.

It is hypothesized that the Tri-Cities area, located in Eastern Tennessee, is actively functioning as a dispersed city, based solely on population data. As the population of the area has grown, each of the three larger cities will not be as specialized. In fact, it is expected that the level of differentiation will decrease between 1980 and 2000. If this region is becoming less dispersed, the interstitial or central area amongst the Tri-Cities should be growing at a faster rate than the outlying areas of the region. In addition, urban areas between the three cities would be expected to increase because of the prediction that over time these three cities will gradually grow towards one another.

As development in the center of the study area is important, so is development in the outlying regions of the cities. Typically, as a city's urban area expands, it expands in an outward direction often known as urban sprawl. This study is unique because it is attempting to determine if the center of the triangular shaped study area is developing with lesser amounts of urbanization occurring on the outside of the triangle.

Project Significance

A study of this kind is significant because it can benefit many groups and organizations. In the previous study of this region, Johnson City led the way in retail services. As the area continues to develop, new pockets of retail will begin to appear. Retail companies would find a study illustrating

the major growth areas beneficial in determining the proper location to open their businesses. The statistical analysis of this area may aid state and local governments in Tennessee to reapportion congressional districts and heighten the efficiency of police, fire and other emergency services. Any new patterns of economic or urban areas displayed may aid the state and local governments to consider the expansion of infrastructure such as schools, hospitals, roads and other services desired by the public.

CHAPTER II

AN ECONOMIC HISTORY OF THE TRI-CITIES REGION

Development of the Transportation System

The Tri-Cities region in East Tennessee received its first settlers in the 1760s. Today, it is the setting of the study area and the three communities of Bristol, Kingsport and Johnson City, as well as other smaller communities. This section briefly describes the economic history of the Tri-Cities region, an important element of the study because the economic history of the area is a major factor in the region's current condition.

One of the most important factors in the development of the Tri-Cities region was the railroad. Elery Lay (1972), a geographer native to the region and who researched it extensively, wrote of a man named Joseph R. Anderson, who purchased one hundred acres of land and began to lay tracks in 1852. This land today is in the Bristol city limits. During this development in the 1850s, it was only natural for a town to be created where there were both railroads and large amounts of iron-ore.

Johnson City had its beginnings as a settlement when Henry Johnson built a combination store-depot-hotel where the new railroad crossed the East Tennessee and Western North Carolina railroads, which ran from Nashville, Tennessee to Raleigh, North Carolina (Lay 1972). This

place was first known as Johnson's Depot or Johnson's Tank until the name Johnson City was adopted in honor of Henry Johnson.

Kingsport was transformed into an industrial center with the coming of the railroad. The railroad that fueled Kingsport into this industrial stage was known as the Clinchfield Railroad. Many towns along the Clinchfield owed their existence to it. The Clinchfield was also a direct cause of the remarkable growth of Johnson City in the early twentieth century (Lay 1972). Its origin can be linked to John C. Calhoun, an American statesman and political philosopher, and his idea of connecting the Ohio Valley with Charleston, South Carolina (Lay 1972). This idea would later become the Clinchfield line. In 1836, construction began on the Clinchfield, but only eighteen miles of the railroad were completed due to financial constraints.

Interest in completion of the railroad waned until the early 1900s when thirteen companies helped to finance construction. The Clinchfield Railroad was completed in 1915 and was 277 miles in total length. It touched five states and was called the Carolina, Clinchfield, and Ohio Railroad (Lay 1972). It started at Spartanburg, South Carolina, and ran north through the study area locales of Erwin, Johnson City, and Kingsport, Tennessee (Lay 1972). The railroad construction ended in Elkhorn City, Kentucky and connected to other major cross-country railroads. The railroad was an important first piece of the region's transportation system,

but it was only the beginning of the transportation development for the Tri-Cities region.

The railroad had brought enough people to the area to warrant construction on a regional airport. In 1935, representatives from Johnson City, Kingsport, and Bristol began to discuss the idea of creating an airport for the three cities. A piece of land near the geographical center of the three cites was selected, and through the financial efforts of the local and county governments, the property was acquired and developed (Lay 1972). In the early years of the airport, there were four airlines servicing the Tri-Cities. In 1958, over 50,000 people used the airport for traveling purposes. By 2000, the number of passengers utilizing the airport each year had increased to over 200,000.

Both the railroad and airport were important to the economic development of the region, but the highway system, completed in the 1970s, could not be ignored. The construction of U.S. routes 11 and 11W as well as Interstates 81 and 181 increased the connectivity of the Tri-Cities region along with the rest of the nation.

Thanks to the development of the railroad, airport and highway system, the economic situation of the region began to improve. In 1919, Johnson City had thirty-six manufacturing establishments. In the same year, Sullivan and Washington counties were included in a list of twenty counties in Tennessee which contained manufacturing establishments

whose manufacturing products were valued at over $4,000,000 (Lay 1972). One of the oldest plants in Johnson City was the Johnson City Foundry and Machine Works, first organized in 1883. The foundry's original concept was to serve the East Tennessee and Western North Carolina Railroad. In the mid 1900s, the foundry had 125 workers making various steel fabrications (Lay 1972).

From 1920 to 1930, Kingsport experienced a large amount of industrial growth. The city doubled its population and had twenty-five plants whose products were valued at almost $16,000,000 (Lay 1972). In 1920, the Tennessee Eastman Corporation purchased land in Kingsport and began to manufacture photographic supplies for its parent company, Eastman Kodak. In 1957, Tennessee Eastman was manufacturing more than 250 products and employed over 7,500 people (Lay 1972). In 2002, Tennessee Eastman made more than 1,200 products and had expanded to 30 countries employing nearly 16,000 people.

Tennessee Valley Authority

In the late 1920s, around the time of the Great Depression, the Tennessee River Valley was one of the poorest regions in the United States (Kyle 1958). The previous two centuries of land use had stripped away the region's land cover and allowed heavy rains to wash away much of the fertile soil. The Tennessee Valley was in need of a network of dams and a

rejuvenation of grass and forest cover. For these reasons, the Tennessee Valley Authority was created by Congress under the FDR Administration in 1933 (Kyle 1958).

To many people of this region, the Tennessee Valley Authority represented the highest achievement of American Democracy (Kyle 1958). The Tennessee Valley Authority is a development agency for any land that is encompassed within the Tennessee River watershed. The Tennessee River stretches for 650 miles through seven Southeastern states, and then empties into the Ohio River (Colignon 1997). The watershed includes all of central and eastern Tennessee, extreme northern Alabama and Georgia along with portions of southern Virginia and Kentucky. A small portion of western North Carolina and northern Mississippi are also located in the watershed.

The Tennessee Valley Authority's first responsibility in operating its reservoirs and 49 dams was flood control and navigation improvement (Kyle 1958). The generation and sale of electric power developed from this mission. In addition, the Tennessee Valley Authority was charged with the general responsibilities for improving the watershed, for reforestation, and for the development of the economic and social well being of the valley's population (Kyle 1958).

The Tri-Cities and the Tennessee Valley Authority

The Tri-Cities region of East Tennessee is part of the Tennessee Valley Authority (TVA) service area. The study region contains four storage dams used to create reservoirs along with a steam plant. Boone Dam is located on the South Fork of the Holston River in northeast Tennessee. Boone was the nineteenth dam completed in the TVA system and added 196,700 acre-feet of water to the Tennessee Valley Authority's system of lakes (Kyle 1958). The Fort Patrick Henry Dam, located approximately a mile from the city limits of Kingsport and also on the South Fork of the Holston River, produced a reservoir that extends ten miles upstream to the Boone Dam. This was the Tennessee Valley Authority's twentieth dam and was completed just six months after the Boone Dam in 1953. The South Holston Dam is located seven miles south of Bristol, Tennessee-Virginia, on the South Fork of the Holston River (Kyle 1958). Construction of the dam began in 1942 but was halted in favor of other wartime construction efforts. Building resumed in 1947 and was completed in 1950 (Kyle 1958). The Watauga Dam is located on the Watauga River in East Tennessee. Its reservoir stretches sixteen miles east of the dam toward the North Carolina border (Kyle 1958). The John Sevier Steam Plant is located on the Holston River near Rogersville, Tennessee. The plant has four coal-powered generating units and was completed in 1957. Today, the John Sevier plant

generates five billion kilowatt-hours of electricity a year, enough to supply 350,000 homes (Tennessee Valley Authority 2002).

At the present time, the Tennessee Valley Authority employs over 13,000 people throughout the watershed and provides wholesale power to 158 municipal and cooperative power distributors. As well as directly serving 62 large industries and government installations in the valley, TVA supplies the energy needs of more than eight million people (Tennessee Valley Authority 2002).

The railroad, airport and highway brought people to this region and the TVA kept them there, providing much needed work to many Americans. Understanding the history of a region or a concept gives a more accurate view of the culture, economics, and development patterns of today. History is as important as those who wrote about it. Literature provides a tangible link to the history of places and ideas. The next chapter will review writings about concepts of the dispersed city, early development patterns, connectivity, and cultural impressions that helped shape the Tri-Cities region as it is today.

CHAPTER III

LITERATURE REVIEW

This research is the follow-up to a thesis produced by Allen Finchum (1985), an urban geographer who studied at the University of Cincinnati. The study investigated the Tri-Cities metropolitan area of East Tennessee to determine if it qualified as a "Dispersed City" (Finchum 1985). The method of analyzing a dispersed city in this thesis was derived from urban geographer Charles Hayes' (1976) study of the North Carolina Piedmont that consisted of the urban nodes of Winston-Salem, Greensboro, High Point, Burlington, Asheboro and Lexington, North Carolina. Both studies sought to determine if people in the study area lived in one node, shopped in another, worked in a third, sought higher education in yet another, and so on.

A dispersed city is a group of urban nodes in close proximity to each other, separated by tracts of non-urban land, and functioning as a single entity (Hayes 1976). Distances between nodes of a dispersed city are short enough for customers to choose one of the several economic and social services for higher level shopping. Each urban node purveys convenience

items locally but specializes in higher-level goods and services (Burton 1963).

Ian Burton (1963), an urban geographer, explained that the dispersed city concept has some general characteristics, but every instance of a dispersed city differed from one another. Burton explained:

> "...the existence of the dispersed city in the sense of a number of functionally interdependent centers in not firmly established...There is some circumstantial evidence for the existence of dispersed cities...The actual evidence of such a phenomenon remains to be demonstrated" (Burton 1963).

Finchum's (1985) conclusion was that the Tri-Cities region does function as a dispersed city. Finchum also conjectured that over time the large amounts of non-urban land would gradually fill-in and develop. In order for a region to be classified as a dispersed city, Harris Stone, Joan Stone and J. William Carswell (1998) gave the following characteristics based on their background in architecture. A region must be composed of several built-up areas separated from each other by open space and non-urban land uses. Each node should have roughly the same population size and some specialized activity. The entire region should have a common government such as a legislative district. Finally, each node should be linked by a system of communication and transportation as far advanced as science and economy could provide.

Hayes (1976) also classified the North Carolina Piedmont as a dispersed city. Burton (1963) suggested that the emergence of such

centers depends, at least in part, upon the level of transport technology operating in the formative stage of development. Even transportation, however, is only one explanatory factor. Other types of data used in Finchum's (1985) study were population growth of the region and economic growth of the area.

Origin of the Dispersed City Concept

Urban geographer Oliver Beimfohr (1953) was the first person to write about a dispersed city. He focused on a region located in Southern Illinois. Communities in this dispersed city included Perry, Franklin, Jackson, and Washington counties, Illinois (Beimfohr 1953). Burton (1959) commented on the dispersed city of Southern Illinois:

> "It seems clear that from the viewpoint of retail trade these urban centers are not arranged in a hierarchical pattern, possibly because their very proximity to each other in an area of some 157,000 people has served to encourage local specialization rather than the domination of any one of them" (Burton 1959).

Donald Clements (1977), an urban geographer, evaluated the dispersed city in Southern Illinois, but he also focused on other areas defined as dispersed cities. Other possible dispersed city locations identified by Clements were the lower Rio Grande Valley of Texas, the upper Grand River of southern Ontario, the Salzgitter region of Germany, the vicinity of Okayama, Japan and the coal-rich Nottingham-Derbyshire area of the English Midlands (Clements 1977).

Despite where a dispersed city occurs, it is nonetheless a unique urban form. Cities have been studied by many different researchers from a range of disciplines. In order to fully understand the development of the dispersed city, a general knowledge of the history and evolution of the urban area is necessary. The next section reviews the theories and people that were influential in this field of urban geography.

Early Urban Beginnings

Urban geography, more specifically urban sprawl, is the spread of development from the center of a city in a concentric shape. The first person to determine the pattern of people and how the level of goods and services change as one moves away from the center of a city was Walter Christaller. Christaller was an economist from Germany who hypothesized those towns and cities of the same size would develop in a hexagonal pattern on the landscape. Christaller described the word "central" as "referring to regions, but more correctly, it referred to the settlements dispersed over a region" (Christaller 1966).

Christaller's theory postulated that large cities of a particular size will have numerous smaller towns surrounding it that do not provide as many of the goods and services the larger city provides. Each of these towns will have smaller towns surrounding it for the same reasons. This pattern

structures cities located on the landscape to create a series of regular hexagonal shapes.

After all calculations have been completed, the importance of a place and its supply of goods and services are what make it a central place (Christaller 1966). Christaller discussed nine different institutions including things such as administration, cultural importance, and social importance. Some examples Christaller stated for importance were schools, public libraries, museums, theaters, universities, and scientific institutes (Christaller 1966).

August Lösch (1954), a German economist, also searched for a logical and scientific explanation of settlement patterns. In Lösch's version of central place theory, the smallest settlements on the isotropic plain were assumed to be farms that are again hexagonal in shape. The size of each market area in the Löschian landscape conventionally measured by the number of farms it contained (Lösch 1954). His work focused on modifying Christaller's central place theory in order to transmit a more realistic representation of the relationship between settlements of different proportions.

John Marshall (1977), an economic geographer, compared both the theories of Christaller and Lösch. He discussed central place theory and compared the exact geometric relationship between the models of Lösch and Christaller. Marshall compared both theories and concluded

that Lösch's theory seemed more plausible to researchers. Since Lösch considered the number and spacing of farmsteads and drew attention to the fact that the sequence of market area sizes need not be based on a constant multiplier, his theory provided a basis for greatly increased flexibility (Marshall 1977). The fact that Lösch reviewed the number of farms for each market area was important because he considered the idea that every market area was going to be different and the same multiplier was not going to work for all situations.

The authors in this section analyzed concepts in which the development of urban patterns was imperative for a region's success. An important aspect in the development of urban patterns is the transportation system. In many ways, roads, railways and airports are vital to the growth and sustainability of a city. Also important is the level of connectivity within the system. The issue of connectivity of routes is a key element in the formation of the dispersed city since the nodes must be well connected. The next section of this literature review focuses on transportation routes and changes in their connectivity.

Connectivity of Transportation Routes

The connectivity of transportation routes is an intricate part of the dispersed city concept. Urbanization typically develops along major routes between cities. A person's memory of an urban area is usually

linked to a road, its intersections, and major landmarks. There are three main studies that focus on the psychology of connectivity where it applies to transportation. Loren Staplin and Edward Sadalla (1981), environmental psychologists, explained how both turns and intersections along a route influence the connectivity of that route. Results from their study indicated that an increasing number of turns and intersections led to an increase in subjective route length, thus decreasing the connectivity of the route (Staplin and Sadalla 1981).

David Canter and Stephen Tagg (1975), psychologists, performed distance estimation studies in seven major cities around the world. They found that the greatest distortions in estimated distance occurred between points where there were no connecting main transportation arteries, and argued more generally that physical features, especially roads, served to structure a person's cognitive representation of a city (Canter and Tagg 1975). George Rand (1969), a psychologist, proposed that, for most people, spatial cognition at the urban level may be modeled by route maps: non-Euclidean, two-dimensional representations that consist of a set of environmental reference points (landmarks), and a connecting route system of paths and nodes (Rand 1969).

Cities and Towns of Today

In a study of this type, it is important to understand the process of urbanism and how it is classified. The definition of urbanization as stated by urban geographer, Maurice Yeats (1980), "...is the process whereby an essentially rural society is transformed into a predominantly urban one. Hence, urbanization is usually defined as the proportion of the population of an area (often country) that resides in urban places above a certain population size" (Yeates 1980).

Geographers Richard Thoman, Edgar Conkling and Maurice Yeates (1968) explained that understanding urbanism is important because an increasing amount of the world's population is being born in metropolitan areas, cities and towns. This trend was found particularly in technologically advanced economies. Prior to the Industrial Revolution, cities existed mainly as exchange centers. They were a place dependent on the surrounding countryside for existence. Modern cities are still exchange centers, but they also generate a large measure of their own in production because of factories and other businesses (Thoman *et al.* 1968).

Arthur Smailes (1966), a geographer, researched the origins of towns and the cultures that are involved in their creation. He explained how towns are among the foremost expressions of different cultures. Cultural diffusion can be seen throughout the book, especially when the subject of

how patterns and ideas spread from town to town. Towns were extremely important agents in the spread of cultures. They were among the most notable illustrations of the process whereby forms and patterns developed in a particular setting were introduced elsewhere as exotic features (Smailes 1966). Immigrants moving into towns with the same ethnicity congregated in compact groups to form ethnic quarters (Smailes 1966).

Larry Bourne (1971), geographer and planner, researched the social geography of the city and how a city's internal structure referred to the location, arrangement, and interrelationships between social and physical elements in the city. The physical elements of the city include such things as buildings and cars. Social space is made up of economic, demographic, cultural, and other kinds of space which, when placed on the physical space of the city, serve to isolate areas of social homogeneity (Bourne 1971). These isolated areas of social homogeneity are simply culture regions that share the same social characteristics.

William Lucy and David Phillips (1997), urban and environmental planners, believed that the city of Richmond, Virginia was a prime example of a metropolitan area that had entered the post-suburban era. The authors defined this post-suburban era in terms of inner suburban population loss and relative income decline, suburban employment increase, suburban outcommuting reduction, exurban population and income increase and farmland conversion (Lucy and Phillips 1997). Arthur

Nelson (1992), an urban planner, explained there are four major factors behind exurbanization. They included the deconcentration of employment and the rise of exurban industrialization, the latent antiurban and rural location preferences of U.S. households, improving technology that makes exurban living possible, and the apparent bias of policy favoring exurban development over compact development.

As time passes, suburbs undergo different changes in their maturing process. The main characteristic of a post-suburban era is this maturing of the suburbs. A few characteristics of a maturing suburb are increased employment within its borders, which leads to less commuting to central cities and income decline in the central city (Lucy and Phillips 1997). In conclusion, Lucy and Phillips (1997) said that suburban transitions do not always result in prosperity. Some of the mature suburbs in the Richmond area have declined in population and income status because of suburban housing advances further away from the central city (Lucy and Phillips 1997). Development pressures on farmland may also increase as well as some city neighborhoods revive because they seem like better locations than the declining suburbs (Lucy and Phillips 1997).

Richard Lonsdale and Clyde Browning (1971), both geographers, researched the rural-urban locational preferences of manufacturing plants of ten southern states. Southern plants were much more oriented to small towns and rural areas than was true nationally, and this tendency

was becoming even more pronounced (Lonsdale and Browning 1971). During the time of this study, manufacturing plants had moved from the large cities of the industrial north and had relocated to rural regions of the south. Overall, the locational preferences of manufacturing plants varied by the type of industry. Light industry typically consisted of high-technology manufacturing firms while heavy industry included steel and paper manufacturing. Light industry was found in cities more often than heavy industry (Lonsdale and Browning 1971). Another factor of a manufacturing plant's location was its age. Many of the newer plants, regardless of industry type, were located outside municipal boundaries (Lonsdale and Browning 1971). The size of the plant was not a major factor in the study. There did not seem to be a relationship between the size of the plant and whether it was located in an urban area.

Cultural Ideas

A dispersed city occurs when two or more small towns with rural areas between each town function as one economic area. The population of this area is influenced to travel from one location to another in order to obtain a good or service. Where people come from and what they are accustomed to doing is related to the cultural background of the region. The following articles analyze where people originate and the types of living conditions they prefer.

Pierre Filion, Trudi Bunting and Keith Warriner (1999), urban planners, discussed the aspects of urban dispersion including urban structure, but more importantly, urban dispersion and its relation to social ecology. The authors conducted a survey to find out the ideal residential setting irrespective of financial constraints. A majority of participants voiced their preference for non-urban locations within commuting distance from a city. Some of the findings from this article included people wanting to live close to the city, but they did not want to experience city life. People also preferred a house in the country, twenty miles from town, with lots of trees and near water (Filion *et al.* 1999).

Frederick Steiner (1994), a planner and landscape architect, analyzed the positives of urban sprawl and how cultural aspects of our society affected this sprawl. Suburban sprawl is a kind of dispersed settlement associated with almost every American metropolitan area, but in the U.S. is epitomized by the suburbs of the southwest (Steiner 1994). Steiner explained that there was both bad sprawl and good sprawl. In other words, the landscape created by humans was important in determining which kind of sprawl an area may have. Benign sprawl is basically sprawl that does not tax an area's resources. Development that uses water-conserving native vegetation, that retains storm water on site, and that harnesses the energy of the region's greatest strength, the sun, are all aspects of good judgment (Steiner 1994).

Pierre Filion and Trudi Bunting (1999) believed that some Canadian cities are not as compact and centralized as conventional wisdom would have one to believe. In their study a person was pro-rural, pro-suburb, or pro-city. Someone who was pro-rural was most likely to say they wanted privacy, an abundance of land, and to be away from it all (Filion and Bunting 1999). A person who was pro-suburb was most likely to say the suburbs were convenient, had lots of space, and were close to stores and schools (Filion and Bunting 1999). A pro-city individual said the city was good for walking, had good public transportation, and was surrounded by all goods needed (Filion and Bunting 1999). This article was very similar to the previous paper by Filion and Bunting in that it reviewed different types of cultural landscapes and analyzed which type people prefer.

The goal of this section was to review literature pertaining to the dispersed city concept. Also included in this section was literature related to the different characteristics of a dispersed city along with the traditional development of a city. The literature began with the development of a dispersed city and some of the major writers who developed the concept. The literature continued on with the development of urban geography and its related concepts including central place theory. In addition, the topic of transportation routes and their connectivity was discussed. This is an important characteristic of a dispersed city. The connectivity of an urban area can lead to a vast

amount of changes. The next section discussed literature that analyzed cities and towns and how they have changed over time. Finally, this section concluded with how people perceive their surroundings and how they have changed the structure of a city throughout history.

Even though there was not an enormous amount of literature found on the dispersed city concept, the dispersed city is not a forgotten concept. As our world continues to develop, it leads to the possibility of more areas developing like East Tennessee therefore producing the need for increased publication.

CHAPTER IV

METHODOLOGY

The goal of the research is to determine how the Tri-Cities region of East Tennessee has changed between 1980 and 2000. The focus of this chapter is to describe the research methodology of this work. This chapter discusses the types of data that were collected as well as the rationale for choosing data at a particular geographic level. A discussion of the statistical methods will be included in order to describe how each particular analysis aids in answering the research questions.

Data Collection

The first components of data collected were geographic datasets known as shapefiles to visually display the study area. They exhibit how the region has changed over the past twenty years. Population census data were key elements in examining the changes of the study area. Some elements of census block group and tract data that were used in this study are population, percent urban, and population density.

Economic census data for this study were extremely valuable to display the changes in business activity of this region over time. The

Economic Census is published every five years (ex. 1997, 2002). It lists such information as the number of establishments in an area along with the number of employees. Data for this study were collected at the county and place levels because these levels of geography were the best at displaying any changes to various portions of the study area. If data were collected at the MSA level, it would only display changes to the study area as a whole. The data gathered for this study focused on both manufacturing and retail establishments. All manufacturing and retail data for the study area during the years of 1982 - 1997 were compared to view any new emerging economic patterns.

Population Data

The next step taken in this research was to compare population data between 1990 and 2000. 1980 census data were not used for a couple of reasons. First, 1980 data were used in Finchum's study and provided evidence that the Tri-Cities region was dispersed. Second, the 1980 census disk did not provide complete coverage of the United States. This made 1980 data difficult to compare with 1990 and 2000.

For both the MSA and each of the three study cities, 1990 and 2000 data were chosen to demonstrate the changes in population. The changes in the amount of land for each of the three cities were analyzed in order to determine if any increases in population were related to the

amount of land that had been annexed during the ten-year period. In relation to population data, the population change between 1990 and 2000 was investigated through the use of block groups. This was completed in order to determine if there were patterns that developed in the study area.

Urban Areas

The next procedure was to determine if the study area had seen a significant increase in urban land. In order to perform the appropriate test, the percent of urban land from 1990 was compared to urban land from 2000 at the census tract level. Census tracts were chosen because 1990 percent urban data was not available in the same geographies for 2000. This means that tracts from 1990 had to be compared with 2000 tracts even though some slight changes in the boundaries may have occurred. Census tracts were chosen over block groups because they were found to be less volatile in regards to boundary changes. In fact, the variance of percent urban data for the study area at the tract level in 2000 was 0.1744 while the variance at the block group level was 0.1904. This showed the data at the tract level would be less variable because the distribution was not as spread out as the block group level.

This procedure was completed by using a two-sample difference of proportions test (one-tailed). This test assessed the likelihood that a

statistically significant positive difference existed between the percentages of urban land in 2000 versus 1990. The null and alternative hypotheses were as follows:

$$H_0: P_1 = P_2$$

$$H_A: P_1 > P_2$$

where P_1 = proportion of urban land by census tract for 2000

P_2 = proportion of urban land by census tract for 1990

The test statistic for the difference of proportion procedure (Z_P) was as follows:

$$Zp = \frac{P_1 - P_2}{\sigma_{P1 - P2}}$$

The denominator of the above equation represented the standard error of the difference of proportions and was calculated as follows:

$$\sigma_{P_1 - P_2} = \sqrt{p'(1-p')\left(\frac{n_1 + n_2}{n_1 n_2}\right)}$$

where p' was the pooled estimate of the focus category for the population.

The equation for p' was as follows:

$$p' = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2}$$

The aforementioned hypothesis was tested at the 5% significance level. This means there was a confidence of 95% that a Type I Error was not being made. A Type I Error occurs when a null hypothesis is true, but it is incorrectly rejected.

Population Density

Population density for the study area was the next variable analyzed. To determine if there was a statistically significant difference between the population density of 1990 and 2000, the Wilcoxon matched-pairs signed-ranks test was performed. This test was chosen over the matched-pairs T test because the standard error could not be calculated from the population density data collected. To perform the analysis, the 120 census tracts for the study area were selected. For each of the census tracts, the population density for 1990 and 2000 was obtained as well as the difference in density and the rank value of this difference for each tract. Since population density was selected for two different time periods, a matched-pairs procedure could be applied. The null and alternative hypotheses were as follows:

> H_0: The ranked matched-pair differences of the population density in 1990 and 2000 were equal
>
> H_A: The ranked matched-pair differences of the population density was positive in 2000 versus 1990

The test statistic for the Wilcoxon matched-pairs procedure was:

$$Z_W = \frac{T - \frac{n(n+1)}{4}}{\sqrt{\frac{n(n+1)(2n+1)}{24}}}$$

where n was the number of census tracts and T was the sum of ranks for positive differences.

The data used in this procedure were tested at the 5% significance level.

Regression

A multiple regression utilizing 2000 census data was performed to determine if there were variables that seemed to explain the changes in the amount of urban area found in the region. In multiple regression analysis, one attempts to predict a single dependent variable from a number of independent variables (Bennett *et. al* 1987). Each independent variable chosen was expected to help explain the value of the dependent variable. The dependent variable used was the percent of urban land for the study area. The data were classified in units known as Zip Code Tabulation Areas (ZCTAs). This new geography was developed for Census 2000 to overcome the difficulties in precisely defining the land area covered by each ZIP Code (United States Census Bureau 2003). ZCTAs were selected for this study primarily because the number of businesses was desired as an independent variable. Since the Economic Census does not produce its results in tracts or block groups, zip codes were the geography that best fit this analysis. The independent variables used to help predict changes in the amount of urban area were median house value, percent of population with a Bachelor's degree, percent of houses occupied, number of businesses, median household income, percent white and population density.

A stepwise regression procedure was then performed. This analysis would only take in variables that significantly improved the value of R-Square. All other variables would be excluded from the procedure.

Economic Census

Economic census data for this study were extremely important in order to display the changes within this region over time. It lists such information as the number of establishments in an area along with the number of employees. Data for this study were collected at the county and place levels and focused on both manufacturing and retail establishments. Data were collected at the county level to determine if there was a large portion of the study area that was specialized while the place data simply focused on the cities of Bristol, Kingsport, and Johnson City. An important issue with place data was that the total number of establishments and employees was not released by place. This was important because the percent of employees and establishments cannot be determined without the totals for a place. These data were not released primarily for confidentiality concerns. Because of this situation, place data were compared to the city's population. It was assumed that if two cities had similar populations, they should have a similar number of businesses in each economic category. Otherwise it can be argued that one of the cities had a specialization over the other.

In order to determine if the study area had a particular specialization in retail or manufacturing activities at the county level, the number of establishments and employees for the region were compared to the national average. This was completed by using a one-sample difference of proportions test (one-tailed). This test assessed the likelihood that a statistically significant positive difference existed between the study area's establishments and employment trends and the national average. The null and alternative hypotheses were as follows:

$$H_0: P = \rho$$

$$H_A: P > \rho$$

where P = proportion of establishments and employees in retail and manufacturing for each county in the study area

ρ = proportion of establishments and employees in retail and manufacturing for the United States

The test statistic for the difference of proportion procedure (Z) was as follows:

$$Z = \frac{P - \rho}{\sigma_P}$$

The denominator of the above equation represented the standard error of the difference of proportions and can be calculated as follows:

$$\sigma_P = \sqrt{\frac{\rho(1-\rho)}{n}}$$

The data used in this procedure were tested at the 5% significance level.

The next chapter provides the results of the analysis described in this chapter. The analysis section will provide answers to each of the research questions outlined in Chapter 1.

CHAPTER V

STATISTICAL METHODS AND ANALYSIS

This chapter provides the results of the separate analyses conducted to determine if the Tri-Cities region of East Tennessee is a dispersed city. Each section utilizes the research methodology discussed in Chapter 4, and uses the census data collected for this study to answer the proposed research questions.

Population Data Analysis

Table 1 shows 2000 population data for each of the three study cities along with the Tri-Cities MSA. As stated in the introduction, the three cities do have a similar population size. This is an important observation in regards to the analysis of economic census data by place. Similar sized populations should have a similar number of establishments and employees by business type.

Table 2 displays the percent change in population between 1990 and 2000. Kingsport had the highest gain of over 23% while the MSA increased a total of 10.1%. Bristol, Kingsport, and Johnson City increased by a combined total of 14,969 persons while the rest of the MSA excluding

these three cities increased by 29,075 persons. The analysis in this section explains where these 29,075 persons have settled.

Population of Core Cities and Metropolitan Statistical Area - 2000	
City	**2000 Population**
Bristol, TN/VA	42,188
Johnson City, TN	55,469
Kingsport, TN	44,905
Core Cities - Study Area	142,562
MSA	**2000 Population**
Tri-Cities	480,091
Source: U.S. Census Bureau, 2000	

Table 1

Percent Change - Population of Core Cities and Metropolitan Statistical Area 1990-2000	
City	**Percent Change**
Bristol, TN/VA	0.8%
Johnson City, TN	12.3%
Kingsport, TN	23.5%
Core Cities - Study Area	11.7%
MSA	**Percent Change**
Tri-Cities	10.1%
Source: U.S. Census Bureau, 2000	

Table 2

Table 2 above displays an increase in population for each of the three major cities in the study area. Figure 3 illustrates that numerous block groups around each city declined. Table 3 provides information relating to the overall size of each city. The population of each city had increased between 1990 and 2000 and the land area had increased as well. This increase of land was related to annexation around each city to increase its size. For example, Kingsport's population increased 23.5% during the ten

Population Change: 1990 - 2000

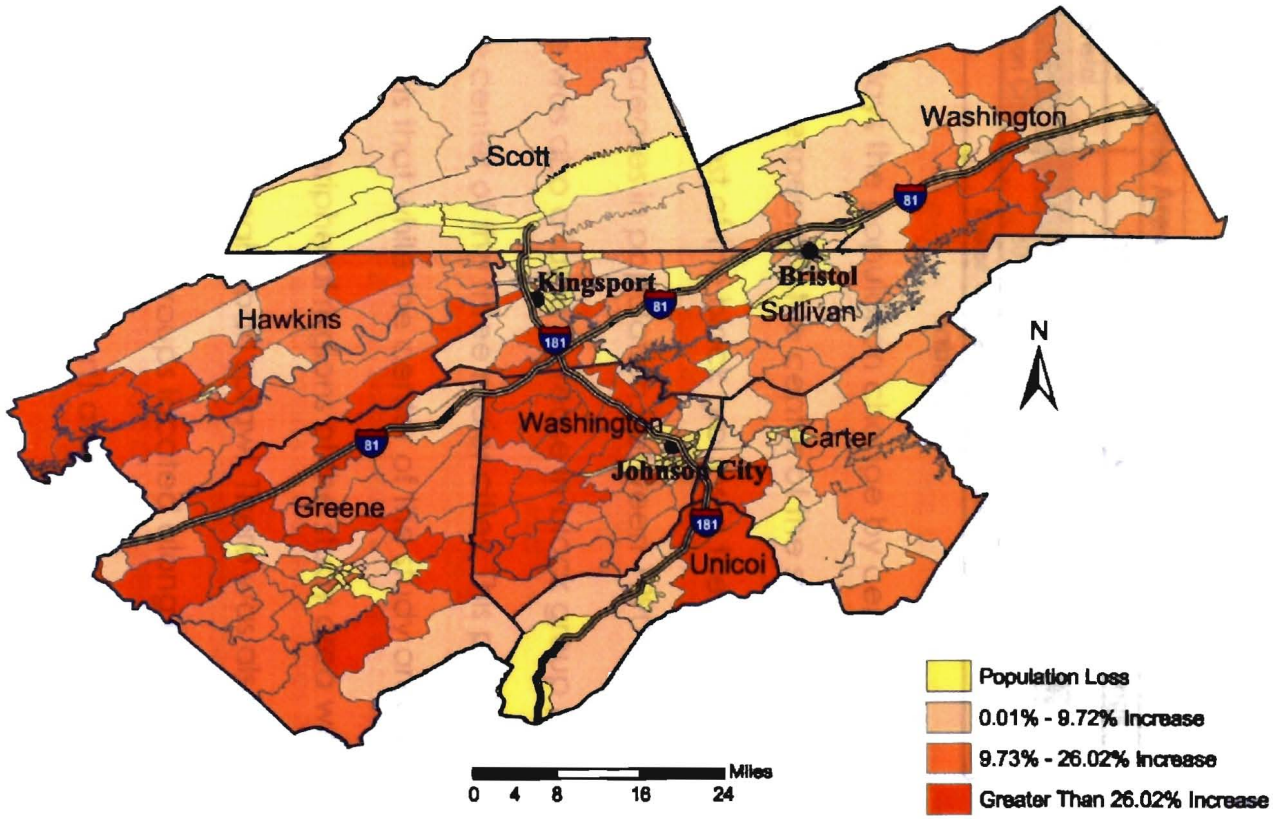

Figure 3

year period. During this same time, Kingsport increased in area by nearly 40%. This is an important discovery because it helps illustrate that each city was increasing in population because it was increasing the amount of land it governs.

Study Cities Area Change - 1990 - 2000 (square miles)			
Cities	1990	2000	% Change
Bristol	32.6	42.6	30.7%
Kingsport	32.4	45.0	38.9%
Johnson City	30.6	39.6	29.4%
Source: U.S. Census Bureau, 2000			

Table 3

Figure 3 displays the population change by census block group from 1990 to 2000. As expected, the center of the study area showed significant increases. Most of the block groups in the center of the Tri-Cities region reported increases in population between 1990 and 2000 of at least 9.73%. There was also a large increase in block group populations found outside the center of the three major cities. This particular observation suggests that while the center of the study area was gradually filling in, the peripheral regions of the study area were experiencing some traditional urban sprawl. There was also a large increase in population in block groups located along Interstates 181 (connecting Johnson City to Kingsport) and 81 (connecting Bristol to Gray).

Urban Area Analysis

In order to determine if the study area had seen a significant increase in urban land between 1990 and 2000, the percent of urban land from 1990 was compared to urban land from 2000 at the census tract level. This was completed by using a two-sample difference of proportions test (one-tailed) discussed in the methodology section of this thesis.

Figure 4 displays the 2000 census tracts that exhibited statistically significant increases over 1990. The results were evaluated at the 5% significance level. The census tracts in orange had z-scores greater than 1.645. All scores greater than 1.645 led to the rejection of the null hypothesis, allowing 95% confidence in the alternative hypothesis. Many of the tracts found in the middle of the three cities grew significantly. This helps to show that the amount of urban land was increasing in the study area. The primary reason for the tracts northeast of Bristol and southwest of Johnson City being significant was that these tracts are located along Interstate 81 or Highway 11E. The first areas outside of cities that become urbanized tend to be located parallel with the Interstate or U.S. highway system. There were also many tracts seen on the peripheral of the study area that displayed a significant increase in urban land. This provided another example, along with the population change data, that traditional types of urban sprawl were occurring in the region. The tracts found south of Johnson City displayed significant increases in urban land

Urban Percent Change: 1990 - 2000

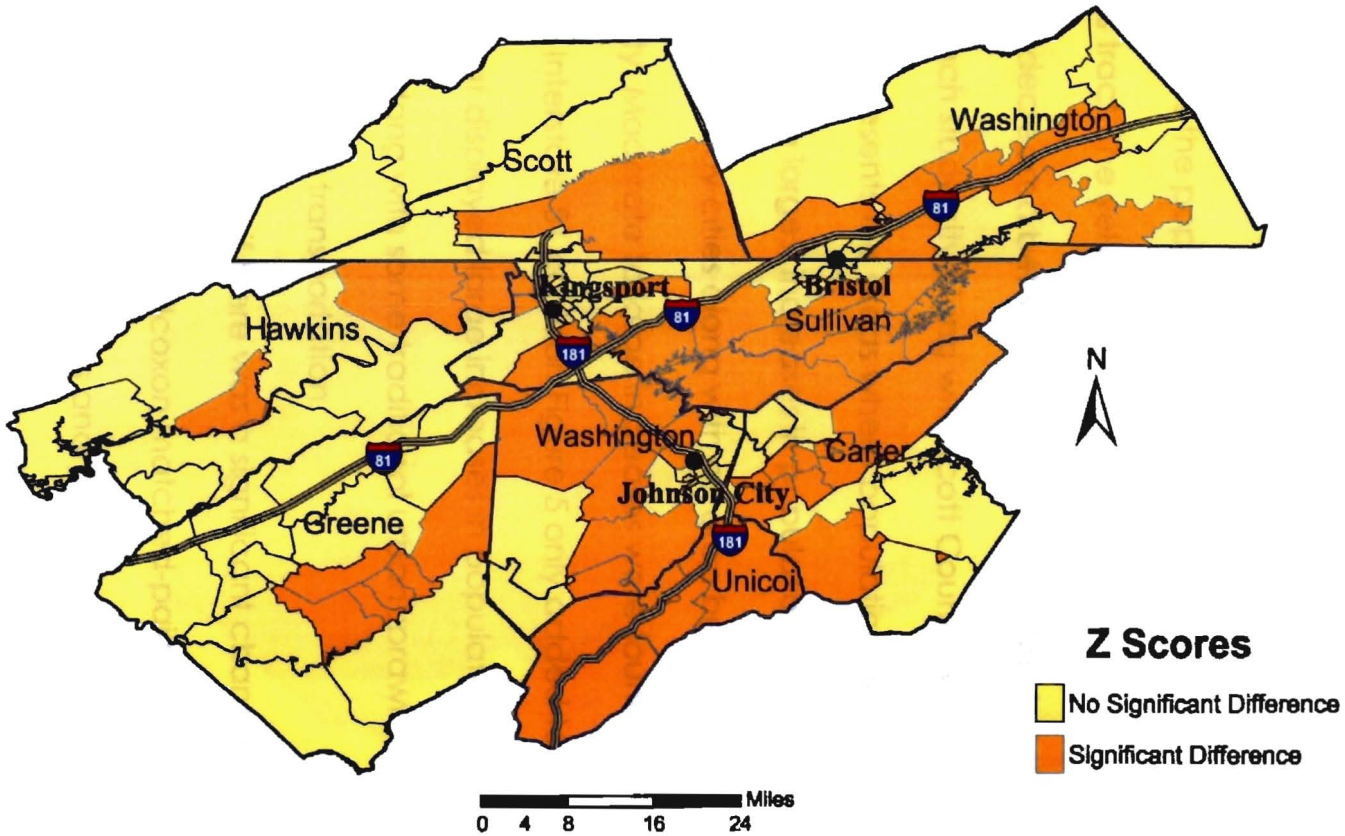

Figure 4

because Interstate 181 has caused that region to become well connected to both Johnson City and Kingsport.

Population Density Analysis

Figure 5 shows the population density change between 1990 and 2000 by census tract. The yellow tracts were the areas where population density actually decreased between 1990 and 2000. Most of those tracts were found in each study city along with Scott County, Virginia. The darkest orange represents the areas where population density increased at the largest rate. The largest increases in population density were in the middle of the three study cities along with an area between Kingsport and Johnson City. Moderate to large increases were found northwest of Bristol along the Interstate 81 corridor. Figure 5 only added to the results of previous maps that displayed large increases in population in the center of the study area along with some traditional urban sprawl development near the major nodes of transportation.

In order to determine if there was a significant change in population density for the study area, the Wilcoxon matched-pairs signed-ranks test was applied. Of the 120 census tracts analyzed, 91 displayed an increase in population density, 28 demonstrated a decrease and one tract displayed no change. Since there were a large number of tracts displaying an increase in population density, it appeared that the study

Population Density Change: 1990 - 2000

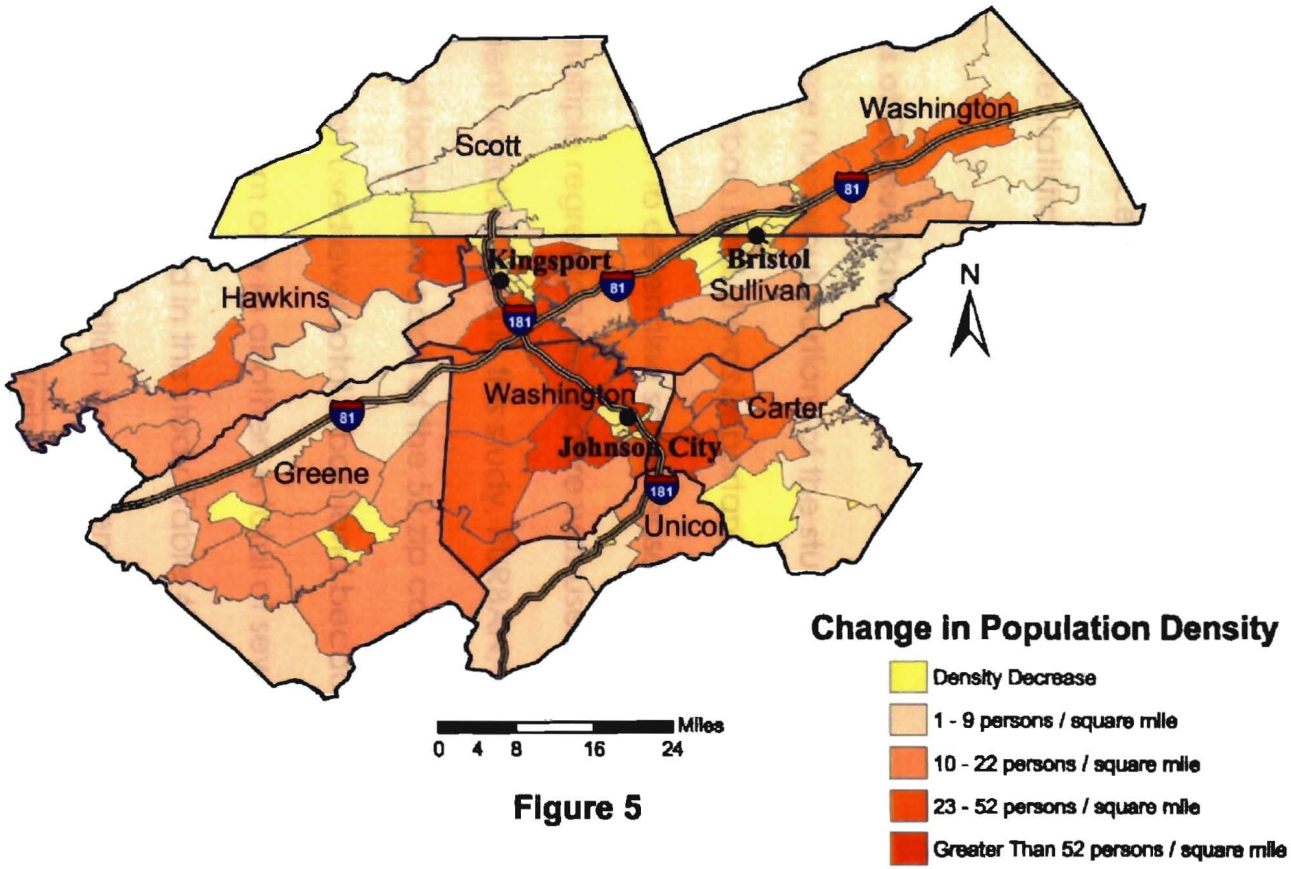

Figure 5

region had experienced a population density increase between 1990 and 2000. The Wilcoxon matched-pairs signed-ranks test was performed to determine if this increase was significant. After performing the Wilcoxon test at the 5% significance level, the Z_W obtained was 4.10. This procedure suggested that the difference in population density for the census tracts in 2000 versus 1990 were statistically significant.

Regression Analysis of Census Data

Since there were numerous portions of the study area that had a significant increase in urban land, it was important to determine the cause of these changes. In order to determine some reasons why the study area had changed, a multiple regression procedure was used.

The dependent variable used in this study, PURBAN, was the percent of urban land located in each of the 52 zip codes for the study area. Percent urban was used over total urban land because the size of each zip code differed from one to another. A total of seven independent variables were used in this study (Table 4). They were associated with the general population and taken from 2000 census data.

Independent Variables	
NUMBUS	Number of Businesses
POPDENS	Population Density (square miles)
PWHITE	Percent White
MHINCOME	Median Household Income
POCCU	Percent of Housing Units Occupied
MHVALUE	Median Housing Value
PDEGREE	Percent of Persons with a Bachelor's Degree

Table 4

The first independent variable was NUMBUS (Number of Businesses). This variable was chosen because urban areas tend to have a concentration of businesses. POPDENS (Population Density – square miles) was selected because an urban area typically has a dense population. PWHITE (Percent White) was used to determine if race plays a role in an area becoming urban. MHINCOME (Median Household Income) was chosen to see if income plays an important role in the location of an urban area. POCCU (Percent of Housing Units Occupied) was selected to determine if a large number of vacant housing units were more prominent in an urban area. MHVALUE (Median Housing Value) was used to see if the value of a home was important to the explanation of an urban area. The last independent variable was PDEGREE (Percent of Persons with a Bachelor's degree). This variable was chosen to analyze if the education of people in the urban area was a factor to its classification.

The first procedure conducted on this data was a Pearson Correlation. All eight variables were compared against one another in order to determine how much each variable helped to explain one another. First, the correlation between the dependent variable (PURBAN) and each of the independent variables (Table 5) is displayed.

Significance and Confidence for Each Independent Variable versus PURBAN		
Independent Variables	Significance Level	Confidence Level
NUMBUS	0.600	0.000
POPDENS	0.492	0.000
PWHITE	-0.425	0.002
MHINCOME	0.235	0.094
POCCU	0.481	0.000
MHVALUE	0.124	0.381
PDEGREE	0.520	0.000

Table 5

Overall, the correlation between PURBAN and each independent variable showed a moderate to high level of significance with a high level of confidence. The two variables that were not highly correlated with PURBAN were MHINCOME and MHVALUE. MHINCOME had a significance level of .235 and a confidence level of .094. This confidence level showed that there was a 90.6% confidence of a relationship between PURBAN and MHINCOME. This was not significant if considering a confidence level of 95%. MHVALUE proved to be even less correlated. With a correlation coefficient of .124 and a confidence level of .381, there was only 61.9% confidence of a relationship between PURBAN and MHVALUE.

In the correlation matrix comparing the independent variables, a few relationships were found. The independent variables with the highest correlation coefficient were POPDENS and PWHITE at -0.661. This showed that as the population density increased, the percent of whites decreased. Another high correlation coefficient was found between

NUMBUS and PDEGREE. This showed that areas which had a high number of businesses had a high percentage of people with a college degree.

In addition to correlation, testing for equal error variance between the dependent variable and each independent variable is an important step in determining the strength of the regression analysis. Homoscedasticity is the assumption that the variability for one variable is roughly the same at all values of the other variable (Neter *et al.* 1996). When equal variance is not observed, it is known as heteroscedasticity (Neter *et al.* 1996). To test these assumptions, scatterplots of the dependent variable versus each independent variable were produced. After reviewing all seven of the scatterplots, only NUMBUS was found to contain a high level of heteroscedasticity. It is important to note that the heteroscedasticity between PURBAN and NUMBUS is not fatal to the analysis between the two variables, but it is weakened.

Since both correlation and equal error variance testing were performed, the next analysis conducted was multiple linear regression. When using the multiple linear regression analysis, an equation was computed to predict the percent of urban areas by zip code for the study area. The basic equation is explained:

$$Y = a +/- b_1x_1 +/- b_2x_2 \ldots +/- b_nx_n$$

Y is the dependent variable, *a* is the constant, *b* is the beta coefficient, and x is the independent variable. After running the multiple

regression, the equation was calculated as follows:

PURBAN = -4.059 + 6.775E-04 (NUMBUS) + 2.082E04 (POPDENS) + 2.809 (PWHITE) + 6.259E-06 (MHINCOME) + 1.336 (POCCU) -1.97E-06 (MHVALUE) + 3.310 (PDEGREE)

The R-value for the multiple regression was .872 and the R-Square value is .761. The value of R-Square indicated that 76.1% of the variation in PURBAN was explained by the variation of the combined independent variables. The significance level for the R-Square value was les than .001.

A histogram with a normal curve (Figure 6) was produced showing the distribution of frequencies of standardized residuals for PURBAN. The residuals by zip code deviate moderately from being normally distributed. All 52 observations were located +/- 2.50 standard deviations from the mean average percent capacity.

The next analysis completed was stepwise regression. This analysis would only take in variables that significantly improved the value of R-Square. All other variables would be excluded from the procedure. After performing the stepwise procedure, the five variables that were used were NUMBUS, POPDENS, MHINCOME, PWHITE and PDEGREE.

The R-Square value for the five variables was .754. NUMBUS by itself had an R-Square of .360. POPDENS contributed .224 with MHINCOME adding another .078 to the R-Square value. PDEGREE and PWHITE completed the explanation by adding a combined value of .092. The equation for the

stepwise regression was as follows:

PURBAN = -3.723+ 7.453E-04(NUMBUS) + 2.383E-04(POPDENS) + 8.556E-06 (MHINCOME) + 3.488(PWHITE) + 2.717 (PDEGREE)

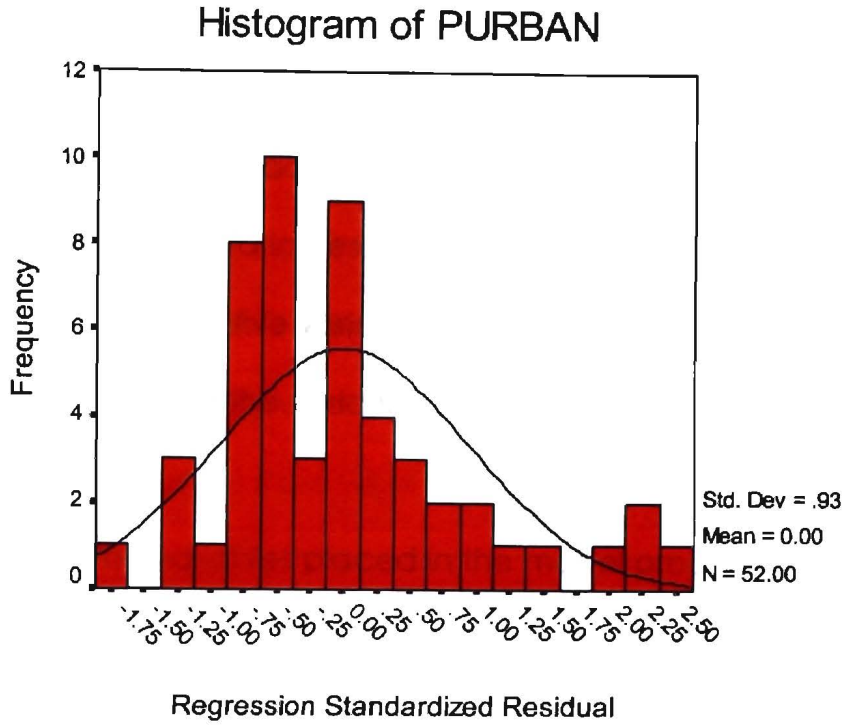

Figure 6

It was understandable that NUMBUS was the first variable entered into the stepwise because it was the highest correlated variable with PURBAN. PDEGREE would be expected to be the next variable entered since it was the second most correlated with PURBAN. This did not happen due to the fact that PDEGREE was so highly correlated with NUMBUS. Since these two variables were so highly correlated, they had a high degree of multicollinearity between them. When NUMBUS was placed into the stepwise regression, it had already explained a large amount of the

variable PDEGREE. Therefore, PDEGREE was not as significant in the stepwise procedure. The significance level for the R-Square value in the stepwise regression was less than .001.

When comparing the two regression procedures, there was almost no loss of explanatory power. The multiple regression, with seven independent variables, had an R-Square of .761. The stepwise regression, with five independent variables, had an R-Square of .754. This demonstrated that the five variables used in the stepwise regression accounted for most of the variation of the percent of urban area in the Tri-Cities region.

Overall, the variables placed in the model predicted PURBAN well. The results demonstrated that the number of businesses along with population density were very influential in determining the percent of urban land. The only problem with these two variables was the high amount of heteroscedasticity found between the dependent variable and the number of businesses. This helped to weaken the argument that the number of businesses played an important role of the percent of urban land. Surprisingly, the variable that did not play an important factor in explaining the percent of urban land was the median house value. On average, the value of a home in an inner city is not as high as a home in the suburbs. This was not shown in the model since the median home value was not included in the stepwise procedure.

Other variables that could have been included in the regression analysis could include the number of employees along with the percent of particular races such as Hispanic, Asian, and African-American.

Economic Census Analysis

The next section of the analysis focused on the economic census data collected for this study. This section was imperative in determining the answer to the research question relating to whether or not the study area had decreased in specialization during the last twenty years.

Economic Census data were collected for the years of 1982, 1987, 1992 and 1997. Throughout the period some distinct changes could be seen by comparing the data from year to year. Tables 6 and 7 illustrate the changes in manufacturing from 1982 through 1992. Between 1982 and 1987, there was a steady rise in the number of manufacturing establishments. An interesting observation between 1982 and 1987 was the change in employees. At the time of the previous study for the Tri-Cities region, Kingsport was considered the city that specialized in manufacturing. Due to the automation of manufacturing plants, Kingsport began to see a decline in its manufacturing employees. According to the table, Kingsport actually experienced a 12.3% decrease in manufacturing employees while Johnson City increased over 10%. In fact, Kingsport decreased in manufacturing establishments by almost 15% between 1987

and 1992 while the rest of the region experienced a significant increase. Since Kingsport was the node that specialized in manufacturing, these data provided a good example of how the area had decreased in its specialization of manufacturing.

Percent Change - Manufacturing Establishments and Employees 1982-1987		
Core Cities & MSA	**Establishments**	**Employees**
Bristol TN	7.8%	Not Available
Johnson City TN	6.5%	10.8%
Kingsport TN	5.8%	-12.3%
Johnson City MSA	11.0%	-0.2%
Johnson City MSA (not including above 3 cities)	14.0%	Not Available
Source: U.S. Census Bureau, 1989		

Table 6

Percent Change - Manufacturing Establishments and Employees 1987-1992		
Core Cities & MSA	**Establishments**	**Employees**
Bristol TN	10.9%	-45.2%
Johnson City TN	7.3%	-7.6%
Kingsport TN	-14.5%	12.7%
Johnson City MSA	11.3%	3.2%
Johnson City MSA (not including above 3 cities)	17.2%	14.7%
Source: U.S. Census Bureau, 1994		

Table 7

Tables 8 and 9 display the changes in retail patterns for the region between 1982 and 1992. Table 8 displays an interesting pattern between the number of establishments and employees. During this 5 year period, there was a significant decrease in establishments while there was a steady increase of employees. An explanation for this was that there was the creation of a number of large Walmart-like establishments that employed a large number of people. Between 1987 and 1992, Kingsport and Bristol decreased in establishments with Bristol also decreasing in employees. These tables did not necessarily display a change in

specialization of retail, but it seemed that the changes in the economic base of both Bristol and Kingsport were causing Johnson City to look slightly more specialized.

Percent Change – Retail Establishments and Employees 1982-1987		
Core Cities & MSAs	**Establishments**	**Employees**
Bristol TN	-21.6%	28.5%
Johnson City TN	-17.3%	16.9%
Kingsport TN	-20.8%	16.8%
Johnson City MSA	-27.9%	19.9%
Johnson City MSA (not including above 3 cities)	-34.6%	21.4%
Source: U.S. Census Bureau, 1989		

Table 8

Percent Change - Retail Establishments and Employees 1987-1992		
Core Cities & MSAs	**Establishments**	**Employees**
Bristol TN	-1.3%	-4.4%
Johnson City TN	6.6%	18.2%
Kingsport TN	-6.3%	5.6%
Johnson City MSA	3.6%	14.1%
Johnson City MSA (not including above 3 cities)	7.5%	23.2%
Source: U.S. Census Bureau, 1994		

Table 9

In order to determine how the region has changed economically during the last 20 years, the economic census data by county were compared with the national average. Tables 10, 11 and 12 focus on the total establishments and employees for the United States along with the national percentage of establishments and employees that are related to manufacturing and retail. Table 10 showed that as the country's population had increased, the number of establishments and employees had also increased.

United States Total Employees		
Year	Establishments	Employees
1982	4,633,960	74,297,252
1987	5,937,061	85,483,804
1992	6,317,690	92,800,870
1997	6,894,869	105,299,123
Source: U.S. Economic Census, 1997		

Table 10

Percentage of Manufacturing Establishments and Employees - United States		
Year	Establishments	Employees
1982	7.5%	24.0%
1987	6.0%	20.7%
1992	5.9%	18.3%
1997	5.3%	16.0%
Source: U.S. Economic Census, 1997		

Table 11

Percentage of Retail Establishments and Employees - United States		
Year	Establishments	Employees
1982	41.5%	19.5%
1987	25.3%	20.8%
1992	24.2%	19.8%
1997	16.2%	13.3%
Source: U.S. Economic Census, 1997		

Table 12

Tables 11 and 12 display the percentage of establishments and employees in both retailing and manufacturing had decreased between 1982 and 1997 in the U.S. A reason for the decrease in the percentage of establishments related to the mergers of companies along with large corporate establishments that put the smaller, local establishments out of business. Table 12 displays a significant decrease in the percentage of establishments that are retail. The decrease is seen due to mergers and large corporate establishments, but also to changes made in classifications by the economic census. The economic census has taken

the retail category and created new categories such as information, finance/ insurance and accommodation/food services. Another reason for the decrease in the percentage of employees relates to the automation of the workplace. As companies increased their technology, machines that did the work faster and more efficient were replacing employees (Rifkin 1996).

Tables 13 and 14 list the percentages of establishments and employees by county for the study area. These are the data that were tested against the national average to determine a specialization.

Percentage of Retail Establishments and Employees - Counties								
	1982		1987		1992		1997	
MSA & County	Establishments (number)	Employees	Establishments (number)	Employees	Establishments (number)	Employees	Establishments (number)	Employees
Tri-Cities MSA								
Carter, TN	61.1%	21.0%	31.2%	23.2%	27.8%	23.8%	20.1%	15.7%
Greene, TN	54.4%	16.7%	30.3%	16.4%	28.1%	18.2%	21.3%	14.2%
Hawkins, TN	70.1%	17.2%	29.7%	17.2%	31.2%	15.4%	23.2%	10.6%
Sullivan, TN	46.0%	17.1%	26.8%	19.4%	26.2%	19.6%	20.3%	13.5%
Unicoi, TN	61.2%	18.2%	31.7%	18.1%	30.6%	19.2%	18.4%	9.3%
Washington, TN	47.3%	19.9%	26.5%	20.8%	25.8%	21.3%	19.5%	13.7%
Bristol, VA	48.7%	21.5%	33.1%	19.5%	29.1%	17.4%	23.9%	15.5%
Scott, VA	62.4%	23.2%	34.1%	28.0%	35.5%	30.6%	27.0%	25.7%
Washington, VA	48.0%	22.9%	28.8%	26.4%	30.9%	26.8%	22.2%	19.3%
Source: U.S. Economic Census								

Table 13

Percentage of Manufacturing Establishments and Employees - Counties								
	1982		1987		1992		1997	
MSA & County	Establishments (number)	Employees	Establishments (number)	Employees	Establishments (number)	Employees	Establishments (number)	Employees
Tri-Cities MSA								
Carter, TN	7.4%	44.2%	6.2%	42.0%	6.3%	34.3%	6.2%	19.2%
Greene, TN	9.2%	54.5%	8.2%	52.4%	8.5%	44.6%	9.0%	39.5%
Hawkins, TN	5.8%	61.2%	6.9%	60.5%	8.1%	66.4%	8.4%	56.3%
Sullivan, TN	5.7%	43.2%	4.8%	38.3%	4.9%	35.2%	4.9%	28.1%
Unicoi, TN	10.9%	52.5%	10.0%	57.6%	8.9%	55.4%	8.1%	41.4%
Washington, TN	6.3%	38.8%	5.5%	31.0%	5.8%	23.7%	5.5%	20.7%
Bristol, VA	8.0%	47.9%	7.3%	46.2%	6.3%	51.0%	6.3%	47.5%
Scott, VA	8.2%	42.7%	6.3%	49.0%	8.5%	28.1%	NA	NA
Washington, VA	6.6%	30.1%	5.4%	44.0%	7.0%	21.0%	5.7%	15.0%
Source: U.S. Economic Census								

Table 14

Tables 15 and 16 display the results of the z-tests at the 5% significance level. The numbers in red represent z-scores greater than

1.645. All scores greater than 1.645 reject the null hypothesis. This means that there is 95% confidence in rejecting the null hypothesis and accepting the alternative hypothesis. The numbers in red accepted the alternative hypothesis and displayed a "specialization" or a statistically significant positive difference between the percentages from the study area and the national average.

Z Scores of Manufacturing Establishments and Employees - Counties								
	1982		1987		1992		1997	
MSA & County	Establishments (number)	Employees	Establishments (number)	Employees	Establishments (number)	Employees	Establishments (number)	Employees
Tri-Cities MSA								
Carter, TN	-0.10	40.27	0.21	48.63	0.61	39.52	1.13	8.75
Greene, TN	1.82	88.65	2.89	107.50	3.66	92.93	5.76	90.86
Hawkins, TN	-1.23	72.18	0.79	90.94	2.17	126.95	3.40	118.29
Sullivan, TN	-3.37	106.33	-3.02	104.75	-2.41	109.63	-1.04	84.30
Unicoi, TN	1.84	34.48	2.71	52.26	2.06	56.33	2.07	41.85
Washington, TN	-1.86	59.04	-1.00	45.93	-0.20	28.11	0.41	28.23
Bristol, VA	0.46	61.03	1.45	74.49	0.48	107.45	1.19	103.71
Scott, VA	0.43	24.24	0.16	38.16	1.94	14.43	NA	NA
Washington, VA	-0.72	11.06	-0.71	47.09	1.42	7.02	0.64	-3.24

Table 15

Z Scores of Retail Establishments and Employees - Counties								
	1982		1987		1992		1997	
MSA & County	Establishments (number)	Employees	Establishments (number)	Employees	Establishments (number)	Employees	Establishments (number)	Employees
Tri-Cities MSA								
Carter, TN	9.25	3.38	3.51	5.57	2.28	9.56	2.93	7.20
Greene, TN	7.55	-8.75	3.70	-14.77	3.03	-5.63	4.76	3.76
Hawkins, TN	11.02	-4.66	2.25	-8.17	3.80	-11.37	4.59	-8.60
Sullivan, TN	4.61	-14.44	1.93	-8.11	2.80	-1.62	6.70	1.53
Unicoi, TN	5.67	-1.68	2.43	-3.77	2.43	-0.89	0.97	-7.07
Washington, TN	4.88	1.67	1.33	0.15	1.85	7.21	4.67	2.69
Bristol, VA	3.78	5.69	5.04	-3.84	3.30	-7.67	5.29	7.80
Scott, VA	7.43	5.17	3.59	9.77	4.64	15.34	5.37	20.23
Washington, VA	2.83	6.72	1.97	11.34	4.48	17.04	5.45	20.57

Table 16

Table 15 focuses on manufacturing specializations throughout the study area. It is clearly evident that the region as a whole was strongly specialized in manufacturing. There was a statistically significant difference in manufacturing employees for the study area versus the national average in almost every county and every year. The counties did not necessarily show a significant number of manufacturing

establishments, but the establishments located within the study area were most likely large facilities that employed a large number of people.

Table 16 focuses on retail specializations throughout the study area. This situation was opposite to the manufacturing data. The table displayed the study area having a significant specialization in establishments but not retail employees. This means there were a large number of smaller retail establishments that did not necessarily employ a large amount of people.

These tables demonstrated that the Tri-Cities region of East Tennessee specialized in both manufacturing and retail when compared to the national average. In addition, the counties showed similar levels of specialization when compared to each other. It could be stated that the study area as a whole had a specialization in manufacturing and retail compared to national statistics.

This next test analyzed the economic census data at the place level. Since the total number of establishments and employees were not released at the place level geography, some basic comparisons of the raw data were completed. It was understood that the three study cities were roughly the same size in terms of population. Therefore, if a city had a substantially larger number of establishments or employees than the other two, it could be argued the city contained a specialization within the region.

Table 17 focuses on manufacturing. Some of the employee data was not released due to concerns of confidentiality. Based upon the data that had been collected, it could be clearly seen that Kingsport contained a much greater number of employees than either Bristol or Johnson City. In terms of establishments, Johnson City seemed to have a larger number of establishments in manufacturing. These results lead to the idea that Kingsport specialized in larger manufacturing facilities that employed a large number of people while Johnson City contained a larger number of smaller manufacturing companies.

Total Number of Manufacturing Establishments and Employees - Places								
	1982		1987		1992		1997	
Place	Establishments (number)	Employees	Establishments (number)	Employees	Establishments (number)	Employees	Establishments (number)	Employees
Bristol, TN	51	NA	55	6200	61	3400	59	1987
Johnson City, TN	77	8300	82	9200	88	8500	101	8801
Kingsport, TN	52	17100	55	15000	47	16900	61	NA
Source: U.S. Economic Census								

Table 17

Table 18 focuses on retail. This table provided evidence of the three study cities becoming less specialized. In the years of 1982 and 1987, Kingsport seemed to have a slight specialization in both establishments and employees in relation to retail. In 1992 and 1997, Johnson City surpassed Kingsport in both of these categories. This was an excellent example of the study area becoming less specialized as it continued to develop.

Total Number of Retail Establishments and Employees - Places								
	1982		1987		1992		1997	
Place	Establishments (number)	Employees	Establishments (number)	Employees	Establishments (number)	Employees	Establishments (number)	Employees
Bristol, TN	291	2516	228	3234	225	3092	181	2082
Johnson City, TN	567	5267	469	6158	500	7276	435	6118
Kingsport, TN	664	6388	526	7458	493	7873	415	5841
Source: U.S. Economic Census								

Table 18

In general, it was found that many of the census tracts and block groups in the center of the three cities showed an increase in population and percent urban. However, a slight increase in population or percent urban in an area which had very few people may give a false impression of being significantly greater. A field inspection of the area confirmed the belief that although more people have moved into the center of the study area, these cities have not grown into one urban mass. Therefore, there is evidence that this is still a dispersed city.

The percent of urban land is simply a function of population according to the definition given by the U.S. Census Bureau. Since population was the key component in determining if this area was still dispersed, a regression analysis was done to identify those variables linked to an increase in the amount of urban land, and as a result, population. It was found that population density and the number of businesses were the most influential variables in the regression.

Lastly, results of the economic analysis were as expected. The level of specialization between the three cities had decreased, as it has in many other parts of the country. This is not to disprove that this area is a dispersed city. It may simply suggest the presence of Walmart-like

establishments in the region. The aforementioned results have provided answers to the research questions stated in the introduction of this thesis. The next chapter explains how each analysis has helped to provide these answers.

CHAPTER VI

CONCLUSIONS

The Tri-Cities region of East Tennessee is home to approximately a half-million people. Since so many people live in this area, it is important to understand how the area has developed and will continue to develop into the 21st century.

The purpose of this study was to determine if the study area was functioning as a dispersed city. Also included in the study were a brief history of the study area along with some past literature that is related to both urban geography and the concept of a dispersed city as applied to the study area. The data that were used to make this determination were population, the amount of urban land, population density and data collected from the economic census. Based on population data alone, it was evident that the area did increase in population. In analyzing the amount of urban land, a large increase was found in the center of the three study cities as well as some peripheral areas. The population density analysis provided evidence that the center of the study area was developing at a faster rate than the outlying areas.

The analysis conducted provides a clear answer to the three research questions asked in the introduction section of this thesis. From population analysis, this area is still functioning as a dispersed city. Although the population continues to increase, especially in the center of the study area, research conducted in this region in July, 2002, illustrated that there is still an enormous amount of opportunity for development. Based on population, this area is still considered dispersed because one urban mass has not yet been created. In terms of economics, this region has become less specialized. Unless someone requires a high-end good such as a luxury vehicle, they will be able to conduct their business close to home. The economic census data does not necessarily suggest that this area is no longer functioning as a dispersed city since levels of specialization are decreasing in many places.

Based upon the changes in urban land and population density, it can be seen that some traditional sprawl in an outward direction is taking place. This can be noted by focusing on the areas south of Johnson City, southwest of Kingsport and northeast of Bristol. Even though the study area has not completely filled in, the access of the transportation routes from the peripheral areas to each study city has caused this to occur.

The Tri-Cities region is in a transition zone between a dispersed city and becoming one urban mass. It is important to state that as this region continues on its move towards one urban mass, it will never take upon the

characteristics of a traditional American city. There will never be one central business district around which everything is built. The Tri-Cities region currently has three major nodes and will only continue to increase the size of each node until one urban mass develops and the separate nodes become less visible.

Limitations

There were several important limitations that restricted this study. Comparing 1997 economic census data to previous years was a problem because economic data for 1997 were published by the North American Industry Classification System (NAICS). Prior to 1997, the economic data were published by the U.S. Standard Industrial Classification (SIC). The SIC Code system was developed during a time when the bulk of the American economy was involved with manufacturing. In addition, the growing need to relate U.S. output to that of Canada and Mexico under the proposed North American Free Trade Area (NAFTA) agreement required a major overhaul of the SIC (U.S. Census Bureau 2000). The implementation of the NAICS Code identified new high-tech industries, particularly those involved with computers and other electronic equipment (U.S. Census Bureau 2000). The issue was that both classify some businesses in categories slightly different from one another, making it difficult to compare data from 1997 and previous years. The U.S. Census

Bureau has done some bridging between the two codes, but this bridging has only been done on a national level.

Another issue with the economic census was the difficulty in collecting both education and medical data. One of the main goals of this project was to determine if Johnson City, Kingsport, and Bristol still had their specialization of industries in 1997 compared to 1982. Manufacturing and retail data were published by place, county and MSA, making it easy to collect. Education and medical data were broken into numerous categories and publications along with classifying both as tax exempt or non-tax exempt. This classification made it difficult to research the number of business and employees in education and medicine for the study area.

One last issue with the economic census was that the total number of establishments and employees was not released by place. This was important because the percent of employees and establishments could not be determined without the totals for a place. These data were not released primarily for confidentiality concerns.

Finally, 1980 population census data were not published for comparison with data from 1990 and 2000. The 1980 census disk did not provide complete coverage of the United States. For example, the disk contained data for census tracts with large populations, but it did not provide data for the outlying areas.

Study Area Predictions

It is predicted that the Tri-Cities region of East Tennessee will continue on its path to becoming one urban area. If a similar study of this kind is conducted in the future, it is expected that one will find the center of the area continuing to develop, traditional forms of urban sprawl continuing to increase as the center fills in and an economic base that continues to decrease in specialization. As development continues, it should be important to note the construction of new roads along with an increase in passenger numbers at the Tri-Cities regional airport.

Future Research

This study could be continued in several ways. A study could be performed that takes into account a matrix of connectivity and how the development of various roads in the region has furthered development. Additional long-term studies could concentrate on the regional airport. A study could analyze the development of the airport, the impacts it has had on the region and the amount of development taking place near the airport as compared to the rest of the region. Another aspect of researching the Tri-Cities region could be to determine whether the area is becoming less specialized or if each city is changing its specialization. For example, Johnson City surpassed Kingsport in terms of retail

establishments. It would be interesting to see if Johnson City begins to specialize in retail in comparison to the other two cities.

Because of the limited amount of literature available on the dispersed city concept, this report could be used as a model describing methods to be used on a similar situation located in another portion of the world.

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