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presented by

David Eldred Hood, Jr.

has been accepted towards fulfillment
of the requirements for

Master's degree in Geography

Major professor

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By

David Eldred Hood, Jr.

A THESIS

Submitted to
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1983

ABSTRACT

A SPATIAL ANALYSIS OF REGIONAL SHOPPING CENTER LOCATIONS BASED UPON SALES GROWTH RATES: A CHICAGO CASE STUDY FOCUSED UPON EXPRESSWAY LOCATION

By

David Eldred Hood, Jr.

The objectives of this study were to describe and analyze the locational patterns of twenty regional shopping centers in the Chicago Metropolitan Area in order to assess the effect of the expressway system as a locational factor. Each center's growth was examined in terms of its retail sales over time. This growth was calculated using a time series regression equation for each center from its opening date through 1980. The slope of each regression was considered the estimate of each centers' growth. These slopes were ranked from high to low and the resulting spatial pattern of ranked centers was discussed.

In addition, communities having the highest percentage growth in terms of population and income were examined for three, ten-year periods between 1950 and 1980. The results, showing the patterns of highest percentage change communities, were used to help explain the patterns of ranked centers. It was concluded that a consistent relationship did not exist between expressway location and shopping center growth rates.

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CHAPTER 1

INTRODUCTION
STATEMENT OF PROBLEM AND HYPOTHESES

Study Objectives

The main objective of this study was to examine the spatial relationship between the Chicago area expressway system and twenty large regional shopping centers in terms of their respective sales growth through 1980. Each center's growth over time is discussed in relation to the distance from its nearest expressway access. In addition, each center's locational attributes are examined from the viewpoint of the changing patterns of rapidly growing communities in terms of population and income between 1950 and 1980.

Chicago As A Transportation Center

Like many other cities throughout the United States, the development of Chicago's transportation system provided various directional stimuli for growth of the metropolitan area. In order to examine the changing locations of population and income growth as related to expressways, it is useful to first discern how and when this transportation system was developed. It is also helpful to examine the basic character of the communities served by the existing transportation facilities throughout the expanding metropolitan area.

Water transportation provided the first major stimulus for the city's growth. This growth, however, was primarily confined to the lakeshore and had little effect on the development of the greater metropolitan area. Playing a more important role in the settlement patterns of the metropolitan area were the rail and road networks. Radiating outward from the city center, their development allowed many of Chicago's residents to re-locate in areas containing the amenities of suburban life.

Rail Transportation. The development of the Chicago rail system was a major stimulus to the growth of the metropolitan area. Between 1848 and the turn of the century, seventeen trunk line railroads were established in the Chicago Metropolitan Area. By 1869, rail service to both San Francisco and New York was available from Chicago. This period of rail construction brought in great numbers of workers who eventually settled in the area. Many jobs were created in both the construction and transportation support industries. Initially, the main interest of the rail carriers was transporting freight on a national basis and encouraging the development of local manufacturing.

It was only after the radiating railroad lines gained direct access to the Loop (Chicago's central business district) terminals during the early 1900's that the rail-oriented suburban development pattern crystallized. Its character was simple: a large central city with twelve rail radii along which suburbs were aligned. These suburbs were located according to the placement of stations, out to a

distance of more than thirty miles from the city center. Beyond these radiating suburbs was a ring consisting of relatively independent industrial towns: Waukegan, Elgin, Aurora, Joliet, and Chicago Heights.[1] Today, the commuter railroads bring 138,000 workers into the Loop daily.[2] Thus the rail system promotes the viability of the Loop by making it highly accessible to commuters living throughout the expanding metropolitan area (Figure 1).

Road And Expressway Development. Much like the rail system, Chicago's road and expressway development provided a stimulus for growth throughout the metropolitan area. By the 1920's, the truck and automobile began to effectively compete with the railroad as a mode of freight and personal transportation respectively. The city, however, found itself grossly unprepared to handle the rapid increase in automobile use. Beginning in the 1930's, a massive road-building program was undertaken. With the onslaught of the depression, and then World War II, this program didn't intensify until the late 1940's. The initial thrust was to widen many of the already existing streets leading out of the city. Many of these major arterials such as Archer, Grand, Blue Island, and Milwaukee Avenue were constructed along old Indian trails radiating out from what is today the downtown area.

Expressway development in the Chicago area began with the construction of the Edens Expressway in the mid-1950's. The final linkages of the system were completed in the mid-

COMMUTER RAIL SYSTEM 1980

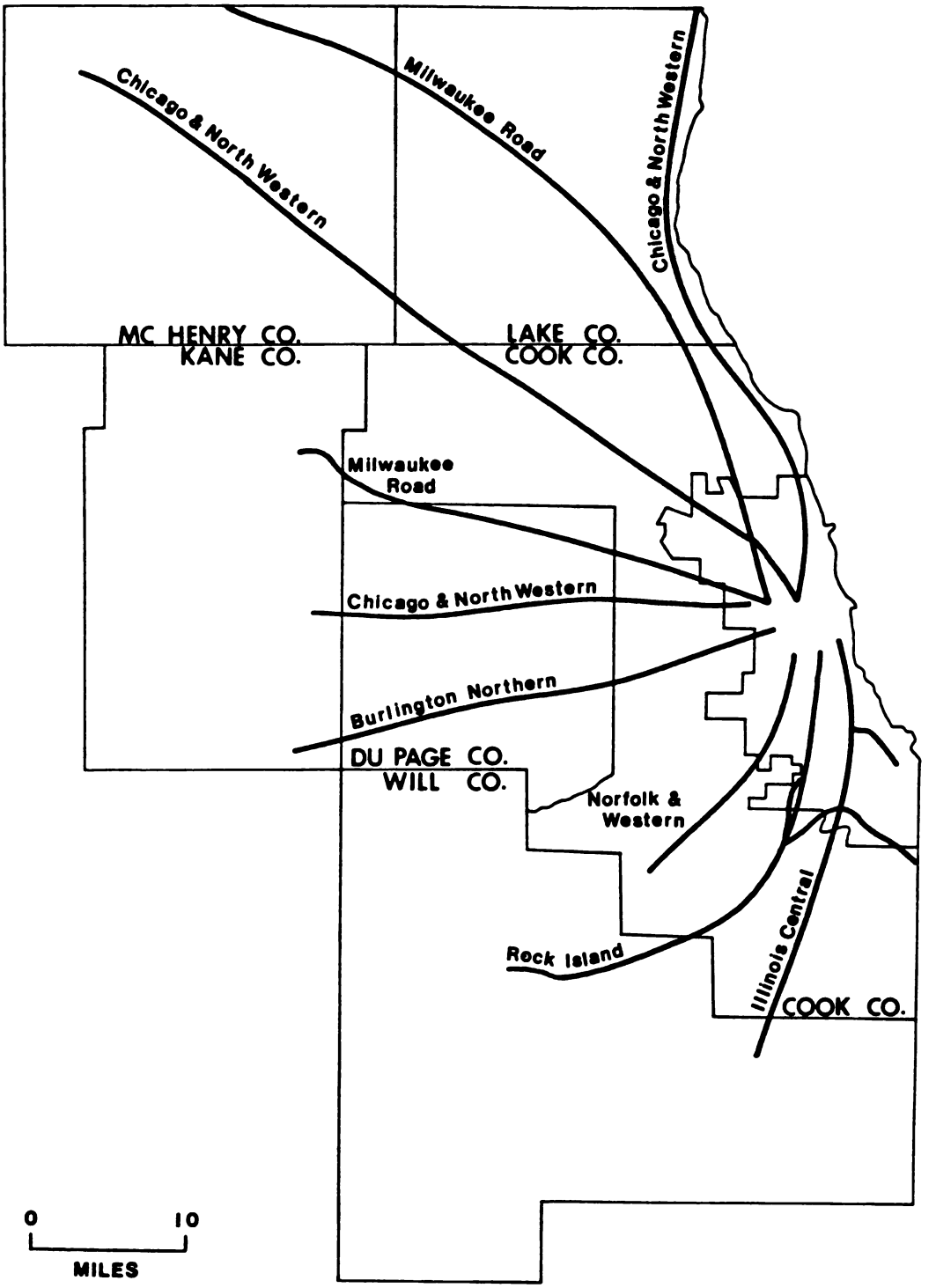


Figure 1

1970's (Figure 2). The passage of the 1954 National Transportation Act created the National Defense Highway System, a plan under which local city governments were allocated federal monies for highway construction. The majority of Chicago area expressways were financed primarily from this source, with only about ten percent of the costs paid from local taxes.[3] A radial expressway pattern consisting of six major expressways (Edens, Kennedy, Eisenhower, Stevenson, Dan Ryan, and the Chicago Skyway) was developed outward from the City of Chicago. The Tri-State Tollway, a beltway around the city connecting Indiana and Wisconsin, was also constructed as part of the system. This tollway, however, was not constructed with federal financial support. Its construction was financed through the sale of transportation bonds. In many instances, Chicago's expressways were routed through existing low income neighborhoods. The Stevenson Expressway, however, cut through a major manufacturing corridor to the south of the city. The Eisenhower and Stevenson Expressways were built on the Sioux Line and Santa Fe-Illinois Central right-of-way properties respectively.

The Growth Of The Metropolitan Area

The 1980 census indicated that the population within the Chicago city limits had fallen to 3.3 million. This is a decrease of 5.7 percent from the 1970 census figure of 3.5 million. During the same period, however, the population in the six country metropolitan area outside the Chicago city limits increased to 3.6 million. This is a 25.8 percent

CHICAGO AREA EXPRESSWAYS 1980

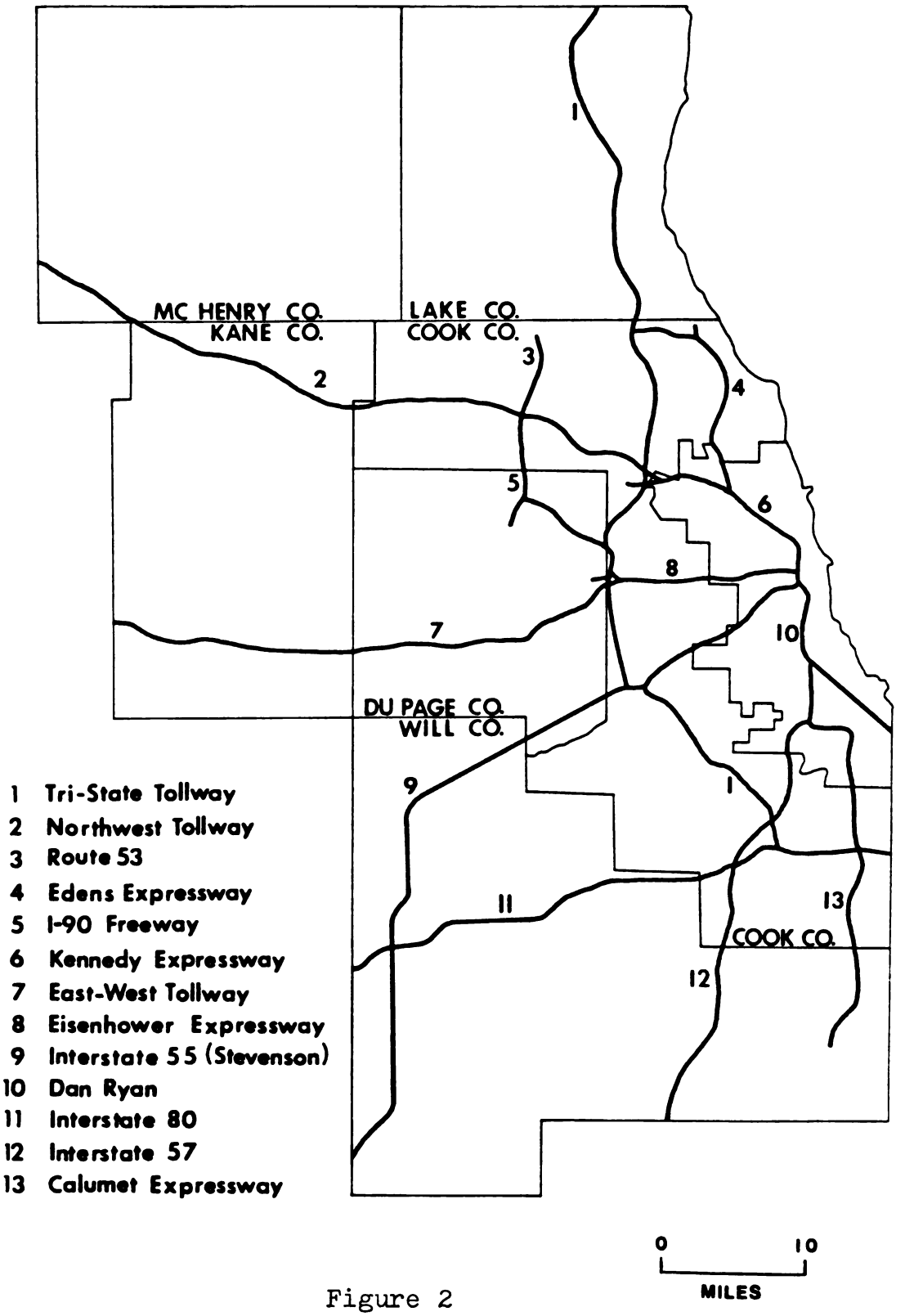


Figure 2

increase over the 1970 census figure of 2.67 million. Therefore, Chicago, like most American cities experienced a pronounced migration of population into its suburbs during the past two decades.

By 1980 there were almost 300 independent communities located within the six county metropolitan area.[4] The development of these suburban communities was closely tied to the development of ribbon suburbs located at rail station locations. During the 1930's, a substantial change took place in Chicago's residential structure. Many of the wealthier residents began to move away from the crowded central city. The improvement of the major arterials radiating outward from the city, and the subsequent development of the expressway system, promoted suburban development by providing efficient journey-to-work travel routes between the adjacent metropolitan area and the City of Chicago.[5] Dr. Irving Cutler, an authority on the development of the Chicago Area, pointed out:

> The automobile and an improved road pattern are playing a major role in the location and dispersal of population and economic activities, especially in suburban areas. Settlement need no longer be aligned along railway routes. The automobile has made huge new areas accessible for residential, commercial, and industrial uses. The expressway system, in particular, has altered the area traffic patterns and has lessened the use of other modes of transportation, especially mass transit.[6]

Chicago's suburbs are a heterogeneous mix of old and new, wealthy and poor, and young and old. While no one description fits all suburban communities, several regional patterns can be identified. The north and western suburbs

tend to be the older, more established communities. Many of Chicago's wealthier suburbs lie to the north. These include Kenilworth, Winnetka, Lake Forest, and Highland Park. The western suburbs contain some of the more industrial communities in the metropolitan area. These include Cicero, Franklin Park, and LaGrange. Many large corporations have located offices near the large regional shopping centers and expressways to the west of Chicago. Industrial parks containing light manufacturing and warehousing activities have also found the Tri-State Tollway to be an advantageous locational focus for their operation in the western suburbs. The poorer suburbs generally lie to the south. These tend to be blue-collar, industrially oriented communities. Large steel works are located in both the Calumet Harbor and Burns Harbor (Indiana) steel districts. Lower housing values and educational levels tend to characterize the southern suburbs.

Chicago As A Retail Trade Area

In 1980, retail sales in the Chicago Metropolitan Area were estimated to be thirty-five billion dollars.[7] As the development of the transportation system affected the direction of suburban migration, the retail structure within the metropolitan area was changing greatly. Specifically, the structure of the retailing sector in the Chicago Metropolitan Area has undergone two basic changes resulting from the increasing numbers of suburban residents. The first involved the shift in demand for retail locations resulting from the migration of Chicago's more affluent

population to the suburbs during the post-war era. The second change involved the increased use of the automobile to both travel to work and shop within the more dispersed suburban communities. Together these two changes created the environment necessary for the successful operation of the large, regional shopping centers now located throughout the Chicago Metropolitan Area. Large wealthy suburbs generated sufficient demand for the higher threshold retail outlets such as Marshall Field, Sears, Montgomery Ward, J. C. Penny, and Nieman Marcus. Once two or more of these large chain retailers agglomerate, the flow of customers is sufficient to support the further agglomeration of lower order and specialty type stores such as music, jewelry, drug, and electronic concerns. Shopping centers of this type are in some respects the downtowns of suburbia and the pattern of retailing has oriented itself to these new retail nodes.[8]

The agglomeration of two or more large chain retailers and the subsequent large scale agglomeration of lower order establishments has become well established as a form of suburban retail structure. This design, not surprisingly, caters to the use of the automobile as an essential part of the shopping process. Those who most frequently patronize large regional shopping centers find that the automobile is convenient for four basic reasons.[9]

1) The automobile is generally available for transportation whenever the middle or upper class consumer wishes to go shopping.

2) Using the automobile allows the consumer to readily stop at other locations while traveling to or from the regional shopping center.

3) Regional shopping centers are usually located so that they are easily accessible from the communities which they serve.

4) Plentiful and usually free parking is available at such centers.

It is evident that many factors contribute to the construction of a retail structure of a particular type on a specific site.

Chicago's Shopping Centers. The locations of the twenty centers included in this study were chosen for a variety of reasons. Much of the developers' decision making ability in choosing site locations was generated from their ability to effectively speculate about the future. This speculation involved predicting the future tastes and preferences of the consumer as well as the locations of high income and population growth communities throughout the metropolitan area. There are, however, a few basic locational strategies within which some of the centers may be classified.

Two centers, Old Orchard (opened in 1956), and Woodfield (1971), were constructed on land purchased prior to the construction of the then proposed Edens Expressway and Eisenhower Extension respectively. Thus the developers were relying on estimates of future flows along these expressways once they were completed.

Since many of Chicago's expressways were routed through already dense areas of housing and industry, tracts

of land large enough for the development of large regional shopping centers were often not available. This was especially true for the Eisenhower, Dan Ryan, and Kennedy Expressways. Hillside Center (1956), however, was able to fit into a rather small area directly adjacent to the Eisenhower Expressway at a point nineteen miles from downtown Chicago. This has proven to be a problem as other larger and more diverse centers were developed nearby, encroaching upon Hillside's trade area.[10] Specifically, Oak Brook, Yorktown, and North Riverside Park Mall were located within a few minutes drive of Hillside Plaza.

Orland Square (1976), and Strattford Square (1981) were located within established population centers rather than areas expecting future growth. Neither of these two centers are located near an expressway and shoppers living any distance from the centers must take arterial routes to reach them.

The final underlying strategy, which was characteristic of developers in the Chicago Metropolitan Area, is shared by Fox Valley (1975), and Hawthorne Center (1973). Both centers were constructed on large tracts of land away from densely populated areas and expressway accessibility. The developers' speculation was that the continuing suburban sprawl would move toward these centers. Customers attracted by the centers encouraged other commercial enterprises to open in the vicinity. New residential areas were planned and constructed by the developers of the shopping centers in

an attempt to spark the growth of the centers' trade areas.

The locations of other centers do not adhere to one of these general locational strategies. Their site selection may be based on a mixture of the strategies or include entirely different reasoning. Phillip Peters, Associate Director of the Northeastern Illinois Planning Commission, suggests that expressway access was perhaps the major factor that developers considered in locating shopping centers prior to 1970. However, the increased density of the population and the limited space available for development adjacent to expressways resulted in an expressway location becoming a secondary factor in the locational decision.[11] Landau and Heyman, a fifty year-old Chicago based shopping center development and management firm that operates ten centers in Illinois and Indiana, sports another opinion concerning the future locational patterns for shopping centers.[12] Rather than building new centers in the middle of cornfields and waiting for the threshold population to follow, the firm buys existing properties that are distressed and expands the centers they already own. Expanding existing centers makes sense because retailers are willing to move into proven locations, and the additions start producing revenue for the developer from the first day they open. Such additions can be financed, at least in part, from a center's cash flow. This allows the developer to avoid traditional financing sources, something that is especially important when mortgage money is as scarce and expensive as it has been in the last few years.

The preceding paragraphs introduced the changing demographic and retail character of the metropolitan area. With this background established, several hypotheses are presented to link together the relationship between regional shopping centers in the Chicago area and the local expressway system.

Statement of Problem and Hypotheses

The objectives of this study were to describe and analyze the locational patterns of shopping centers in the Chicago Metropolitan Area in order to assess the effect of the expressway system as a locational factor. Each center's growth was examined in terms of its retail sales over time. Sales for the centers were compared to their distance form the expressway system. This study will contribute to the explanation of similar patterns in other large metropolitan areas.

The first hypothesis of this study was designed to address the study centers' sales increases in reference to expressway system location. The results of testing the second hypothesis were used to evaluate the study area's basic market potential based on population and income changes.

The two hypotheses of this study are:

1) Shopping centers in the Chicago Metropolitan Area located near the expressway system have realized greater sales increases than those centers located further from the system.

2) The changing locations of both high percentage income growth communities and high percentage population growth communities between 1950 and 1980 were significantly related to the location of the expressway system.

The first hypothesis analyzed the shopping centers' sales growth rates in relation to each center's distance from an expressway access. The second hypothesis was tested for three, ten-year periods (1950-60, 1960-70, 1970-80). Percentage changes in population and income for each suburban community were calculated to test differences between communities near an expressway access and those located further away. It was believed that the expressway system's regional accessibility resulted in two distinct spatial patterns. First, an inverse relationship should exist between each shopping center's sales growth over the study period and its distance from an expressway access. Secondly, communities located nearer an expressway access should show greater increases in population and income throughout the study period than other, less accessible communities. Thus, it was hypothesized that the regional accessibility provided by the expressway system has altered the character of residential and commercial locations along that system.

The next chapter is a review of the literature dealing with the relationship between expressway systems and their effect upon the character of adjacent properties. The third chapter explains the methodological structure used in testing the two hypotheses. The third chapter also defines

several key terms used throughout the study. The fourth chapter presents the results of the statistical analysis and discusses the spatial patterns depicted by mapping the variables employed in the data analysis. The final chapter is a summary of the study's findings and suggests areas for further research.

CHAPTER II

LITERATURE REVIEW

Introduction

A review of literature and interviews with several knowledgeable investigators have shown that no study of this type has been undertaken previously in the Chicago area.[13] Studies dealing exclusively with the relationship between retailing trends and urban expressway system development do not seem to exist. However, much research has been done on the relationships between transportation and urban land use. The majority of this research involves the highway's impact on either property values or housing and commercial enterprise re-sale values within urban areas. A significant amount of research has also examined changes in property values at interchange locations along rural highways.

A highway's impact upon local property values and retail sales depends primarily on improved accessibility. The hypothesis in both cases is that improved accessibility alters the characteristics of nearby properties. Thus reviewing transportation's impact upon property values may aid in the examination of transportation's effect upon retail sales. Although many of the studies examining transportation and land use patterns have been done outside the field of geography, the economic geographer is certainly interested in the spatial patterns of retailing, housing,

and industry which result from the introduction of a new transportation artery.

Initial Research

In the 1950's, new interest in the impact of highways on the surrounding communities was generated, partly encouraged by the Highway Revenue Act of 1956. Many of the early studies examined the effect of highways on property values and assumed all property value effects to be a result of accessibility benefits. The results of these early studies varied widely, however, because of the different methods used in the studies. The 1960's brought about a number of studies dealing with the adverse effects of highways on surrounding properties. Most recently, regression techniques have been utilized in an attempt to explain both the beneficial and adverse effects of highways. A summary of highway impact literature is presented in the following paragraphs.

Some of the early studies took place in Dallas, Houston, and San Antonio and are summarized in Adkins (1959). Each of these studies examined real estate sales before and after a highway was constructed. The sales prices after a highway was completed were adjusted for non-highway related changes in property value by utilizing selected control areas away from the highway and examining value changes there. These studies considered both the actual sales prices and an approximation of the unimproved land value obtained by subtracting the assessed value of the improvements from the sales prices. In San Antonio, results

were classified according to several land use categories. While residential properties were virtually unaffected, manufacturing and industrial land realized an almost 220 percent increase in value. In Houston and Dallas, the findings were very similar. Using the sales prices adjusted for the value of the improvements, the land adjacent to the highway appreciated 400 percent more than the land in the control area. Land values four blocks away from the highway, however, were found to be uninfluenced by the highway in both cities.

Adkins discussed two specific problems associated with these three early studies. The first problem arose in the authors' attempt to adjust the sales prices by the assessed value of the improvements. Assessed values are often considered poor measures of actual market values. In partial answer to this, the San Antonio study compared sales prices according to land use categories. Once again, however, assessed values were utilized within each category. These three studies discussed by Adkins represented the important first steps in research dealing with transportation's economic impact upon adjacent properties.

Another study, conducted through the University of Kentucky's Bureau of Business Research (1960), examined "The Effect of the Louisville Watterson Expressway on Land Use and Land Values". Much like the Texas studies, this investigation used data on real estate sales before and after a highway development, using selected control areas as a basis for comparison. Again, assessed values of the

improvements were used. However, in contrast to the Texas studies, land values were found to increase as one moved away from the expressway indicating that other factors besides accessibility may play a major role in accurately measuring the expressway's impact on the adjacent area.

A similar study was undertaken by Bardwell and Merry (1960), in Colorado. Although much of their study area was rural, they included some suburban residential property. Bardwell and Merry only collected sales data during two time periods; one before and one after a high way was constructed. They utilized the consumer price index rather than control areas to deflate all sales prices. The study's suburban area results were mixed with improved properties depreciating in value while unimproved properties appreciated greatly. Although Bardwell and Merry differed from Adkins in utilizing the consumer price index, some of the same problems were still shared by both studies. The consumer price index may not be following the same trends as an area of residential properties in one particular city.

Highway Impact Upon Suburban Residential Properties

Two studies which examined a highway's impact by only investigating suburban residential sales data were done by Bone and Whol (1959) and the Baltimore City Planning Commission (1962). Both studies utilized control areas and examined annual sales for a number of years in order to ascertain the time period in which the highway had the most influence. Bone and Whol also utilized a residential building cost index to deflate sales prices. Bone and

Whol's "Massachusetts Route 128 Impact Study" showed mixed results for the two communities studied. In one community the highway seemed to have caused property values to appreciate, but the amount fluctuated widely from year to year. The second community didn't show any significant appreciation of property values attributable to the new highway. The Baltimore Planning Commission's "Study for East-West Expressway" evaluated the effect of expressway construction on initial sales and resales of houses located within various subdivisions along the Baltimore Beltway. Based on their annual data collections, the study concluded that the beltway had no significant effect on property values in the study areas. Similar results were found by the California Division of Highways (1965) study "The Golden Gate Freeway: An examination of the relationship Between Freeways and Community Values".

Chicago-Area Research

Two significant studies were conducted in the Chicago Metropolitan Area in the mid-1960's. Davis' dissertation, "The Elevated System and The Growth of Northern Chicago" (1965), examined land values block by block along the North Shore elevated routes in Chicago. He discovered that a direct relationship existed between distance from the central business district and the elevated's impact upon land values. Specifically, Davis was able to determine through a detailed set of data that beyond six miles north of the CBD the elevated system was accountable for higher

land values. Golden's study, "Land Values in Chicago: Before and After Expressway Constructions" (1968), used a before and after method of examination similar to many of the earlier studies. Golden's innovation, however, was that his "before" date of examination was chosen to be two years prior to the right-of-way acquisition for each expressway addition. This two year period controlled for the possibility that changes in land values may occur between the right-of-way acquisition date and the date of actual construction. His "after" date for each expressway segment was two years after that segment was opened to traffic. Using a t-test for comparing the land value differences between the two time periods, Golden found that every expressway but one showed net value increases in property values of the adjacent properties over time.

Highway Impact At Interchange Locations

Two studies related to the interstate highway system in North and South Carolina, respectively, were done by the North Carolina Highway Commission (1966) and Gittinger and Guilbert (1967). The North Carolina Highway Commission examined real estate sales at thirty-six interchanges along I-95 in North Carolina. The average value per acre for each sale among the interchange locations was calculated for periods of time before and after I-95's opening. Although the value per acre fluctuated greatly after the highway was opened, the values were consistently higher than those prior to the highway's construction. The average increase in

sales prices for all thirty-six interchanges was thirty-five percent. In contrast to the North Carolina I-95 study, Gittinger and Guilbert utilized control areas in their study of I-26 in South Carolina. Using the land parcel sales both at I-26 interchanges and at selected tracts of land adjacent to the highway, they compared these areas near the highway to those further from the highway. Once again, those areas nearer the highway were found to have higher re-sale values than those areas farther away. Schmidt (1967), who conducted a study very similar to Gettinger and Guilbert's, also found higher values along an interstate highway.

Effects Upon Retail Sales

A study expanding its scope by including a highway's effect upon retail sales as well as commercial and residential property sales was undertaken by Garrison and Marble (1968). Their study was of Highway 99 in Washington, which in 1954 was altered from going through the city of Marysville to serving as a limited access beltway around the city. Changes in both land values and business sales were studied along the new highway location. Data on 400 property sales, divided into 14 land use categories, were collected between 1953 and 1955 along the beltway's route in order to examine changes which took place after the beltway's completion. Garrison and Marble found that sales appreciated along much of the beltway's neighboring areas, especially in areas zoned for light manufacturing and commercial uses.

In their examination of business sales, Garrison and Marble acquired data on gross sales of business establishments located within Marysville from the files of the Washington State Tax Commission. Comparisons were made between 300 firms in the Marysville area and 300 firms in Snohomish, a control area located fifteen miles away. The 300 Marysville firms were divided into three geographic categories: those in the downtown area, those along the new beltway location, and those located in all other areas. For each of the three areas, mean retail sales before the highway improvement were compared with retail sales after the improvement. Comparing the slopes of the business trends over time, Garrison and Marble found mixed results. Along the beltway, sales increased for the regionally oriented activities such as auto dealers and large shopping centers, while many of the downtown firms remained either constant or fell slightly in their sales. Garrison and Marble's study was the only one found throughout the literature search which examined retail sales as a separate entity. Their findings point towards what was hypothesized for the Chicago area: shopping center adjacent to expressway access enjoying greater sales increases over time than those not as accessible on a regional basis.

Adverse Effects Of Highways

During the 1960's, a few studies were written on the harmful effects which highways might impose on their surrounding areas. Although the majority of these adverse effects would influence residential rather than commercial

locations, the following studies indicate that a highway may alter the character of prospective communities that would otherwise provide favorable locations for shopping center development. Two studies by Colony (1966, 1967) and one by Towne and Associates (1966) were among the first to examine a highway's adverse effects on property values.

Colony's two studies examined the effects of expressway noise on adjacent property values. Using property value data based on assessed values rather than actual market sales, Colony's findings may not have been truly supportive of the actual market conditions. He found, however, that land further from a highway appreciated more rapidly than land directly adjacent to it. Towne and Associates undertook a study concerning the effects of expressway noise on apartment rents. Using step-wise regression, they evaluated a number of variables as they related to apartment rents. These included distance from the expressway, neighborhood quality, and various measures of expressway noise. Their results showed that noise generated from an expressway was statistically insignificant in the determination of local apartment rents. Similar results were found by Briton and Bloom (1969), and Nelson (1975).

The Use of Regression Analysis

Beginning in the 1960's, several studies utilized regression techniques to explore the relationships between highways and the characteristics of adjacent properties.

Mohring (1961), examining a bridge connecting Mercer Island to Seattle, was among the first to utilize regression

analysis. The new bridge greatly reduced travel time to Seattle from these outlying areas. Sales of unimproved land were studied for the inland properties after the bridge was completed. Regression analysis was then used to attempt to explain the price of each parcel using variables such as parcel size, distance to the island, distance to downtown Seattle, and various characteristics of the local neighborhood. Although Mohring's results were inconclusive, he developed a new direction for transportation impact research to take.

Another study, very similar to Mohring's, was conducted by Pendleton (1963). Pendleton acquired more useful data, thus increasing the validity of his results. He used such variables as type of house, square feet of living space, number of bathrooms, and size of lot in a regression equation designed to measure the effect of accessibility on property values. His final accessibility coefficient showed a $63.68 decrease in property value for every minute increase in commuting time to the Seattle downtown area.

Beginning in the mid-1970's, a number of studies involving regression techniques focused on the Washington D.C. area. Gamble (1973,1974), studied both the adverse and beneficial effects on the local freeways on four towns in Virginia, Maryland, and New Jersey. This study was innovative in that it combined both positive and negative effects. Gamble's results were similar to other studies conducted since then in the Washington D.C. area. Using

step-wise regression techniques, Gamble selected variables for housing characteristics, accessibility measures, and noise level measures to be used in his final regression equations. His chosen measure for noise was the Noise Pollution Level Index presented in Robinson (1971). For the four communities combined, Gamble found his noise level index to represent an $82.00 increase in property value for each one decibel decrease in the index. Interviews within the four communities provided support for his findings. This represented the first attempt by a highway impact study to use the interviews as a check against its findings. Similar results representing a $75.00 increase in property value per one decibel decrease are presented in Anderson and Wise (1977).

A Washington State Department of Transportation study (1980), examined four residential study areas. They collected data on 4,785 property sales, and through a similar definition of an accessibility index, concluded that when the highway significantly increased the accessibility of a neighborhood, property values increased between twelve and fifteen percent. Commercial-industrial property values averaged 16.7 percent higher in those areas designated as high accessibility. Langley (1976), using the same type of data within the Washington D.C. area, concluded similar results.

Expressways And Suburban Residential Structure

Another logical impact of a highway on its adjacent properties is its effect upon the location and character of

the local resident population. This effect is highly visible within urban areas where accessibility and high speed, limited access transportation innovations have served to facilitate the decentralization of the population within large urban areas of the United States. Homer Hoyt (1939), in his study of the block by block land value structure of 100 North American cities, noted that "...the movement of high income families tended to proceed outward along fast mass transit lines connected to downtown". Specifically, Hoyt suggested that high income residents would, through time, move out away from the central city along sectoral paths located on one or more sides of the city.

A study on the retesting of the Burgess Concentric Zone theory (Guest, 1971), suggests that "one may find both concentric and sectoral location tendencies for high status groups". On the relationship between urban transportation and income, Manning (1978) states: "If a person's income is already heavily committed he may seek to economize on travel spending, either by switching to slower but cheaper means of transport (thus trading time for money), or seeking a closer job. Average travel distances will be shorter in miles if not in minutes among those who are constrained by a lower income". This view depicting the direct relationship between income and the amount one is willing to pay for the daily journey-to-work is also shared by Leathers (1967), and Lansing (1969).

Halvorson (1973), in evaluating journey-to-work attitudes and behavior, assumes "...that individuals

purchase separation from their workplace in direct proportion to their income level and consequent ability to pay the transportation costs implied by home-work separation". In looking at the journey-to-work as a determinant of residential location, Kain (1962), also notes that individuals with higher incomes tend to reside farther from their place of work than do middle and low income families. In 1959, the Chicago Area Transportation Study (CATS) introduced a comprehensive transportation plan for the Chicago Metropolitan Area through 1980. Their definition of an urban expressway's purpose is to provide efficient, high speed travel for commuters from the metropolitan area to the central business district".

Thus in evaluating a highway's impact upon local retail sales it is helpful to also examine the highway's impact upon population growth and character. In doing this, the researcher can gain useful insight into the basic market structure provided along the transportation route.

Summary

The literature dealing with transportation's effect upon land use and property values provided varied results when examined in reference to this study. A majority of studies, however, indicated that higher property values are associated with adjacent expressway locations. Thus, increased value is placed upon the regional accessibility provided by favorable expressway location. Garrison and Marble (1968), showed that the regional accessibility may favor retail sales as well. Golden (1968), provided

evidence that property values adjacent to Chicago area expressways have increased. Davis (1965), found similar results concerning the Chicago North Shore Elevated System. Therefore, in the Chicago area, previous studies favored placing a high value of accessibility upon transport modes designed to provide regional accessibility and journey-to-work travel into the central city. It is consequently hypothesized that this high value of accessibility will surface when studied in the context of shopping center sales, and patterns of residential location change.

The following chapter introduces the methodology used to evaluate the Chicago expressway system's effect upon shopping center sales and patterns of suburbanization throughout the thirty year study period, 1950-1980.

CHAPTER III

METHODOLOGY

This study investigated shopping center growth in a comprehensive, spatial context spanning a thirty-year period. The twenty centers studied were evaluated in terms of their sales growth over time with respect to the changing patterns of high growth income and population communities, as well as the developing regional transportation system. The following paragraphs outline the methodology employed in the study.

Phases Of The Investigation

The study was conducted in two phases. The first examined the changing locations of both high percentage change income and population growth communities in the Chicago Metropolitan Area between 1950 and 1980. The main goal was to assess the area adjacent to the expressway as desirable retail market areas in terms of population and income growth over the thirty-year period. The expressway system was built between 1952 and 1973. Thus, income and population were examined during the decades of expressway building within the metropolitan area.

The second phase of the study examined the sales for each center from its opening date through 1980. The sales data were gathered from two sources: the center developers themselves and sales tax data provided by the Illinois

Department of Revenue. Growth rates were estimated for each center as a function of its changing sales over time. The centers' growth rates were then spatially examined in two contexts. First, each center's sales growth was described in terms of the distance between the center and the nearest expressway access. Secondly, the centers' site locations were analyzed in respect to the relative locations of high growth income and population communities throughout the study period. It was hypothesized that those centers located nearer the expressway had realized higher sales growth rates over the thirty-year period.

Defining The Parameters

Before describing the methodology, it is necessary to define several key terms.

Study Period. The period studied was between 1950 and 1980. Observed changes in population and income utilized U.S. Census data for the years 1950, 60, 70, and 80. The shopping centers included in this study were constructed between 1949 and 1977. Each center's sales were collected from its first year of operation through 1980.

Study Area. The study area included the six county Chicago Metropolitan Area, consisting of the suburban portions of McHenry, Lake, DuPage, Kane, Will, and Cook counties. The downtown Chicago area was excluded from the analysis.

The Study Centers. This study included twenty regional shopping centers in the Chicago Metropolitan Area as defined

SHOPPING CENTER LOCATIONS

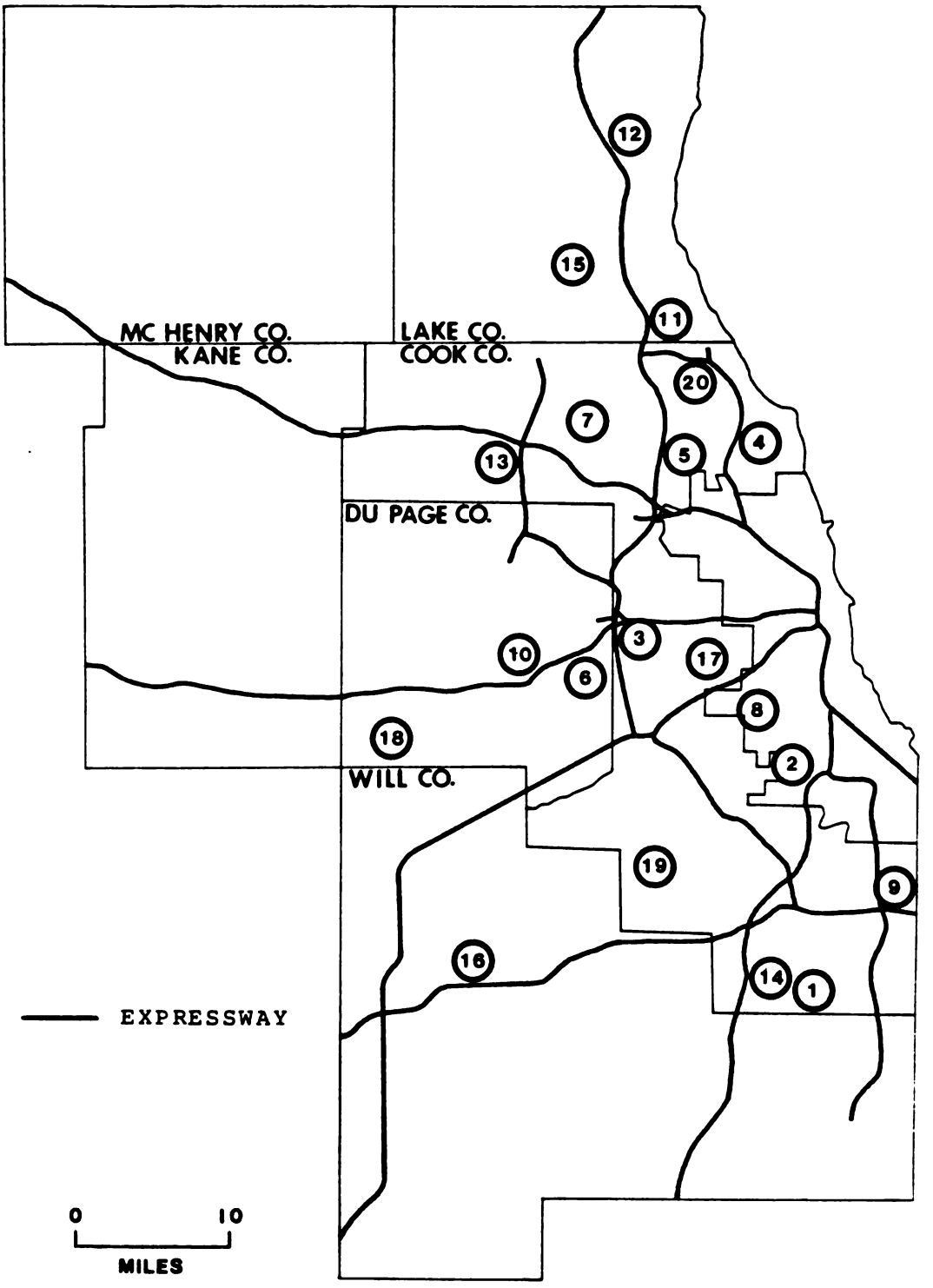


Figure 3

Table 1

Study Center Information

Name of Center	Municipality	Land Area (acres)	Year Opened
1. Park Forest Plaza	Park Forest	53	1949
2. Evergreen Plaza	Evergreen Park	25	1952
3. Hillside Plaza	Hillside	53	1956
4. Old Orchard	Skokie	97	1956
5. Golf Mill	Niles	88	1960
6. Oak Brook Center	Oak Brook	125	1962
7. Randhurst	Mount Prospect	100	1962
8. Ford City	Chicago	100	1965
9. River Oaks	Calumet City	100	1966
10. Yorktown	Lombard	133	1968
11. Deerbrook Mall	Deerfield	48	1969
12. Lakehurst	Waukegan	98	1971
13. Woodfield	Schaumburg	191	1971
14. Lincoln Mall	Matteson	110	1973
15. Hawthorne Center	Vernon Hills	113	1973
16. Jefferson Square	Joliet	56	1974
17. Fox Valley Center	Aurora	120	1975
18. North Riverside Mall	North Riverside	64	1975
19. Orland Park	Orland Park	100	1976
20. Northbrook Court	Northbrook	140	1976

Source: Shopping center management firms, 1983.

by the Urban Land Institute (Figure 3, Table 1).[14] Each of the twenty centers had the following five characteristics:

1) Planned and constructed as a large regional shopping center by one developer.
2) An area of at least 25 acres.
3) At least 300,000 square feet of gross lettable area.
4) Built around at least one full-line department store (i.e., Sears, Ward, J.C. Penny).
5) Serving a market area extending at least 10 miles from the center.

The Urban Land Institute's definition of a large regional shopping center fits into this study very well. Smaller, neighborhood type centers were excluded since they are not necessarily developed as comprehensive facilities. The existence of a major department store, however, was the key element in the selection process. Regional shopping centers constructed after 1977 were excluded from the study due to the unavailability of sales information needed for time series analysis.

Community. In examining the changing patterns of high percentage income and population growth communities, the area of measurement was by urban place. An urban place, as defined by the U.S. Census, is an incorporated village, town, or city with a population of at least 2,500 residents.

Obtaining And Analyzing The Data

The Relationship Between The Expressway And Study Center Growth Rates

In testing the first hypothesis that shopping centers located near an expressway access have realized higher sales growth rates than those centers located further from an access, the study centers' sales over time were examined. Each center was then evaluated in terms of its growth rate and distance from the nearest expressway access.

Time Series Regression. For each study center, a time series regression analysis using the least squares method was conducted, utilizing annual sales data from the opening date of the center through 1980. This analysis included the two variables time and sales. Annual sales figures not available from the study centers themselves were provided by the Illinois Department of Revenue's tax division. The center's growth statistic for the study period was the slope of the regression line. The slope of each center's regression line was then correlated with the distance from the center to the nearest expressway access point. It was hypothesized that an inverse relationship existed between that slope of each center's regression line and the distance to the nearest expressway access.

Changing Locations Of High Percentage Income and Population Growth Areas

In testing the second hypothesis, the locations of high percentage change population and income growth communities were significantly related to the expressway system, data

were gathered from U.S. Census materials.

Income. A two group structure utilizing a Wilcoxon test for the differences of ranked percentage change in income was conducted in order to assess the relationship between the expressway system and the location of high percentage income growth communities.[15] Percentage change in median family income from 1950 to 1960 was computed for all communities in the six county study area. For the ten year period, all high percentage income growth communities were defined as all places above the median of the percentage change distribution for all communities in the study area. These high percentage income growth communities were then broken down into two groups. The first group included all high percentage change income communities 0-2 miles from an expressway access. The second group consisted of all high growth communities beyond two miles from an expressway access. Distance was measured as straight line distance from the geographic center of each community to the nearest expressway access. Those communities with direct access to the commuter rail system were excluded from the analysis. This was done to control for the rail system's effect on the growth of suburban communities enjoying rail access. Computations were made for these communities, however, so that they could be discussed in relation to overall suburban growth patterns.

Two miles was chosen as a breaking point between groups in accordance with the Chicago Area Transportation Study prediction (CATS V. II, 1960) that the majority of high

income suburban residents would live within two miles of a major expressway. For the two groups of high growth communities, a Wilcoxon test was run on the differences in ranked percentage change in median family income. The results of whether or not those places nearer the expressway realized a higher percentage increase in income was used in supporting or rejecting the second hypothesis concerning income. The same methodology was used for the last two ten-year periods, 1960-70, and 1970-80.

Population. In studying the changing pattern of high percentage population growth communities, the same Wilcoxon test structure was used. Again, the test was run for each of the three ten-year periods, identifying those places within, and those beyond, two miles from an expressway access. The results were used to assess the relationship between the expressway system and the location of high percentage population growth communities for each ten-year period.

Map Analysis

In an attempt to spatially tie in the results of both the Wilcoxon tests and time series regressions, several maps have been constructed and their resulting patterns discussed. For the ten-year period 1950-60, a map was plotted depicting the locations of high percentage income and population growth communities, and the expressway system.[16] Similar maps were drawn for 1960-70 and 1970-80, respectively. The changing patterns of high growth income and population communities were discussed in relation to

shopping center and expressway locations, as well as shopping center growth rates over the study period. These maps showed several patterns over time and space which helped to explain the results of the quantitative analysis.

CHAPTER IV

RESULTS

The analysis was completed in two phases. The first involved a time series analysis for each of the twenty shopping centers. The second phase utilized the Wilcoxon test for each of the three population change and three income change variables. The following discussion summarizes the findings of both the time series and Wilcoxon analyses.

Results Of Time Series Regressions

For all but one of the twenty shopping centers, sales data were analyzed from the center's opening date through 1980. For Park Forest Plaza, opened in 1949, sales data were only available after 1961. Thus the first thirteen years were not included in the computation of that center's regression. The b-coefficient of each center's regression line was considered its growth statistic. The coefficients ranged from 29.06 to .169 respectively, with a median value of 10.50. A ranking of the centers according to their growth rates is presented in Table 2. A map depicting the spatial variation among the ranked centers is presented in Figure 4.

In considering the first hypothesis that shopping centers located nearer the expressway system have realized higher sales growth rates than centers further from the

Table 2

Shopping Centers Ranked According To Sales Growth

Center Name	Growth Rank	"b" (Slope)
Woodfield	1	29.06
Orland Square	2	26.20
North Riverside Mall	3	24.80
Fox Valley	4	18.80
Hawthorne Center	5	11.75
Ford City	6	11.73
Yorktown	7	11.12
Oak Brook	8	10.90
Northbrook Court	9	10.50
River Oaks	10	10.50
Lakehurst	11	9.76
Old Orchard	12	8.88
Lincoln Mall	13	7.53
Randhurst	14	5.08
Evergreen Plaza	15	4.83
Jefferson Square	16	4.66
Golf Mill	17	2.82
Deerbrook	18	1.25
Park Forest	19	.77
Hillside Plaza	20	.16

SHOPPING CENTERS

Ranked According To Sales Growth

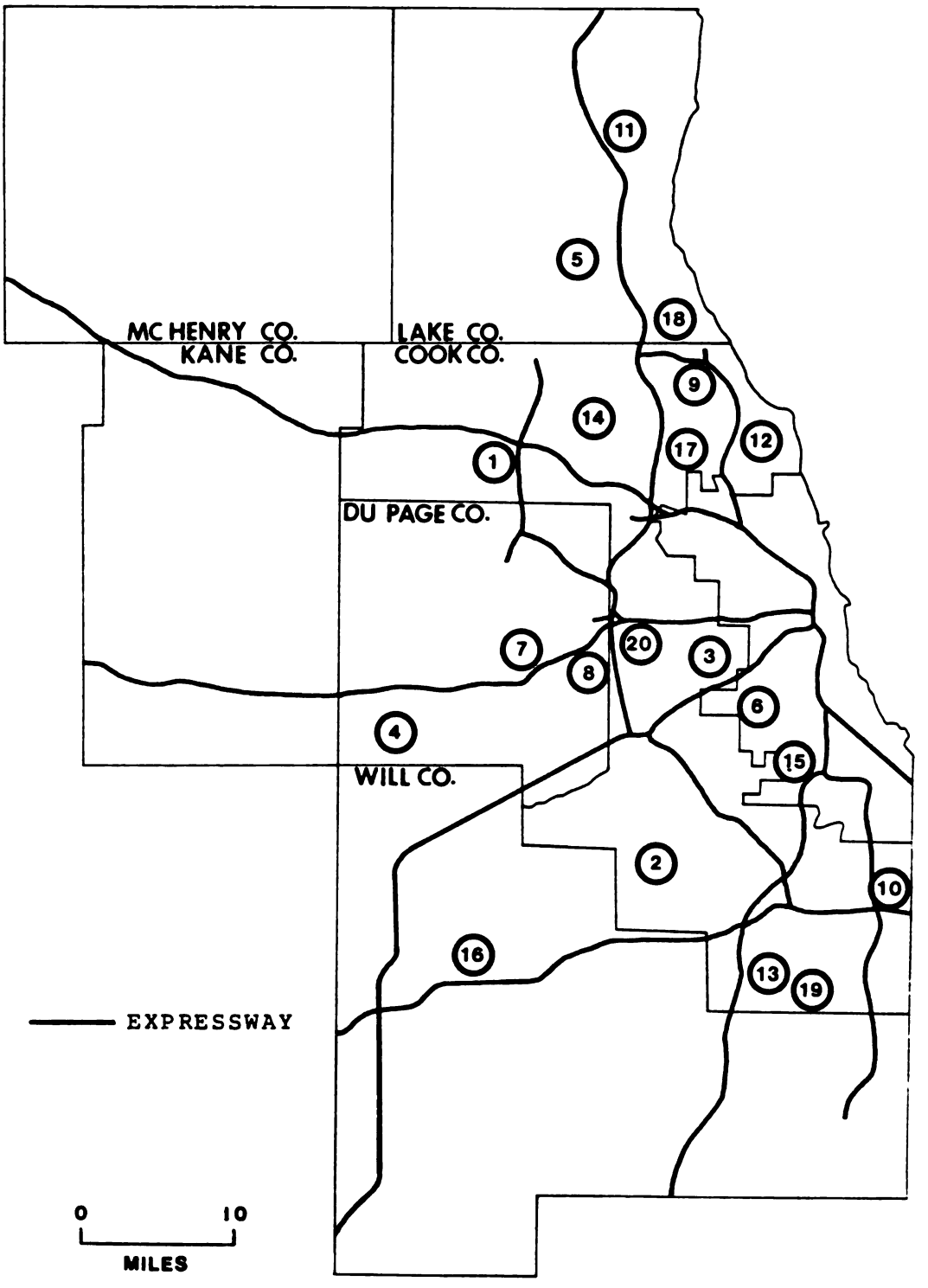


Figure 4

system, an important conclusion can be drawn. There does not seem to be any striking relationship between the ranks of the centers and their proximity to the expressway system throughout the study area. Thus, in order to better understand the existing spatial patterns among the ranked centers, a more detailed examination involving many factors must be undertaken.

Factors Affecting Spatial Patterns Of Ranked Centers

Figure 4 does not show a definitive relationship between favorable expressway location and the locations of high sales growth shopping centers. The general distribution of shopping centers as shown in Figure 3, however, indicates that the regional accessibility provided by the expressway system has most often been a major factor in the developer's locational decision making process. Perhaps more important are the centers' accessibility to large threshold populations, and dominance of expansive market areas. Each center's influence over its market area is in many ways guided by the character of the threshold population. Income, population density, and ethnic structure provide the foundation upon which that character is based. In addition, each center's ability to meet the changing needs of its threshold population over time will also affect the dominance it holds over its market area. Several important factors associated with the shopping centers are discussed in the following paragraphs, in an attempt to better understand the spatial patterns presented

in Figure 4. These include the following:

1. Age of the center
2. Size of the center
3. Number of establishments
4. Tenant mix
5. Locations of competing centers
6. Character of the threshold population

General Observations. Although no single factor can account for variations in shopping center sales growth rates over the entire study area, several patterns help explain these variations which exist on a smaller scale. Specifically, three underlying patterns seem to characterize the distribution of the centers'sles growth rates. The first, not surprisingly, is the general relationship between old and new centers. As one might expect, the newer centers in the study tended to have higher growth rates. Older centers often lack the amenities, successful tenant mix, adequate parking facilities, and potential for expansion which newer centers may enjoy. A second characteristic involves the degree of competition between centers based on overlapping market areas. Specifically, older centers seem to suffer from newer centers built within their market areas. The third pattern seen in the study area is that the four centers located in the DuPage County area have realized high growth rates as compared to centers located throughout the remaining study area. These three underlying patterns, along with the six factors listed on page 45, are discussed below in terms of specific shopping centers. Information

essential to this discussion is provided in Tables III and IV. The following sections examine the relationships among various centers in the study area, based on variations in sales growth rates. For organizational reasons, discussion divides the centers into two groups: those north, and those south of the Eisenhower Expressway.

Patterns Among Northern Suburban Shopping Centers. Lakehurst shopping center, the northern most center studied, is located in Waukegan, a city of 68,000 people. The center's market area extends around this satellite city, rather than relying upon the much larger urban core area to the south.[17] This smaller market area population is further reduced by the competition provided by two smaller centers (Belvidere Mall and Waukegan Plaza) also located in Waukegan.

Hawthorne Center, a much higher sales growth study center, is located closer to the urban core area of metropolitan Chicago. Located among many smaller, high income communities, Hawthorne has little competition in southwestern Lake County. Three solvent anchor stores, 140 total stores, and adjacent subdivisions constructed by the center's developers, all have helped make Hawthorne a highly successful center.

Two centers located north of Chicago, Deerbrook Mall and Northbrook Court, are located within one mile of each other . Northbrook Court, constructed in 1976, has engulfed much of Deerbrook's former market area. Northbrook Court has twice the number of stores, as well as tenants such as

Table 3

Characteristics Of Ranked Centers

CENTER	RANK	SLOPE	YEAR OPENED	ACRES	BUILDING AREA (Sq.Ft)	NUMBER OF STORES
Woodfield	1	29.06	1971	169	2,267,000	235
Orland Square	2	26.20	1976	100	1,240,000	150
North Riverside	3	24.80	1976	64	1,115,000	120
Fox Valley	4	18.80	1976	120	1,497,656	190
Hawthorne Center	5	11.75	1973	113	1,400,000	140
Ford City	6	11.73	1965	100	1,300,000	153
Yorktown	7	11.12	1968	133	1,500,000	130
Oak Brook	8	10.90	1962	125	1,315,000	78
Northbrook Court	9	10.50	1976	140	1,200,000	136
River Oaks	10	10.50	1966	100	1,250,000	53
Lakehurst	11	9.76	1971	98	1,272,696	129
Old Orchard	12	8.88	1956	98	1,245,000	60
Lincoln Mall	13	7.53	1973	110	1,216,158	132
Randhurst	14	5.08	1962	100	1,200,000	86
Evergreen Plaza	15	4.83	1952	38	1,250,000	125
Jefferson Square	16	4.66	1974	56	543,736	67
Golf Mill	17	2.82	1960	88	900,000	78
Deerbrook Mall	18	1.25	1969	48	500,000	65
Park Forest	19	.77	1949	53	900,000	65
Hillside Plaza	20	.16	1956	53	471,000	67

Source: Chicago Tribune Research Services Division, 1980 Data, and Center Management offices.

Table 4

Major Department Stores Located At The Study Centers

	Carson Pirie Scott	Montgomery Ward	J.C. Penny	Sears	Marshall Fields	Lord & Taylor	I. Magnin	Nieman Marcus	Saks 5th Avenue	Wiebolts	Marshall's	Venture	Zayres
Deerbrook Mall		X									X	X	
Park Forest				X	X								
Evergreen Plaza	X	X											
Hillside	X												X
Old Orchard		X			X	X			X				
Golf Mill			X	X									
Oak Brook Center				X	X	X	X	X	X				
Randhurst	X	X								X			
Ford City		X	X							X		X	
River Oaks	X			X	X								

Table 4

Major Department Stores Located At The Study Centers

	Carson Pirie Scott	Montgomery Ward	J.C. Penny	Sears	Marshall Fields	Lord & Taylor	I. Magnin	Nieman Marcus	Saks 5th Avenue	Wiebolts	Marshall's	Venture	Zayres
Yorktown	X	X	X							X			
Lakehurst	X		X							X			
Woodfield			X	X	X	X							
Lincoln Mall	X		X		X					X			
Hawthorne Center				X	X	X							
Jefferson Square		X								X			
North Riverside	X	X	X										
Fox Valley			X	X	X	X							
Orland Park	X		X	X	X								
Northbrook Court				X		X	X	X					

I. Magnin and Nieman Marcus which cater to higher income people. Deerbrook Mall, on the other hand, contains a Venture and Marshall's, two discount-type establishments.

Old Orchard, Golf Mill, and Randhurst centers were all constructed before 1965. Located in densely populated areas, many smaller centers have since emerged and saturated the market area just north of Chicago.[18] In addition, Randhurst has lost a good portion of its market to Woodfield Shopping Center, built in 1971.

Woodfield, located in Schaumburg, was the highest sales growth center studied. Its developers foresaw the population growth of the northern DuPage and Cook County areas during the 1970's. Woodfield offers 235 stores and over two and a quarter million square feet of enclosed shopping space. A well planned floor design, amenities such as an ice skating rink and indoor vegetation, and careful screening of prospective tenants have all contributed to Woodfield's attracting shoppers from throughout the metropolitan area. With Woodfield as the focal point, a great deal of office and residential development has taken place in the Schaumburg area within the past decade.

Patterns Among Southern Suburban Shopping Centers. Much like Deerbrook Mall to the north, Hillside Center has suffered greatly from newer, more diversified centers entering its market area. Hillside was the first major shopping center to locate in the western suburbs. Today, with only one major anchor to support sixty-six smaller stores, Hillside faces a major challenge in order to restore

its marketability. Oak Brook Center, Yorktown, and most recently North Riverside Mall have each contributed to Hillside's decline, as all four centers are located within twenty minutes driving time to one another.[19] Yorktown and Oak Brook are located less than one mile apart along the East-West Tollway in eastern DuPage County. Although their market areas overlap considerably, the centers provide a compatible mixture of tenants which serve much of DuPage and western Cook Counties. Their success is further substantiated by the fact that DuPage County is among the wealthiest counties in the nation, and the most rapidly growing county in the Chicago Metropolitan Area.

Much like Lakehurst Shopping Center in Waukegan, Fox Valley Center's market area is primarily located around a satellite city, Aurora (81,000 people).[20] Fox Valley's developers have begun housing developments on properties surrounding the center. High interest rates, however, have delayed construction of many of these subdivisions and the area has yet to realize its projected growth in population. One factor which has helped Fox Valley is the decline of Aurora's central business district, brought on by the recessionary period of the 1970's. With a number of Aurora's downtown shopping opportunities closing their doors, much of the city's population is taking advantage of the 190 stores located at Fox Valley.[21]

One of the more surprising centers in terms of sales growth rates was Ford City, located in Chicago. Originally a World War II airplane factory, the center has evolved into

a major commercial development serving southwest Chicago and the eastern suburbs of Cook County. Unlike Hillside Center, Ford City has found itself relatively free from competing centers. Many alternative shopping areas in southwest Chicago have faltered, thus enabling Ford City to expand and strengthen its market area.[22] Ford City is served by public transit, in addition to providing its own shuttle services. A second center located near southwest Chicago is Evergreen Plaza (located at 95th and Western Avenue in Evergreen Park). Much like Ford City, Evergreen is located in a congested area where expansion opportunities are limited. Evergreen's market area has undergone changes which have slowed its sales growth in recent years. Specifically, the area east of Western Avenue is primarily composed of lower income blacks. Thus, Evergreen has lost much of the white population which once dominated its market area.[23]

Although not located near an expressway, Orland Square has grown rapidly. With little competition to hinder its growth, Orland is located in the rapidly growing Orland Park, Tinley Park area. Located on La Grange Road, a major north-south arterial, Orland is accessible to a large, densely populated market area. Composed of four major department stores, 150 total stores, and an adequate parking area, Orland is the major shopping center of southwest Cook county.

River Oaks and Park Forest are two older centers located south of Chicago. River Oaks contains only fifty-three stores, and is not located in either a high income or

high population growth area. Similarly, Park Forest is located relatively far from the metropolitan area's highest population growth areas. Lincoln Mall was later built near Park Forest and provides it with a good deal of competition. Opened during a recessionary period, however, Lincoln Mall has not done as well as its investors had hoped. Population growth in the far south suburbs was less than expected during the 1970's. Joliet, a satellite city located thirty-eight miles southwest of Chicago, comprises the majority of Jefferson Square's market area. Joliet, suffering greatly from the recession of the 1970's, has not supplied the market necessary to spark the growth of Jefferson Square. In addition, Louis Joliet Mall was constructed in 1977 and is currently bidding for a large share of Joliet's retail market.

Focus of Discussion. As the preceding discussion indicates, the spatial variation among shopping centers ranked by sales growth can only be explained in terms of many interrelated factors. It is evident that no single pattern explains the relationship between the expressway system and the locations of high sales growth shopping centers. The approach to study must also consider the characteristics of the centers, relationships among competing centers, and the changing locations of desirable market areas. The following paragraphs examine the changing locations of high percentage change population and income communities, and summarize the tests involving the expressway system's influence upon these locations between

1950 and 1980.

Wilcoxon Test Results

Wilcoxon tests were used to examine the second hypothesis that the locations of high percentage change population and income communities were significantly related to the expressway system between 1950 and 1980. A total of six Wilcoxon tests were computed for the two variables, population and income, over the three ten-year periods.

In computing the Wilcoxon test, the test statistic (W) was simply the sum of the ranks within one of the two groups studied. That test statistic, and the number of observations in both groups, were then used to compute a z-score. This z-score was the basis for accepting or rejecting the null hypothesis that expressway location is not spatially related to the locations of high percentage change population and income communities.

All six tests used the 95% confidence level for accepting or rejecting the null hypothesis. If $z > 1.96$, the null hypothesis was rejected. The test results are shown in Table V. For all three population, and all three income variables, the z-scores were far below 1.96, and the null was accepted.

Although the expressway system has not significantly guided the locations of high percentage population and income growth communities between 1950 and 1980, certain patterns have evolved over the study period. Figures V, VI, and VII show the locations of the forty highest percentage

change population and income communities for each of the three ten-year periods. The following section describes the patterns depicted by these maps.

High Percentage Change Population and Income Patterns. Figures V, VI, and VII identify two basic patterns which continued throughout the study period. The first, was that the general distribution of high percentage change population and income communities was aligned along either expressway or commuter rail routes. The second pattern showed a continual movement of high percentage growth communities away from the City of Chicago. Specifically, heavy concentrations of high percentage growth communities were located in DuPage County, the areas adjacent to the Chicago-Northwestern rail line extending into McHenry County, and along the Tri-State Tollway in Lake County. In DuPage County, clusters of high percentage growth communities appeared near Woodfield Shopping Center and the East-West Tollway corridor between Oak Brook and Yorktown shopping centers during the 1970's.

Examination of percentage change, rather than numerical change, more accurately depicted the patterns of rapidly developing areas. In the case of Woodfield, the clustering of high percentage growth communities during the 1970's was very much associated with developments attracted to the shopping center after its opening in 1971. Aside from Woodfield and the East-West Tollway corridor, clusters did not consistently form around other high sales growth

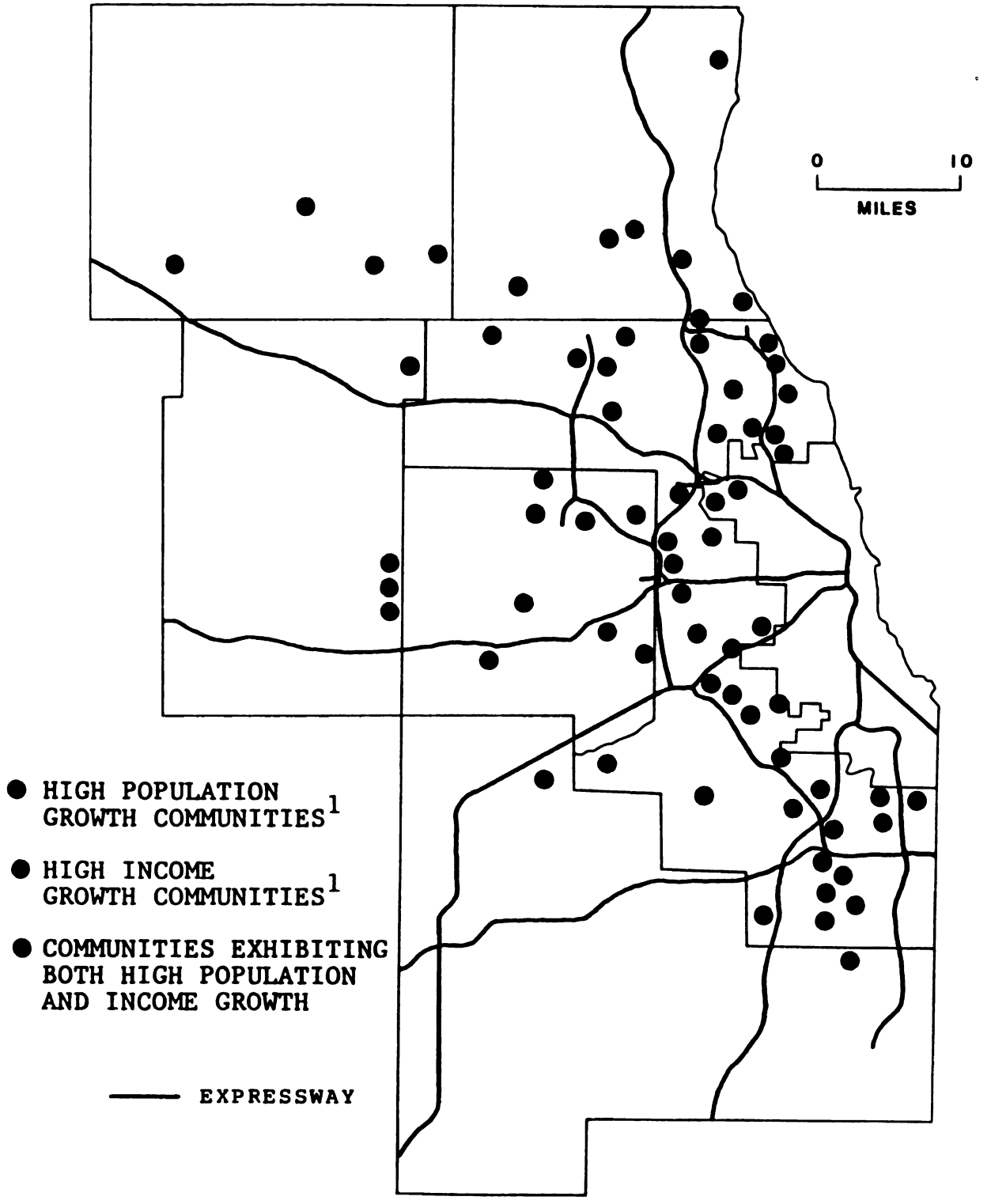
Table 5

Wilcoxon Test Results

Variable	Years	Z-Score
Percentage Change-Population	1950-60	-.428
Percentage Change-Income	1950-60	-.043
Percentage Change-Population	1960-70	.005
Percentage Change-Income	1960-70	-.014
Percentage Change-Population	1970-80	.087
Percentage Change-Income	1970-80	-.-04

*To reject the null hypothesis that expressway location has not affected the locations of high percentage change population and income communities, z must exceed 1.96.

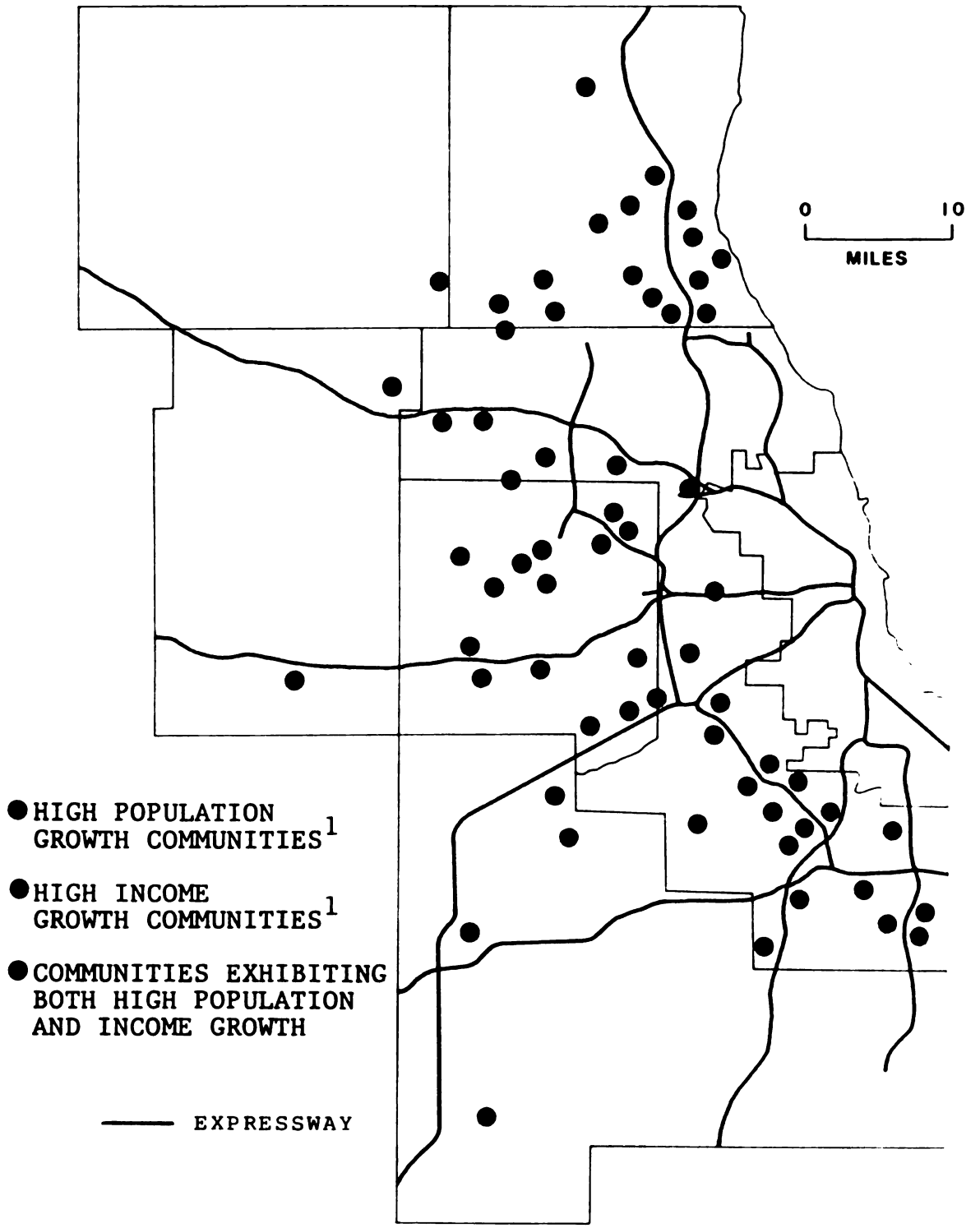
POPULATION AND INCOME GROWTH 1950-60



[1]BASED ON THE 40 HIGHEST PERCENTAGE CHANGE COMMUNITIES

Figure 5

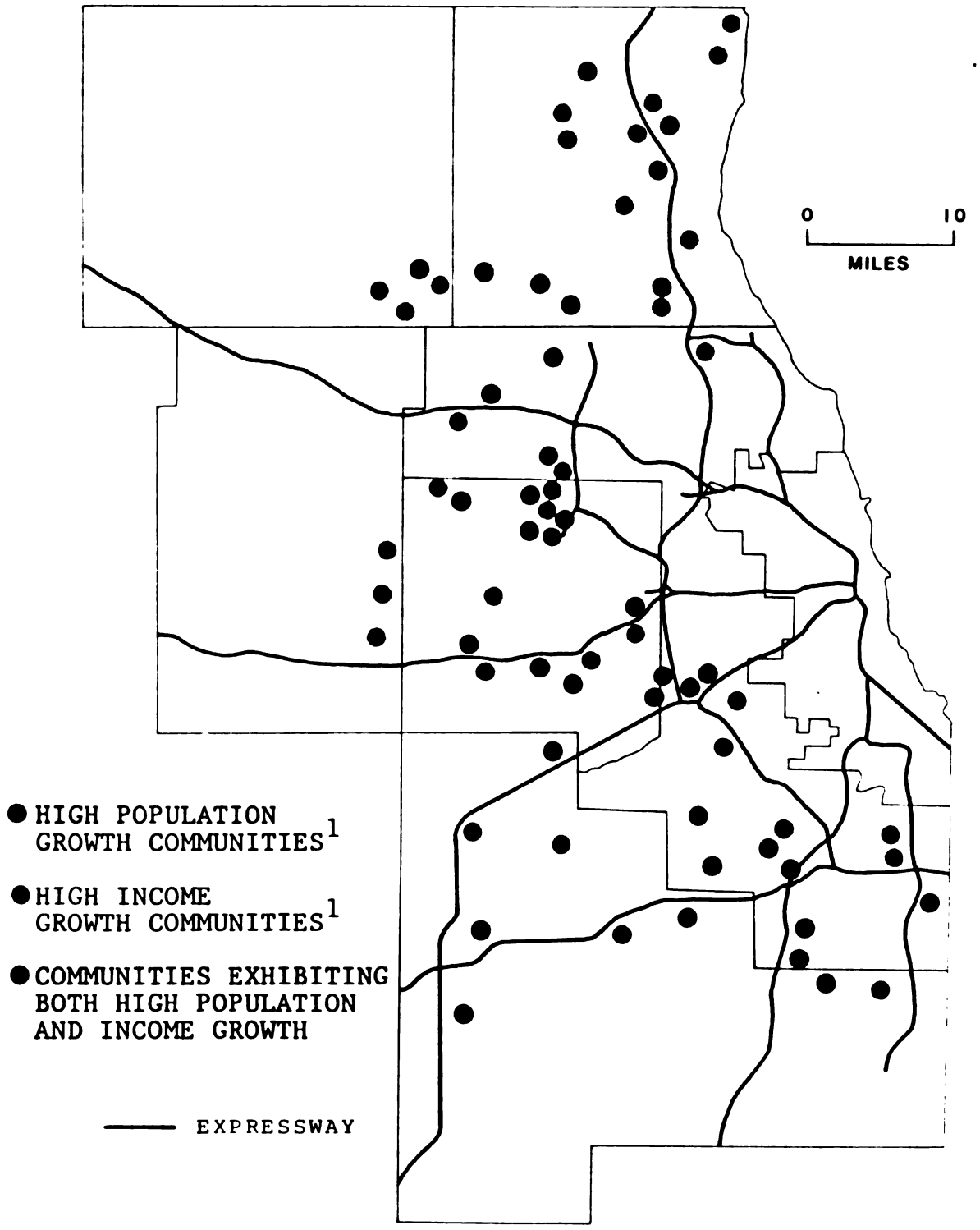
POPULATION AND INCOME GROWTH 1960-70



[1]BASED ON THE 40 HIGHEST PERCENTAGE CHANGE COMMUNITIES

Figure 6

POPULATION AND INCOME GROWTH 1970-80



[1]BASED ON THE 40 HIGHEST PERCENTAGE CHANGE COMMUNITIES

Figure 7

shopping centers throughout the study area. Partial explanation for this was that rapid growth was not possible around shopping centers initially located within a congested area.

The final chapter summarizes the study's findings and suggests alternative methods which may be employed toward continuing research within this area.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary Of The Research

This study's objective was to examine the spatial relationship between the Chicago area expressway system and twenty large regional shopping centers in terms of their respective sales growth through 1980.

Beginning in the mid-1950's, the development of the expressway system facilitated suburban growth throughout the metropolitan area. Middle and upper income families comprised the majority of those moving to the suburbs. The development of regional shopping centers soon followed throughout the rapidly growing suburban areas. These centers catered to the higher income population and use of the automobile which had become the primary mode of transportation throughout the suburbs. Regional accessibility, and accessibility to a large contiguous population, were the two major locational objectives of the centers.

In consideration of the expressway system's importance upon suburban growth during the past three decades, the two hypotheses of this study were:

1) Those shopping centers in the Chicago Metropolitan Area located nearer the expressway system have realized greater sales increases than those centers located further from the system.

2) The changing locations of both high percentage income growth communities and high percentage population growth communities between 1950 and 1980 were significantly related to the location of the expressway system.

Research concerning transportation and urban land use often assumes that accessibility benefits provided by an expressway may, in some ways, alter the character of properties adjacent to that expressway. The research is primarily focused on transportation's effect upon either property values or re-sale values of housing and commercial enterprises. A study by Garrison and Marble (1968), however, examined a highway's effects upon retail sales as well as commercial and residential property sales. Their research indicated that accessibility benefits may result in higher sales growth rates for commercial establishments located along an urban expressway.

The first hypothesis of this study examined the relationship between the Chicago area expressway system and the locations of twenty shopping centers based upon their sales growth rates between their first year of operation and 1980. A time series regression utilizing annual sales over time determined the sales growth rate for each center. The spatial distribution of shopping centers ranked according to sales growth rates did not depict a consistent relationship between high growth rate centers and favorable expressway location. Rather, several specific relationships better explained the existing pattern of the ranked centers. These relationships focus upon several factors including the character of each center's market area, locations of

competing centers, age of the centers, and tenant mix within each center. These factors intermix to form the overall pattern of ranked centers (Figure IV).

The second hypothesis tested the relationship between the expressway system and the locations of high percentage change population and income communities throughout the study period. A Wilcoxon Rank-Sum test was used to compare two groups during each of the three ten-year periods. For each ten-year period, two Wilcoxon tests were run: the first utilizing population data, and the second using income. For each test, the first group consisted of high percentage change communities located two miles or less from an expressway access. The second group consisted of high percentage change communities located beyond two miles. High percentage change communities for both population and income were defined as those whose percentage change was above the median of the percentage change distribution for all communities studied. It was hypothesized that the regional accessibility provided by the expressway system would result in higher percentage change increases in population and income for those communities nearer the expressway.

The results of the Wilcoxon analysis did not statistically demonstrate that those communities located within two miles of an expressway had grown more rapidly in terms of population or income, on a percentage basis, during any of the three ten-year periods. The patterns depicted in figures V, VI, and VII, however, show several trends over

time. Although not significant, the distribution of highest percentage population and income growth communities seemed to focus upon both the expressway and commuter rail systems. Secondly, the highest concentrations of high growth communities tended to continually move outward from the City of Chicago over the study period. Finally, during the 1970-80 period, a clustering of high growth communities occurred adjacent to Woodfield Shopping Center, the highest sales growth center studied.

Conclusions

Several conclusions may be drawn from the preceding analysis. First, expressway system access was a major factor in explaining the overall spatial distribution of shopping centers. The regional accessibility provided by the expressway system, however, must be discussed in light of other interrelated factors. These factors develop the character of both the center's market area and the center itself. Those centers constructed in sparsely populated areas were initially more dependent upon regional accessibility than centers developed within already established market areas. A center's inaccessibility may be partially offset by attractive tenants or a unique shopping atmosphere which, for the consumer, overcomes the friction of distance which would otherwise be detrimental to the center's growth. Conversely, a center enjoying expressway access may do poorly because it lacks factors which attract shoppers. Thus, a true understanding of the relationship

between regional accessibility and shopping center growth must account for the interrelationships among several variables.

Areas For Further Research

One of the goals for continuing research is to expand and refine the research process in terms of problem definition, scope of study, and methodological approach. I suggest two other approaches which may prove useful. The first involves the level at which the population and income data was gathered for the three ten-year periods. Data gathered at the township, rather than the community level, may be more accurate in identifying spatial patterns which most accurately depict the conditions of shopping center market areas. Mapping individual communities according to ranked growth may not define relative market conditions which encompass large areas surrounding the shopping centers.

A second portion of the study which might be expanded is the analysis of each center's regression equation. Rather than defining one slope for each center, the analysis could be broken down into several regressions. Centers could then be compared for specific time periods. Changes in market character, center tenant strategies, and competition between centers may be supported by variations in successive slope changes for each center. In doing this, however, one must realize that decreasing the observations within each regression may result in higher standard errors for the b-coefficients.

A final important factor involves the time series computations. This study utilized both sales tax data and figures provided by the centers themselves in computing the regressions. Although both sources should be fairly accurate in accounting for actual sales, some error does occur which cannot be accounted for. In addition, it should be noted that analysis using time series data is limited as a predictive source. Most of the assumptions generally associated with regression, such as interdependence, normality, and constant variance, are usually not relevant to time series data. Thus it is impossible to attach a measure of statistical confidence to a prediction made from time series coefficients.

Examination of relationships between regional shopping centers located throughout major metropolitan areas is an important area of research. Investigating these relationships helps to explain the variations in sales growth rates throughout the area. Understanding these variations, in a spatial context, will provide a foundation for effective retail and municipal planning in the years ahead. Without the planning process, centers may locate in areas characterized by poor road systems, insufficient market support, or too much competition from already existing centers. This thesis is the first comprehensive research dealing with variations in sales growth rates among Chicago area shopping centers. It provides an important initial examination of the complex relationship between the centers. As suburban areas continue to grow, it is believed

that studies similar to this will help predict patterns associated with the potential locations and character of regional shopping centers throughout large suburban areas.

FOOTNOTES

[1]Matthew L. Rockwell, "Metropolitan Planning Guidelines Phase One: Background Documents", Northeastern Illinois Planning Commission, May 1965, p. 23.

[2]Irving Cutler, Chicago: Metropolis of The Mid-Continent, (Dubuque, Iowa: Kendall/Hunt Publishing Company, 1976), p. 183.

[3]Interview with James Jarzab, Northeastern Illinois Planning Commission, Chicago, 30 October, 1981.

[4]U.S. Census of Population, 1980.

[5]Chicago Area Transportation Study, C.A.T.S., Volume I, Chicago, Illinois, December, 1959, p. 22.

[6]Cutler, p. 127.

[7]Northeastern Illinois Planning Commission, 1982.

[8]Cutler, p. 160.

[9]Rockwell, p. 12.

[10]Interview with Jeffrey Poole, Baird and Warner Reality, Hillside Shopping Center, Hillside, Illinois, December, 1982.

[11]Interview with Phillip Peters, Associate Director, Northeastern Illinois Planning Commission, Chicago, 30 October, 1981.

[12]"Mall developers in a Crunch", Chicago Tribune, Sunday, 5 November, 1982.

[13]Interviews with Dave Thatcher, Chicago Area Transportation Study, and James Jarzab, Northeastern Illinois Planning Commission, Chicago, Illinois, 30 October, 1981.

[14]Frank Knowles, "Shopping Center Requirements on a Regional Basis", Appraisal Journal, v. 43, July 1975, p. 381.

[15]Initially, a t-test for difference in means was to be used. The distribution of population and income data, however, violated the assumption of normality, required for the parametric analysis. The Wilcoxon rank sum test, a non-parametric test, was then chosen. It tests whether two populations have the same median, and does not require normal populations.

[16]The number of growth communities plotted for both income and population was based on natural breaks in the data distributions. All communities above the median of the percentage change distribution could not be mapped due to limited space.

[17]Interview with James Jarzab, Northeastern Illinois Planning Commission, January, 1983.

[18]Interview with Dr. Irving Cutler, Chicago State University, January, 1983.

[19]Interview with Baird and Warner Reality, Hillside Shopping Center, Hillside, Illinois, December, 1982.

[20]James Jarzab, January, 1983.

[21]Dr. Irving Cutler, January, 1983.

[22]Interview with Dr. Robert Rouse, Elmhurst College, Elmhurst, Illinois, January, 1983.

[23]Dr. Irving Cutler, January, 1983.

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