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ABSTRACT

SPATIAL PATTERNS AND DISTRIBUTIONS OF THE LOCATIONS OF RACIAL GROUPS AND EMPLOYMENT OPPORTUNITIES IN MICHIGAN, 1960-1990

By

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Various population groups in Michigan during the last four decades have persistently experienced high levels of residential and employment segregation. The research problem of this study is to determine the spatial phenomena of residential and employment locations for the white, black, and other racial groups. Data are obtained on the county level for the Census years 1960 to 1990 from the United States Bureau of Census, the Michigan Statistical Abstract, and the Michigan Employment Security Commission. The method employed to determine location, distances and direction are centrographic measures. Measures of centrality for the population and economic data were computed for blacks, whites, and other racial groups along with total population and total employment. The results suggest that blacks experienced the highest level of both residential and employment segregation for each decade.

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CHAPTER 1

INTRODUCTION

The uneven spatial distribution of blacks and other minorities from whites is a topic that has been a major focus of research in the United States, especially since the 1960s. The processes of and the mechanisms involved in residential locations of racial groups have generally focused on areas other than, and usually smaller the state level. More importantly, past research has not linked the uneven spatial distribution of racial groups directly to economic opportunities in society.

This research focuses on the spatial differentiation of racial groups at the state level using centrographic techniques to analyze the distribution of residential concentrations and employment opportunities. Residential concentrations of various population groups have been a continuing concern to urban geographers and thus far studied primarily as an urban phenomenon. This urban bias has been portrayed as urban geographic and urban social problems in the context of residential segregation. However, the underlying dimensions of residential location are social and geographic problems that have particular spatial manifestations beyond the urban level.

The problem of this thesis is twofold. First, to determine the extent to which the pattern of residential concentration of racial groups is related to the pattern of concentration of employment opportunities. Second, to determine how such patterns have changed over the decades, from 1960 to 1990. The study area of this investigation is the state of Michigan.

1.1: Data and Method

Data were collected at the county level to determine the geographic distribution of population groups and employment opportunities for the State. Three major sources of data were obtained for this study which were the Bureau of Census Reports on General Population and Housing Characteristics, the Michigan Statistical Abstracts and reports from the Michigan Employment Security Commission.

Centrographic measures are employed to determine the geographic centers of gravity for employment and for the residential concentration of whites, blacks, and other minority groups. These measures are used because they best display the spatial disparity between various racial population groups and employment opportunities at a state level of analysis. The variables will be discussed in detail in chapter two.

1.2: Research Hypotheses

The hypotheses to be tested in this thesis are:

1. The patterns of residential concentration of racial groups is related to the pattern of location of employment opportunities.

2. Some racial groups are located closer to employment opportunities than other racial groups.

3. The patterns of residential concentration of racial groups and the patterns of concentration of employment opportunities are dynamic; that is, changing from decade to decade.

1.3: Definition of Terms

The term segregation is used in this study to describe the uneven spatial distribution between the total population as well as the majority population group and a minority population group within a defined geographic area. The term employment segregation is defined similarly as the uneven spatial distribution of job opportunities within a defined geographic area. Residential concentrations are determined by aggregating county population data for state level patterns.

1.4: Significance of the Research

Prior studies of residential location have been couched within segregation models. The most common of these measures is the Index of Dissimilarity or Segregation Index. Researchers of segregation have developed additional indices, (e.g., *P* exposure index)* many of which have been shown to be highly correlated (Duncan and Duncan, 1955; Massey and Denton, 1989). The majority of this research, however, has been concerned with the patterns of segregation focusing on small-area data (e.g., census tracts, census blocks) within cities.

An exception is one that focused on residential locations of blacks and whites in rural neighborhoods at a county level of analysis (Lang, 1979). Consequently, the identification and observation of residential and employment data at the state level have been largely ignored. In general, segregation research has made little attempt to focus on residential locations at other than an urban level of analysis (Kain, 1965, 1968, 1974; Darden, 1987; Darden and Kamiar, 1988). This study expands our knowledge of segregation or residential location of racial groups by focusing on a state level of analysis. The significance stems from aggregating data to look at broader scales of analysis. This allows future research to determine if concentration of minority population groups is correlated with concentration of employment opportunities at a state level.

1.5: Limitations of the Data and Research Approach

Economic data availability for racial employment and unemployment figures is provided for large metropolitan areas but not necessarily for all counties within the State. Because of the sensitivity of the data, individual states mainly provide county level figures for those counties that make-up metropolitan statistical areas (MSAs). Usually, the decision to use county level data is based on various population or economic thresholds, such as percentage of urbanization. For example, the state of Michigan provides such economic data for counties over 50,000 total population.

The inherent problem of spatial segregation analysis at larger scales is that data for racial and occupational groups may only be provided for selected geographic parcels within metropolitan areas. Therefore, not all socioeconomic variables present in small-area data may be available at larger scales. In addition, common measures of spatial segregation at the state level only provide relative proportions of racial groups between other counties. This study is directed towards aggregating selected county population groups and selected occupational data in order to apply centrographic techniques for analyses. Both residential concentration of racial populations as well as employment, or where the majority of jobs are located in the state are calculated. The employment centroid is represented by those industries that account for the highest percentage of employment activity in the State of Michigan. County level employment data are gathered for each of Michigan's eighty-three counties during each census period. The Total Employment (TE) centroid explains over 86 percent on average of all employment

opportunities in the state of Michigan during the period of this study. The industries that make up the TE centroid are discussed in detail in Chapter two

The methodological contribution of this research is in analyzing the patterns and distributions of residential and employment concentration among whites, blacks, and other population groups of a state. Investigating the directions and patterns of residential and employment concentrations within the State of Michigan will allow researchers a unique longitudinal view of a particular state's residential and economic patterns of growth and their respective spatial distribution.

1.6: Conceptual and Theoretical Framework

Research concerning the geographical approach to residential locations has focused on segregation theory and the adaptation of a particular group to certain spatial constraints to both residential (Darden, et.al., 1980, 1988; Clark, 1984) and employment (Kain, 1968, 1987; Farley, 1987; Hughes and Madden, 1991) opportunities at various urban geographic or "community" levels.

Segregation research has sought to describe the pattern of location and changes of some portion of the population in the world about us. According to theories related to residential segregation, spatial variation in segregation between population groups relates directly to measurable differences associated with social and economic variables (Massey and Eggers, 1990; White, 1983; Burgess, 1969; Parks, 1969, 1969a). For example, the higher the occupational level, the greater the distance a group will live from the central business district. It is generally supported by prior research that groups' movement

outward from the central city is usually preceded by an increase in the level of education, occupation, and income (Burgess 1969a; Parks 1969a). If the distribution patterns and employment opportunities available to various racial groups are uneven, this does not necessarily imply discrimination, but may imply an historical attitude based on traditional ignorance. In fact, to measure discrimination, one must be able to measure the productive capacity of people and the opportunity structure they face. Such measurement is beyond the scope of this study.

1.7: Centroids as Methods of Measurement

The most important characteristics of spatial phenomena can be reduced to three criteria: location, shape, direction, concentration. A spatial distribution may change symmetrically over time and there will be no change in location. For example, technically, a centroid possesses shape although it is not being measured here, the varying symmetry crosses borders, such as a plane or line, or around a point or axis. Although the symmetry of a centroid is structurally or functionally independent of direction, both casual and more robust empirical observation, as well as theory, suggests that symmetrical change will be the unusual rather than the norm (Jones, Manson and Coccossis 1991). Since the factors leading to asymmetrical change will be persistent and enduring, the change of location is likely to be symmetric and unidirectional rather than sporadic or random.

There is little in theory or the observation of real phenomena to suggest that spatial variables will be shapeless--or without shape or circular. However, since there are

few tools for analyzing shape in any efficient way, there have been a few models as to the nature of the shape to be anticipated. For example, the various geographic processes of urbanization depart substantially from the original circular model of Christaller (1966). The importance rises from the potentiality that certain models may give distorted or misleading values to other summary measures which implicitly assume circularity. The degree of direction or dispersion of a spatial phenomenon and the way in which it is changing over time is a critical element and has been a subject of speculation in urban theory since its very origin. In addition, this has been the subject of a large number of attempts at calibration and measurement over time.

The prominent measurement for the spatial distribution of residential populations during the last forty years has been the use of the Index of Dissimilarity. Inherent criticisms of the index have evolved around a number of issues of interpretation (Hughes 1987), including the arbitrary choice of cities for analysis and/or comparison, and the fact that small-units of geographically defined areas of analysis do not necessarily constitute cohesive entities (White, 1983). For example, such areas as census blocks and census tracts may be homogeneous with respect to certain specified variables, such as income, education, and household size (Greene, 1991; Holzer, 1991). Yet, they may not be characterized by a high degree of a "community" or internal interaction such as religion, political agenda and family structure (Wilson, 1978).

The Index of Dissimilarity is computed between two population groups or a sub-group of a population and the remainder of the population. It is a measure which has been used particularly to assess the degree of residential segregation of a sub-group within the

total population. This study differs somewhat in that it employs centrographic techniques where residential and employment concentrations are computed to determine the spatial distribution and patterns. The significance of this research is in the scale and method of measurement, which allows one to determine both the location and direction over time of a spatial entity. In addition, one can apply this measure to compute results for the total population and total employment distribution, and therefore, allow one to compare and contrast the results over time to other population sub-groups. The evolution of centrographic measures have clearly developed for measuring spatial differentiation such as the three characteristics of location, shape and concentration (Tordella 1987, Jones, Manson and Coccossis, 1991).

1.8: Background Related to Race, Residence and Employment Opportunities

During the 1960s, the United States experienced an unprecedented Civil Rights Movement. This movement was an outcry from racial minority groups within American society against discrimination and segregation practices that isolated them from the social and economic benefits experienced by the white majority population (Wilson 1987). Several commissions were appointed to examine the causes behind the violence (riots) stemming from this movement. The Kerner Commission reported that the major grievances of residents in the worst affected areas were police brutality, unemployment, and poor housing (National Advisory Commission on Civil disorders, 1968). In describing employment growth within metropolitan areas, for example, the Kerner Commission observed:

> "Most new employment opportunities do not occur in central cities, near all-Negro neighborhoods. They are being created in suburbs and outlying areas--and this trend is likely to continue indefinitely. New office buildings have risen in the downtown of large cities, often near all-Negro areas. But the outflow of manufacturing and retailing facilities normally offsets this addition significantly--and in many cases has caused a net loss of jobs in central cities.
>
> Providing employment for the swelling Negro ghetto population will require society to link these potential workers more closely with job locations. This can be done in three ways: by developing incentives to industry to create new employment centers near Negro residential areas; by opening suburban residential areas to Negroes and encouraging them to move closer to industrial centers; or by creating better transportation between ghetto neighborhoods and new job locations." (p. 392)

In addition to the Kerner Commission, the McCone Commission was also responsible for examining the causes of the Watts (Los Angeles) riots in the summer of 1965. Not unlike the Kerner Commission, the McCone Commission found that the most serious immediate problem that faced the black population was unemployment (National Advisory Commission on Civil Disorders, 1968). Most notable, is the fact that the majority of civil unrest incidents in major U.S. cities took place after the passage of the Civil Rights Act in 1964 (National Advisory Commission on Civil Disorders 1968). Coupled with growing civil unrest is a deconcentration trend of population and employment which is also having a profound impact on central cities.

During the 1960s and into the 1990s, segregation between various racial minorities and whites continued (Deskins, 1972; Massey and Eggers, 1990; O'Hara 1991). In addition, population growth is continuing at a faster rate in exurbia than in metro areas, a trend not witnessed for more than 160 years (Williams 1987). Other

common barriers that face racial minorities today are their social isolation from the better-off population, with higher incomes and higher educational achievement (Wilson, 1987) along with the decline of jobs offered by the labor market combined with the lack of skills possessed by the job seekers (Kasarda, 1986). Many observers feel that the two presidential administrations (i.e., Ronald Reagan and George Bush) which were in power during the 1980s, perpetuated the social environment that harmed black socioeconomic advancement, voiding civil rights gains, and promoting a general anti-minority climate (Updegrave, 1989). In fact, these administrations eliminated a major portion of each state's federal funding for these programs along with their federal enforcement responsibility (Bell 1991).

The result of these actions was greater emphasis on the influence of a state's fiscal and policy decision making processes (Darden, 1980; Cason, 1980; Clark, 1984 and Hollister 1989). Despite the plethora of federal and state work and aid programs for the poor and disadvantaged such as Work Incentive programs (WIN), Aid for Dependent Children (AFDC), Community Employment Training Aid (CETA), Workfare and Food Stamps, unemployment for blacks, and other minorities continued to rise at an alarming rate (Wilson, 1987).

Research has shown that among the educated, middle-class black population, changes have resulted in greater residential mobility and employment opportunities (O'Hara, 1991). However, Updegrave's (1989) investigation of the Black educated middle-class reveals it to be fragile and shrinking. Updegrave (1989) stated, that economic inequalities are more a result of prejudicial behavior and a legacy of past

discrimination than back-to-back recessions or the federal government's hostility towards affirmative action programs. Moreover, a large portion of the black population, the urban poor, appear stuck in a quagmire of unstable families, intermittent employment, welfare dependence, and the temptations of crime. The popular, but erroneous assumption that if America solves the problem of black poverty, economic parity between the races will be achieved is further disputed by Updegrave (1989), showing that wide differences extend beyond the 31% of the black population that lives in poverty.

1.9: Factors Influencing the Residential Location of Population Groups and Their Employment Opportunities

For the most part, we leave to private enterprise and entrepreneurship the task to determining a city's organization of its residential and industrial districts. It is true that a vast majority of larger cities have developed "master plans" that assist in urban growth and change based on zoning laws and protective ordinances for its population. The topography of the land, natural advantages such as lakes, rivers, great bodies of water, green areas, along with various methods of transportation also influence the spatial distribution of the population. New developments in transportation and communication linkages along with new economic trade areas all contribute to the rapidly changing social and industrial organization of the urban area. They have been the means of re-concentrating traffic from the central business district (CBD) to the centers of suburbs in surrounding counties changing the whole character of retail trade and industrial location. They have also changed the overall pattern of residences and employment opportunities

by multiplying suburbs away from the city centers. These forces have led to a change in employment and population distribution accompanied by corresponding changes in the habits, sentiments, and character of the urban population.

Both social and economic factors have been identified as measurable variables that relate directly to segregation between population groups (Burgess, 1969). Factors such as, employment trends in various sectors of the economy and concentration of minority population groups in older, central city neighborhoods are discernable patterns. Parks (1969a) states, that spatial relations are highly correlated with social relations and physical distance with social distance.

The Competitive Theory of Segregation suggests that white incomes probably rise in the process of generating physical distance from blacks (Thurow, 1975). For example, the greater the physical distance between whites and blacks, the higher the utility of whites, so whites are willing to pay a premium not to associate with blacks. And sometimes whites are confronted with a choice between more physical distance or greater incomes. By contrast, in a social-distance model (e.g. spatial mismatch hypothesis) whites wish only to raise white incomes. Nevertheless, higher white incomes contribute to greater social distance. It is also personal tastes, conveniences, economic interests, and politics that tend to influence the environment of various population groups in our cities. Physical, social, or economic pressures may enable whites to be segregated from blacks or other minority populations.

Researches that measures variables concerned with poverty, unemployment and income inequality in the United States have been conducted on a variety of fronts in

which the extent of income inequality and the degree of spatial segregation by income have been related to levels and trends in residential segregation (Kain, 1965; 1968; 1974; 1986; 1987; Leonard. 1984; Darden and Kamiar, 1988; Masssey and Denton, 1989; Hughes and Madden, 1991).

Kain (1965) linked discrimination in the housing market of Detroit to the distribution and level of non-white employment in urban areas. He found it was much easier to get blacks and whites to work side by side than to live side by side. Leonard (1984) found that the distance of a workplace from the main ghetto is one of the strongest and most significant determinants of both changes over time and level of racial composition of the workforce. He extended Kain's work by analyzing the impact of distance on changes over time in employment share and impact of distance on the level of employment share in Metropolitan Statistical Areas (MSAs). Both found that the efficacy of efforts to integrate the workplace are still limited by residential segregation.

1.10: Appraisal of General Hypotheses

The hypotheses in this study are concerned with both residential and employment segregation. Their relationships are interrelated and interdependent in that methods of measurement, background and theoretical framework may be considered symbiotic. Such hypotheses have their roots in the spatial mismatch hypothesis, white gains hypothesis and the underclass hypothesis.

The *spatial mismatch hypothesis* argues that the extent to which serious limitations on black residential choice, combined with the steady dispersal of jobs from

the urban core, are responsible for the low rates of employment and low earnings of the black population. The spatial distribution of nonwhite employment and residential choices of black households was first characterized by Kain (1965, 1968, 1974) in which he proposed the spatial mismatch hypothesis. However, recent studies on spatial mismatch have focused entirely on the black population deviating from Kain's original characterizations of the interaction of residential segregation and employment discrimination between various races and various income levels (Kain, 1986, 1987).

A second hypothesis, which may be called the "*white gains" hypothesis*, or split labor market hypothesis argues that minority disadvantage occurs because the majority group benefits from it (Farley, 1987). For example, a job not held by a black or other minority group person is potentially available to the white majority member. This view holds that whites have the most to gain where the minority population is the largest. This differential thus predicts that the highest levels of segregation will occur in that situation. Farley (1987) believes that very different geographic distributions of jobs, and therefore employment opportunities are being shifted into the suburbs. However, since findings of this sort are usually restricted to data gathered for Metropolitan Statistical Areas (MSAs), it ignores examination at a broader or finer, smaller scale, thus understating the true magnitude of that shift.

A third hypothesis, stems largely from the work of Wilson who promoted the term, "Underclass" (Wilson 1978, 1987). Wilson argues that minority economic disadvantages today are not the product of overtly racial processes, but rather are due to disadvantages associated with class. Wilson (1978) points out that the unemployment

differential between blacks and whites is mainly a post-World War II phenomenon, and links it to class based disadvantages among blacks with respect to job skills and education. However, numerous research studies have shown that when socioeconomic factors such as occupation, education, and income levels are controlled, racial segregation still persists (Darden, 1987; O'Hara, 1991).

Based on this conceptual\theoretical background, this study examines the spatial concentration of various racial groups and their relation to employment opportunities in the state of Michigan.

CHAPTER 2

DATA SOURCES AND RESEARCH METHODOLOGY

As indicated in the previous chapter, the literature on the spatial concentrations and patterns of various population groups has emphasized racial and economic inequalities at the sub-state level; ignoring geographic processes taking place at broader scales. This chapter is concerned with the structure of the data and that portion of the literature where scale is an issue.

2.1: Data and the Study Regions

Three sources of data were obtained and used for this study which were the Bureau of Census Reports on General Population and Housing Characteristics, the Michigan Statistical Abstracts and reports from the Michigan Employment Security Commission. The county level data were aggregated for a set of five variables for the State of Michigan: total population (TP); total employment (TE); white population (WP); black population (BP) and other population (OP). The primary data source for population figures was the United States Bureau of Census publications on Characteristics of Population and Housing (Bureau of Census, 1961; 1971; 1982; 1992) for the Census years 1960, 1970, 1980, and 1990. The data consisted of county level figures for the State of Michigan and the various racial populations as defined by the Bureau of the Census. Two additional sources provided data for the State of Michigan on both population and employment figures: the Michigan Statistical Abstract; and the Michigan Employment Security Commission, Bureau of Research and Statistics Labor Market Analysis Section. These two sources combined, provide figures for total employment, total employment rates, and total population at a county level for the period of this study.

Comparability between the various racial populations for each of the census periods is based on a series of aggregated tabulations for the 1960, 1970, and 1980 censuses. The aggregated tabulations are patterned after the racial classifications provided by the Bureau of the Census for the 1990 Census of Population (Bureau of Census 1961a, 1993).

The classification of race as used by the Census Bureau reflects self-identification;

it does not denote any clearly defined scientific definition of biological stock. Therefore, the data for race represents self-classification by people according to the race with which they most closely identify. Some of the definitions used in 1960 differ from those used in subsequent census periods. For instance, the 1960 data on race were derived from that which was commonly accepted by the general public. Divisions of the population were categorized by color into two groups: white and nonwhite. The color group designated as "nonwhite" included Negroes, American Indians, Japanese, Chinese, Filipinos, Koreans, Hawaiians, Asian Indians, Malayans, Eskimos, Aleuts, etc. Persons of Mexican birth or ancestry who were not definitely of Indian or other nonwhite race were classified as white.

It was not until the 1990 Census that the specific term "Spanish/Hispanic" was placed on the questionnaire. Persons who did not report a specific race but identified themselves as "Mexican," "Puerto Rican," or "Cuban" in the race question were assigned to white in 1970, and for 1980 these persons remained in the "Other Races" category. The 1990 data on Hispanic origin are generally comparable with those figures for the 1980 census. The 1990 and 1980 census data on the Hispanic population are not directly comparable with the 1970 nor the 1960 nonwhite category data because of a number of factors: (1) over-all improvements in the 1980 and 1990 censuses, (2) better coverage of the population, (3) improved question designs, and (4) an effective public relations campaign by the Census Bureau with the assistance of national and local ethnic groups (Bureau of Census, 1993).

Upon comparing the differences between the white and black populations for the

period of this study, it was necessary to identify those population groups that would fall into the "other population" (OP) category. For the 1960 Census period the category of Negro was identified as the "black population" (BP) variable. The data for the OP variable was determined by a two step process; (1) subtracting the figures for Negro from the total of all other racial categories thus deriving a figure for the BP variable; and then (2) totaling the remaining racial categories in order to derive the OP variable. This process was applied to the 1960, 1970, and 1980 censuses for both the population and employment categories. Population groups included in this OP variable are all remaining population groups other than the census definition of whites and blacks for each census period.

The method employed for calculating the variable total employment (TE) consisted of an aggregation of those industries combined that would employ over fifty percent of the labor force in Michigan. As shown in Table 2.1, manufacturing has consistently been the highest single category over trade and government. The category "other" has consistently increased in proportion to decreasing labor rates in manufacturing. The basic labor force employment categories consist of manufacturing, government, and a combination of service industries headed under the "other" employment category. With the exception of the 1960 census period that accounts for nearly 57 percent, all other percentage figures for TE were well over the 1960 figure. The variable total employment (TE) explains over 86 percent of all employment activity for the remaining census periods.

Table 2.1: Percentage Distributions of Labor Employment in Michigan, 1960-1990

Category	**1960**	**1970**	**1980**	**1990**
Manufacturing	38.8	30.2	23.4	19.6
Other*	--	39.4	42.3	58.3
Trade	18.0	--	--	--
Government	--	14.1	14.6	18.2
Total Percentages	56.8	83.7	80.3	96.1

*Note: The labor category "Other" as defined by the Bureau of Census Economic Data: 1970- construction, transportation, communication, and public utilities; 1980 and 1990- wholesale/retail trade, finance/insurance, real estate services and mining.
Sources: MESC 1981, 1992; Michigan Statistical Abstracts 1961, 1971

2.2: The Issue of Scale in Measuring Segregation

In general, segregation research at the sub-state level of analysis has focused on census or city blocks and census tracts within cities or across Standard Metropolitan Statistical Areas (SMSA) which usually consist of two or more counties. Consequently, the vast majority of segregation literature has generally focused on the largest urbanized area within a State or has used a number of SMSAs in states to compare and contrast their characteristic differences or similarities. The literature proves insufficient when several urbanized areas within a given state, or for that matter, the state itself is the scale of research. Furthermore, these studies fail to compare social and economic characteristics of states that would allow future comparisons.

2.3: The Centrographic Method at the State Level

Spatial segregation can be said to exist wherever the distribution of one group differs from that of another group. The methodology in this study applies centrographic measures at the state level to population sub-groups and a total population and employment centroid. The use of a centrographic technique results in the displaying of centroids allowing one to measure their spatial distributions and in their changes continuous over time. These spatial distributions will be analyzed as stated previously, in terms of their location, direction and distance. Each county is weighted according to population and employment counts. The figures for each of Michigan's eighty-three counties are aggregated to determine the center of the various population and employment centroid which summarizes location. This is the center of "moments" similar to the center of gravity which minimizes the sum of the squares of the distance of the observations to a point (Heyford 1902, Cooper 1963). Basically, it is the mathematical expectation of the location of an observation selected at random from a population. Changes in location and direction of movement over time can be observed by comparing the coordinates of the centers. Differences in the location of components of the population such as racial or employment groups at a single point in time can be compared in a similar fashion. Similar comparisons can be made for a variety of economic activities, physical facilities such as residential housing, or any other phenomenon located in space. Centers are found in and identified by the use of Universal Transverse Mercator coordinates as presented in decimal fractions and degrees.

The formula for centrographic measurement is presented below:

Where: P*i* = population or employment variable for county *I*

X*i* = centroid for variables (e.g., total population) for county *I*

I = 1,2,...83 since there are 83 counties in Michigan

$$\overline{\mathbf{X}} = \frac{\sum_{i=1}^{n} P_i X_i}{\sum_{i=1}^{n} P_i}$$

Assuming planar or two dimension geometry, we can calculate the mean center by simply calculating the mean of the **X** - coordinate (eastling), and the mean of the **Y** - coordinate

(northings). The two coordinates mark the location of the mean center, **X.**

Since the turn of the century, various scholars have embraced this method in analyzing the centrality of an area or population (Hayford 1902; Bureau of Census 1923; Ross, 1930; Scates, 1933). During this earlier period, coordinate axis had to be estimated since few maps were generated for micro-level analysis which were derived from small-scale maps. However, the basic formula for the mean center has not changed.

Centrographic measures have developed a substantial vocabulary over the last century for measuring the three characteristics of shape, dispersion and location. The mean center can be described as the; center of gravity (Lovelock and Weinberg 1985), center of minimum travel (Tordella 1987), a centroid (Jones, Manson, and Coccossis 1978), and more recently, the centre of minimum aggregate travel (Kumler and Goodchild 1990) or centroid ellipses (Greene 1991).

This study will calculate a series of five state centroids for each of the census periods, 1960 through 1990. The five centroids to be displayed are: 1) White population (WP), 2) Black population (BP), 3) Other (OP) remaining minority population groups, 4) total employment (TE), and 5) total population (TP). A precise geographic location or point is determined for all centroids for each of the census periods. These geographical centers or points permit a spatial comparison between the change of distribution of any point(s) within any given census period and from one census period to another.

The spatial patterns and distributions of the state's racial population centroids for each census period is determined from each county's total for that population group. The total population and total employment centroid are figured similarly. The formula (Clarke 1988) for determining the **X/Y** coordinates for each of the state centroids is presented.

X coordinate:

$$\overline{\mathbf{X}} = \frac{\sum_{i=1}^{n} X_i Z_i}{\sum_{i=1}^{n} Z_i}$$

Y coordinate:

$$\overline{\mathbf{Y}} = \frac{\sum_{i=1}^{n} Y_i Z_i}{\sum_{i=1}^{n} Z_i}$$

whereas:

$$\overline{\mathbf{X}} = \frac{\sum X_i}{N}$$

$$\overline{\mathbf{Y}} = \frac{\sum Y_i}{N}$$

$$\overline{\mathbf{Z}} = \frac{\sum Z_i}{N}$$

The variable **Z** is the mean/average of all eighty-three counties in Michigan for each of the five variables. This methodology generated a total of twenty centroids, four sets for each census period and five variables for each set: TE, TP, WP, BP and OP. Each UTM coordinate was input into a analytical and computer cartographic software package called, Atlas Geographic Information System (AGIS). The term GIS stands for; Geographic Information System (or Science). A combination of traditional and analytical computer cartography were employed to generate the maps and determine directions. Two other software packages, Corel Draw and PC Globe, were used to assist in generating output and determining distances and directions.

2.3.1: Measuring Centrality

Centrographic measures have developed a substantial vocabulary over the last century for measuring the characteristics of distributions such as the median center of gravity or centroid for concentration of areas using spatial data. In addition, an ellipse of density, may be derived from the root mean about axes through the center for shape; and the average radius indicating the average distance and direction from an observation in a spatial series from the center point.

A wide variety of measures of various characteristics can be generated to measure a spatial distribution; however, the spatial phenomenon in a single point permits tracing the change of location of that point from one period to another. The application of centrographic techniques in this study provides observations for concentration and direction of the various population groups and employment opportunities over several periods of time. This study will demonstrate the efficiency with which centrographic measures display the distances and directions in the spatial distributions of various phenomenon and convey large amounts of information simply and quickly.

2.4: The Patterns of Residential Locations of Racial Groups and Employment Opportunities: Previous Research

Studies at the micro-level have focused on Blacks, Hispanics, Native Americans, and Asians by measuring the overall unevenness in the spatial distribution of various racial groups within cities or SMSAs. Darden (1987) has found that Asians experience the least amount of residential segregation from Whites, have the highest level of

suburbanization, and are provided the greatest opportunity for social, economic, and spatial mobility. Blacks, on the other hand, experience the greatest degree of residential segregation, the lowest level of suburbanization, and the least opportunity for social, economic and spatial mobility of all racial/ethnic minority groups.

Recently, research at the regional level in which states are aggregated into economic blocks have focused their efforts on deindustrialization and the political economy (Hill 1982; Hill and Negrey, 1987). These studies concentrated on employment opportunities and their relationship to economic regionalization or employment shifts. Hill (1982) suggests the restructuring of the city caused by deindustrialization of the Great Lakes region places city dwelling minorities at a great disadvantage both economically and socially. Research that provided a state-wide (Michigan) focus in the impact on black employment, concluded that new manufacturing jobs (i.e., related to the automobile industry) where locating away from black population clusters (Cole and Deskins 1988; Deskins 1988). Basically, jobs in the automobile and related industries has been and continues to be a major provider of employment for black workers and Deskins (1988) findings conclude that new venture sites are locating beyond normal commuting distances set by the Equal Employment Opportunity Commission (EEOC).

The EEO laws (Title VII) since 1964 have mainly been examined by sociologists and lawyers. Sociologists have examined the mobilization of resources in order to implement a legislative standard and questions of the legitimacy of the administrative process to the exclusion of its effectiveness have occupied lawyers (Blumrosen 1993). Both have examined the process by which legal policy is translated into "real world"

changes in socio-economic behavior.

In sum, residential segregation and employment research has either focused on groupings of multiple counties or Standard Metropolitan Statistical Areas (SMSAs), and the aggregation of city census tracts or census blocks or regional economic groupings of various states. As a result, this scale of research has ignored other scales of analysis that may be rooted in the influence of the state (Clark 1984, Hollister 1989) and to an extent, federal-level policies on the socio-economic and political-economic impact on the population (Cason 1980). The present study is based on a scale of analysis which addresses this concern.

A majority of the spatial segregation research for the State of Michigan has generally focused on the urban areas of Detroit, Pontiac, and Flint. Research at this micro-level (Darden 1978, 1983, 1984; Darden and Kamiar, 1988) as well as the county or MSA (Darden 1985, 1992) level has been on the major racial minority groups. Inasmuch as not all of the population groups within Michigan have fared equally in their experiences of economic prosperity and crisis, a major problem has lingered in that the largest minority population cohort, blacks, have continued over the last forty years to predominately reside in only a few counties. Consequently, the relatively high unemployment rates among blacks and recently, Hispanics, is critical since Blacks reside in a few concentrated areas. Research has shown that the black population has experienced a consistently lower rate of employment combined with consistently high levels of segregation (Darden 1976). The primary reason why blacks have been impacted more severely economically is segregation, both occupationally and

residentially (Deskins 1988). Response to this lingering problem with existing models on racial and employment inequalities ignore the realities of continued spatial segregation at larger scales of analysis.

The analysis of residential and employment locations as well as employment status by racial groups in Michigan will be discussed in the following chapter.

CHAPTER 3

ANALYSIS OF RESIDENTIAL AND EMPLOYMENT LOCATIONS IN MICHIGAN

The results of determining the spatial patterns and distributions of employment and residential locations in Michigan are discussed. The first section is concerned with demographic and economic trends within the State between 1960 and 1990. The following sections discuss findings relating to centrographic measures in distances and directions of population groups from total employment, distances and directions of population groups from total population, and the mapping of centroids. A county locator map for the state of Michigan may be found at the end of this chapter. In addition, raw data for the centroid coordinates at the state level, and the algorithm employed to determine distance is located in the appendices.

3.1: Demographic and Employment Trends, 1960-1990

The racial proportion of the population within Michigan has increased proportionately to overall population growth between 1960 to 1990, and Michigan experienced a total population growth of nearly 1.5 million during this period. The percentage increase of population during this period was 18.8 percent and the percentage of minority population was 16.6 percent. Since 1960, the racial demographics of Michigan's population as seen in Table 3.1 have lightly decreased in its proportion of the white majority by nearly 6.5 percentage points while slightly increasing its proportion of minority populations by over 4.5 percentage point for blacks and nearly 3 percentage points for other minority groups.

Table 3.1: Percentage Population Profile of Michigan by Race, 1960-1990

Census Year	**1960**	**1970**	**1980**	**1990**
Total Pop:	7,823,194	8,881,826	9,262,078	9,295,297
White	90.6	88.3	85.0	83.4
Black	9.2	11.2	12.9	13.9
Other	0.2	0.5	2.1	2.7

Note: "Other" represents all the racial categories not represented in the above Table and as categorized by the Bureau of Census for each of the census years [1]

[1] Source: U.S. Bureau of the Census, General Population Characteristics for 1960, 1970, 1980, and 1990.

In fact, it is projected that by the year 2010, (MESC, 1992) Michigan's racial population distribution will experience even a smaller proportion of whites, 79.4 percent, compared to a higher proportion of nonwhite population of 20.6 percent. Geographically, Michigan's total population is very unevenly distributed. Historically, the majority of the people have resided in major cities located in the southern third of the state. During the period of 1960 to 1990, an average between 40 to 45 percent of the residential population lived in the three counties of Wayne, Oakland, and Macomb as shown in Table 3.2. The greatest population densities are located in the southeastern parts of the state; the lowest, in the northern Lower Peninsula and the Upper Peninsula. However, residential population growth has been increasing in the southwestern portion of Michigan since the mid-1980s.

The highest average population density is in Wayne County and also the location of Michigan's largest city, Detroit. In fact, between 1960 and 1990 nearly three- fourths of the black population in Michigan continually resided in Wayne county, but only one-third of the county's population is black. In addition to blacks being heavily concentrated in southeastern Michigan, other minorities were also concentrated in both urban and rural areas in the southeastern portion of the state. The majority of other minority populations also resided in Wayne county. However, other minority populations on average have made up less than two percent of the county's total population during the period of this study.

Major regional changes in population between 1960 and 1970 were beginning in areas in the northern Lower Peninsula, the southwestern portion of the state, and the

TABLE 3.2: Population Totals for Counties within the Detroit SMSA, 1960-1990

SMSA Counties	1960	1970	1980	1990
Lapeer	41,926	52,361	70,038	74,700
Livingston	38,233	58,967	100,289	114,050
Macomb	405,804	625,309	694,600	704,100
Monroe	101,120	118,479	134,659	135,660
Oakland	690,259	907,871	1,011,793	1,529,400
St. Clair	107,201	120,175	138,802	145,300
Wayne	2,666,297	2,669,604	2,337,240	2,164,400
Totals	4,050,840	4,552,766	4,487,421	4,867,610

TABLE 3.2 (a): Percentage of Population Change for Counties within the Detroit SMSA, 1960-1990

SMSA Counties	%Change 1960-70	%Change 1970-80	%Change 1980-90
Lapeer	20.0	25.3	6.3
Livingston	26.2	41.3	12.1
Macomb	25.2	10.0	1.7
Monroe	14.7	12.1	0.8
Oakland	23.0	10.3	32.9
St. Clair	10.8	13.5	4.5
Wayne	0.5	-12.5	-7.4
Totals	11.1	-1.5	7.9

SOURCE: U.S. Bureau of Census, 1960-1990 Census of Population and Housing, Washington D.C.; 1970-1990 Population Estimates and Projections, Michigan Employment Security Commission, Detroit, Michigan

surrounding urban-suburban areas of Detroit. For example, in Table 3.2, four of the seven counties within the Detroit SMSA increased their population base by over twenty percent during that period. Between 1960 to 1990, Livingston county nearly trebled its population base, Oakland county doubled its 1960 population of 690,259 to over 1.5 million while only Wayne county showed signs of a declining population base.

The character of population change was in the form of suburbanization into areas extending beyond Wayne county. Counties that contained relatively small urban settlements or were somewhat rural in nature such as; Livingston, Washtenaw, Genesee, and St. Clair in the southeastern section as well as Ottawa and Muskegon in the southwest, continued to grow during the 1970s and 1980s. Movement from the larger cities was a major characteristic during this period. Consequently, industry as well as other economic activities and residential housing shifted from the central cities, most notably, Detroit in Wayne county.

Michigan's economy during the period of this study has provided jobs in primarily three sectors; manufacturing, agriculture (including agribusiness), along with recreation and tourism. The largest sector, manufacturing, has been overdependent on the automotive industry which has experienced problems in recession years. It has also been impacted by fierce global competition. The distribution of manufacturing jobs within the automotive industry is predominately concentrated in southeastern Michigan. Consequently, the average income per capita by counties was highest in the southern half of the Lower Peninsula and much lower in the remaining counties of the state. In the 1960s and 1970s nearly 50 percent of Michigan's jobs in manufacturing were in the three

counties of Wayne, Oakland, and Macomb, which correlates closely with the fact that on average, about 40 percent of the state's total population lived in these three counties. Other clusters of manufacturing activity are centered within the Grand Rapids metropolitan statistical area (MSA), along with Lansing, Jackson, Flint and Saginaw.

The emergence of a world economy has challenged the ability of Michigan to adapt and compete in manufacturing, which requires new technologies and new capital and in turn a more highly skilled labor force. Historically, it is important to understand that Michigan's automobile industry has been and continues to be a major provider of employment for black workers (Deskins, 1988). Michigan's heavy dependence upon manufacturing, especially automobiles and trucks, rapidly changed during the early 1980s along with a rapid change in residential population location. Comparably, national and regional (Great Lakes) figures for manufacturing jobs shows a nearly nine percent decline for black employees compared to all other employees (Deskins, 1988). Combined with a diminishing population and tax base, the economy, schools, and government services in Michigan, especially, of older cities such as Detroit, Grand Rapids, Flint and Pontiac have experienced a major exodus of job opportunities combined with a declining population base.

One reason is that the racial make-up in Michigan's urbanized counties include a higher proportion of blacks and other racial minorities contrasted with a lowering proportion of the white majority population when compared to the state wide percentages (Public Sector Reports, 1987). For example, in 1990 the city of Detroit's (Wayne county) racial distribution was 63 percent black, 29 percent white, and 8 percent other minority

groups. Furthermore, Table 3.3 reveals that the 1990 annual unemployment average for black male adults was 17.9 percent, nearly tripling the white male adult rate of 6.8 percent. The corresponding figures for women were 14.2 percent for blacks and 5.7 percent for whites. The unemployment rates among Hispanics fell somewhere in between the black and white unemployment rates. The Hispanic rates for both sexes (including teenagers 16-19 years) were approximately 11.9 percent. Historically, Hispanic's minority population has ranked second to Blacks in proportion in Michigan. However, for the period between 1970 to 1990, the highest rate of growth among all minority population groups in Michigan has been for Asian and/or Pacific Islander's (MESC 1991).

The employment status for Michigan's labor force clearly indicates the effects of this economic and spatial transformation. For example, in Table 3.3, the unemployment rates for black men and women far exceed the rates in all categories for the white and total population in general. Furthermore, black teenagers experience the highest unemployment rate of 35.9 percent compared to the white teenage unemployment rate of 14.6 percent. The Hispanic unemployment rate reveals a significant disparity between women and men, however, their rates average between blacks and the white majority.

TABLE 3.3: Michigan Employment Status by Major Racial Groups, 1990 Annual Averages.

	Employment % of Pop.	Unemployment Rate
Total	60.5	7.5
Men	69.2	8.1
Women	52.3	6.8
Teenagers	48.6	17.3
White	62.9	6.3
Men	71.9	6.8
Women	54.2	5.7
Teenagers	54.7	14.6
Black	46.3	16.1
Men	51.4	17.9
Women	42.2	14.2
Teenagers	24.5	35.9
Hispanic	59.3	11.9
Men	66.0	13.9
Women	53.1	9.6
Teenagers	N/A	N/A

Source: Michigan Employment Security Commission 1992. Note: The Teenagers category is for both sexes, 16 to 19 years of age. No Teenage data was provided for Hispanics

3.2: Findings on the Spatial Distribution Patterns Between Total Employment (TE) and Population Groups

Distances in miles and direction in degrees from the location of the TE centroids are calculated for each census year. Distances between centroids are determined geometrically, basically, by subtracting the **X** and **Y** UTM coordinates from each centroid. Direction of movement for each centroid is determined by its origin of location in a given census period and its direction of movement to its new location in the following census period. Direction is equivalent to 360 degrees in which 0 degree equals due north, 90 degrees equals due east, 180 degrees equals due south and 270 degrees equals due west. The distance and direction are depicted from each of the centroids for total employment (TE), white population (WP), black population (BP) and the population of all other minorities (OP) for the census periods 1960 to 1990. Theoretically, if an even distribution of population groups and employment opportunities existed, distances between centroids would be minimal and their directions of movement between census years would be relatively the same. Whereas, the center of gravity for TP and TE should be relatively the same. An uneven distribution of these centroids would reveal the opposite effect with separate locations between population groups and employment mean centers. All centroids during each census year demonstrates their mean locations at the county level and are aggregated to determine their mean center of gravity for the state. One can roughly equate a change in distance of one mile in any direction to a change in the mean population center by 960 persons (Jones, Manson, Coccossis, 1978).

Table 3.4 reveals the distances and directions for the WP, BP and OP centroids from the TE centroid for each census year is determined. Direction in degrees is simply determined in that a 360 circle, zero degrees is due north, ninety degrees is due east and so forth. The OP centroid for 1960 is located the furthest from TE, 48 miles from the center of gravity. However, during the course of the next three census periods, the OP centroid not only decreases in distance but continually moves in the same direction as the TE centroid, whereas, by 1990, the OP and TE centroids are approximately in the same location. On the other hand, the WP centroid fluctuates between 33 to 37 miles from the TE centroid either moving away or closer in a ESE direction. The WP centroid is always in very close proximity of the TE, while continuing to move in a NNW direction. Interestingly, the WP centroid moves in the opposite direction of BP centroid for each of the census years.

TABLE 3.4: DISTANCES IN MILES AND DIRECTIONS IN DEGREES FOR POPULATION GROUPS FROM TOTAL EMPLOYMENT (TE) "CENTERS OF GRAVITY," 1960-1990

YEAR	WHITE Dist\Dir		BLACK Dist\Dir		OTHER Dist\Dir	
	Miles	Degrees	Miles	Degrees	Miles	Degrees
1960	7	330°	35	133°	48	183°
1970	4	278°	33	134°	10	335°
1980	3	324°	37	136°	3	36°
1990	11	320°	33	136°	0	0°

TABLE 3.5: DISTANCES IN MILES AND DIRECTIONS IN DEGREES FOR POPULATION GROUPS FROM TOTAL POPULATION (TP) "CENTERS OF GRAVITY," 1960-1990

YEAR	WHITE Dist\Dir		BLACK Dist\Dir		OTHER Dist\Dir	
	Miles	Degrees	Miles	Degrees	Miles	Degrees
1960	4	323°	37	135°	63	138°
1970	5	224°	36	133°	7	330°
1980	6	318°	33	133°	2	90°
1990	12	327°	36	134°	4	55°

TABLE 3.6: DISTANCES IN MILES AND DIRECTION IN DEGREES BETWEEN TOTAL POPULATION (TP), TOTAL EMPLOYMENT (TE) AND TOTAL EMPLOYMENT\TOTAL POPULATION "CENTERS OF GRAVITY," 1960-1990

YEAR	TP\TP Dist\Dir		TE\TE Dist\Dir		TE\TP Dist\Dir	
	Miles	Degrees	Miles	Degrees	Miles	Degrees
1960	Origin		Origin		2	340°
1970	1	90°	1	144°	4	14°
1980	4	324°	6	324°	2	0°
1990	3	216°	3	323°	2	180°

3.3: Findings on the Spatial Phenomenon Between Total Population Center's of Gravity and Population Groups

Four indexes are used to determine distance in miles and direction in degrees from the locations of the TP centroid. Distances and Directions are determined by the same methodology for the TE centroids (see Section 3.2).

In Table 3.5, the WP centroid distances and directions from the TP center's of gravity for each of the census periods is nearly identical to that of the TE center's of gravity. This situation is equally true for the BP centroids, again for each of the census periods. The OP centroid's also display similar patterns of distance and direction indexes for each of the census periods. Unlike the 1990 index for the TE center of gravity in Table 3.4, the OP centroid slightly increases in distance from the 1980 census period and it is not identical in locale with the TP center of gravity.

3.4: Mapping of Directions and Relative Locations of All Centroids

The main purpose behind the mapping of the centroids is to geographically display the locations allowing an easier comparison of centroids between each of the census periods. In addition to the tables in the previous section, they act as a supplement so one can quickly determine the relative location of each centroid for comparison of trends between each census period. Three sets of maps are used to display the relative locations and directions for all centroids. The first set of maps, Figures 3.1 and 3.2, depict all centroid locations and directions for the 1960 and 1970 census years. The second set of maps, Figures 3.3 and 3.4, display centroid locations and directions for the

1980 and 1990 census years. The last set, Figure 3.5, highlights the BP centroids for each of the four census periods, 1960 to 1990. All centroids for each census period demonstrates their average weighted locations and one can roughly equate a change in distance of one mile in any direction to a movement in the mean population center by 960 residents.

In Figure 3.1, a tight clustering of centroids exist for TE and WP centroids. This indicates that the center of gravity of the white population as well as the center of gravity for employment locations are evenly distributed for these centroids. The general location of these centroids is best described as to where the borders of Livingston, Ingham, and Shiawassee counties converge. Figure 3.2 for 1970 reveals the continued clustering of the WP with TP and TE centroids.

The next set of maps, Figures 3.3 and 3.4, are for the census periods 1980 and 1990. In Figure 3.3, the WP centroid has reversed its direction slightly increasing its distance from the TP and TE centroids. This trend continued for 1990 (Figure 3.4) resulting in the greatest distance of 11 miles from TE centroid and 12 miles from the TP centroid.

The locations of the BP centroids in the eastern portion of Washtenaw for 1960 to 1990 are quite different from that of all other centroids. Figures 3.1 through 3.4 reveal that the BP centroid is consistently located near the borders of Washtenaw and Wayne counties. This is more clearly displayed in Figure 3.5, revealing that the BP centroid had moved an average of less than 2.1 miles during all four census periods indicating that the black population in Michigan has experienced little or no residential change in their

center of gravity or concentration since 1960. In addition, 1990 data in Table 3.4 demonstrates that the uneven distribution of employment opportunities for the BP centroid is over ten times the level for that of other minorities and nearly three times that of the white majority population.

The OP centroid between 1960 to 1990 experienced the greatest change in distribution patterns between both the TP and TE centroid. The OP centroid located in Shiawassee county for 1970 compared to the 1960 location in Jackson county, dramatically changed to a more even distribution with the TP and TE centroids. It seems that a large out migration from southern counties such as; Jackson, Hillsdale, Lenawee, and Washtenaw, took place towards where the jobs were. The largest other minority group consist of Hispanics for all census periods. Two speculative theories as to the major migration of this centroid are offered; 1) a transformation of predominately agricultural labor force to a manufacturing labor force, and 2) a major growth movement of Michigan's fruit industry (located within those counties bordering Lake Michigan) to the southeastern counties of Michigan. The 1980 centroid location was also in Shiawasee county. Thus, by the 1990 census year, the OP centroid also represented the most evenly distributed group in terms of both residential and job locations.

A summary of the data and methodology is discussed in Chapter four along with concluding remarks on the social and economic consequences of the findings.

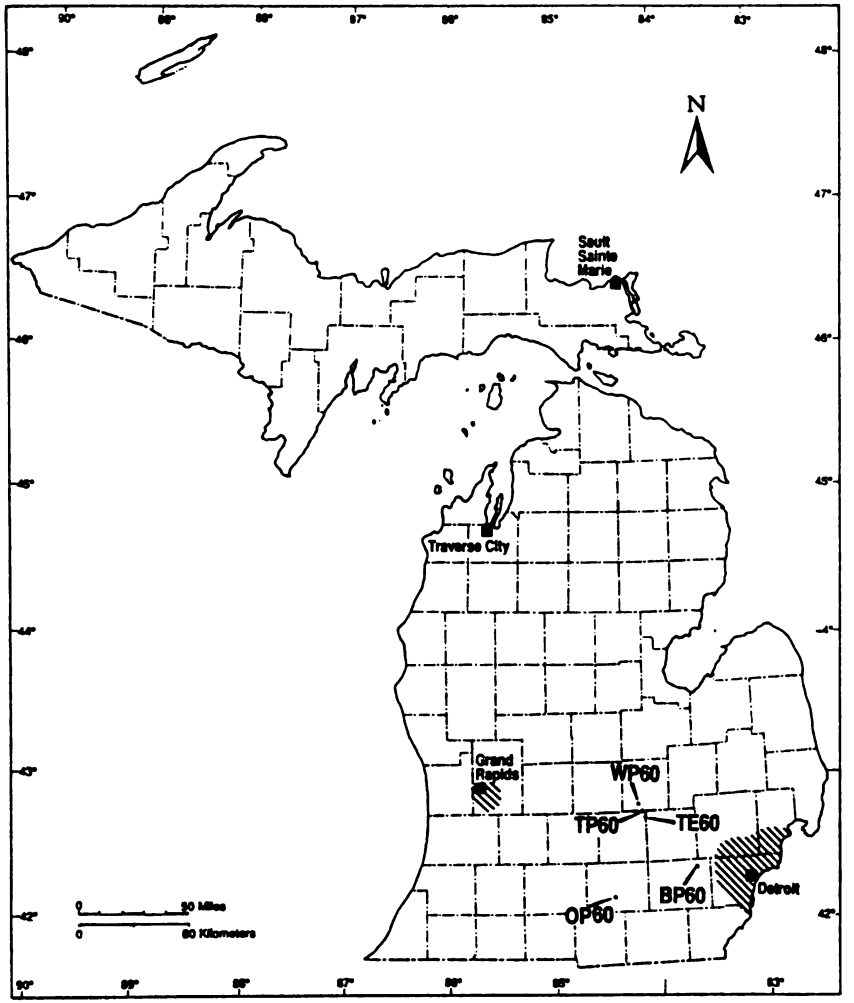

Figure 3.1: Michigan Population Centroids for Total Population (TP), Total Employment (TE),White Population (WP), Black Population (BP), and Other Population (OP), 1960

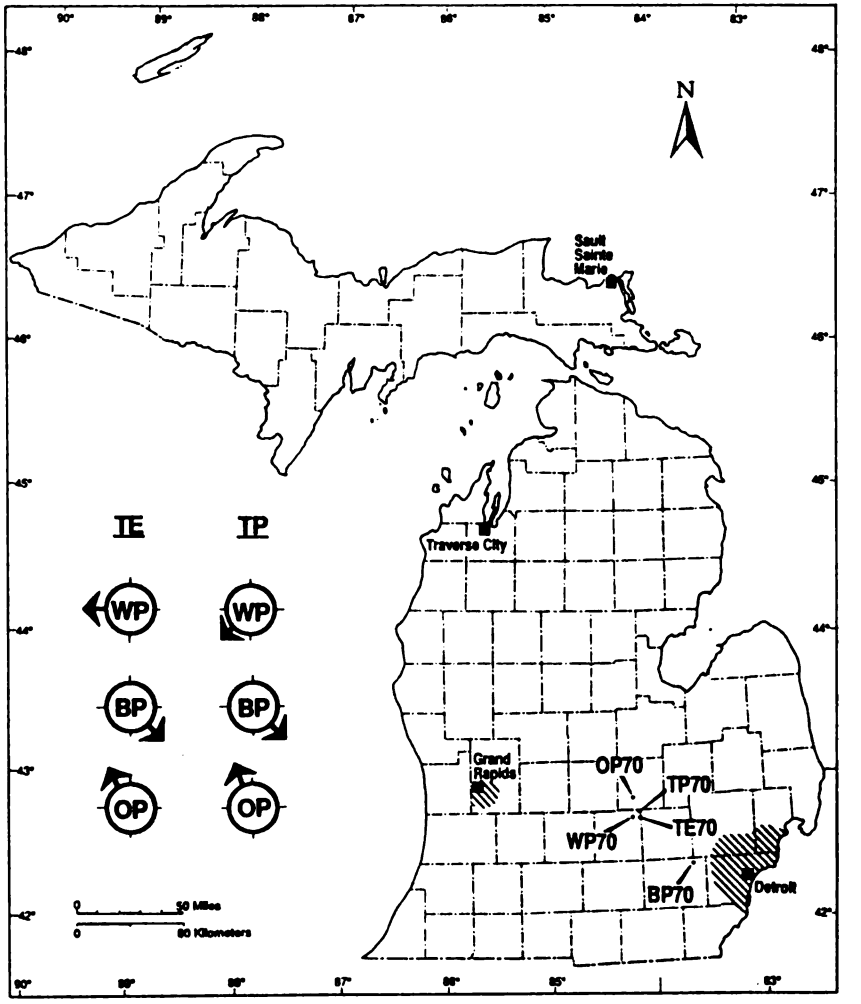

Figure 3.2: Michigan Population Centroids for Total Population (TP), Total Employment (TE),White Population (WP), Black Population (BP), and Other Population (OP), 1970

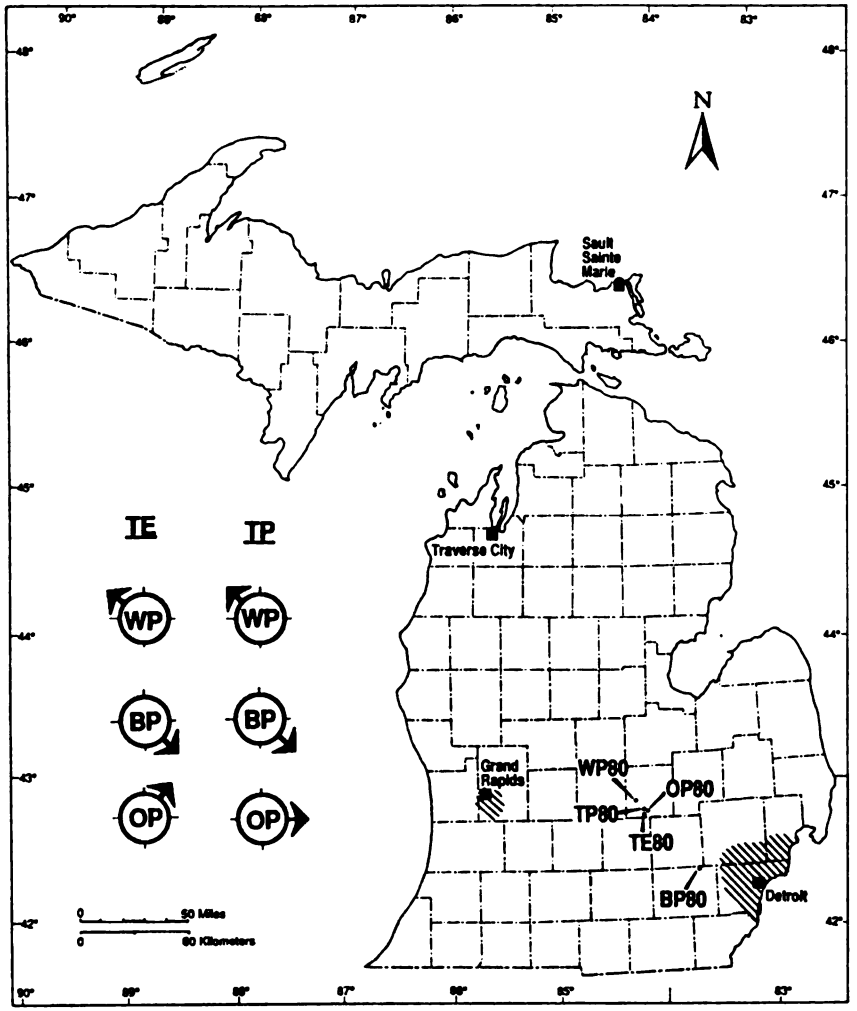

Figure 3.3: Michigan Population Centroids for Total Population (TP), Total Employment (TE),White Population (WP), Black Population (BP), and Other Population (OP), 1980

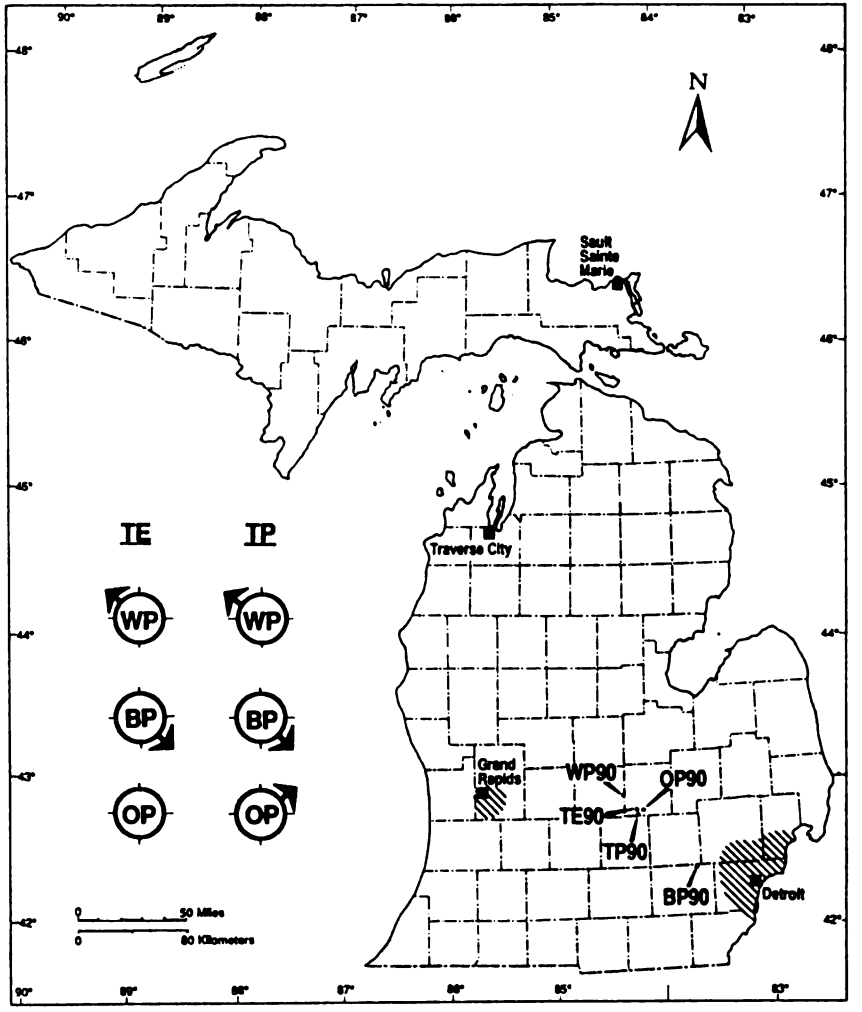

Figure 3.4: Michigan Population Centroids for Total Population (TP), Total Employment (TE),White Population (WP), Black Population (BP), and Other Population (OP), 1990

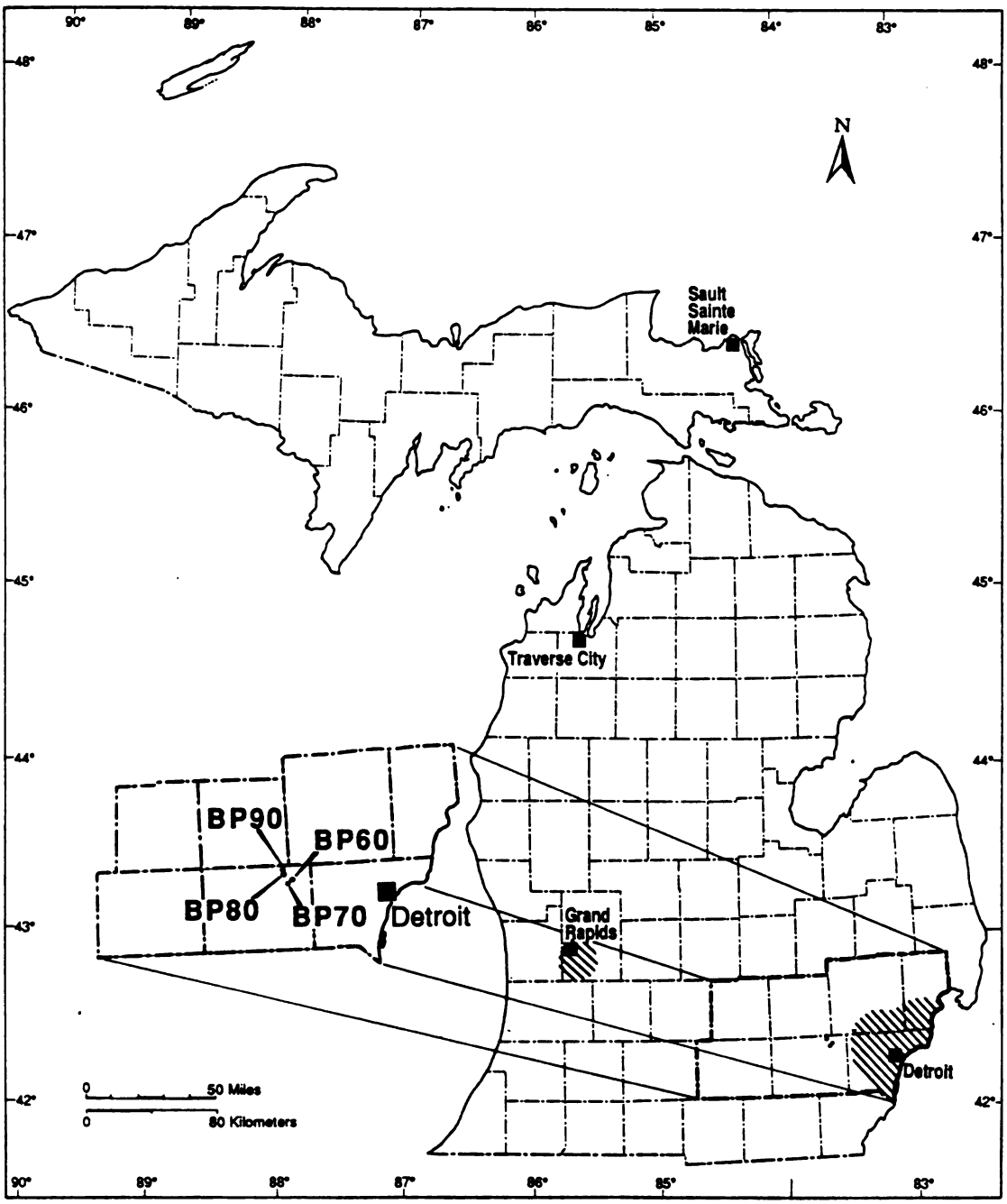

Figure 3.5: Michigan Black Population Centroids, 1960 - 1990

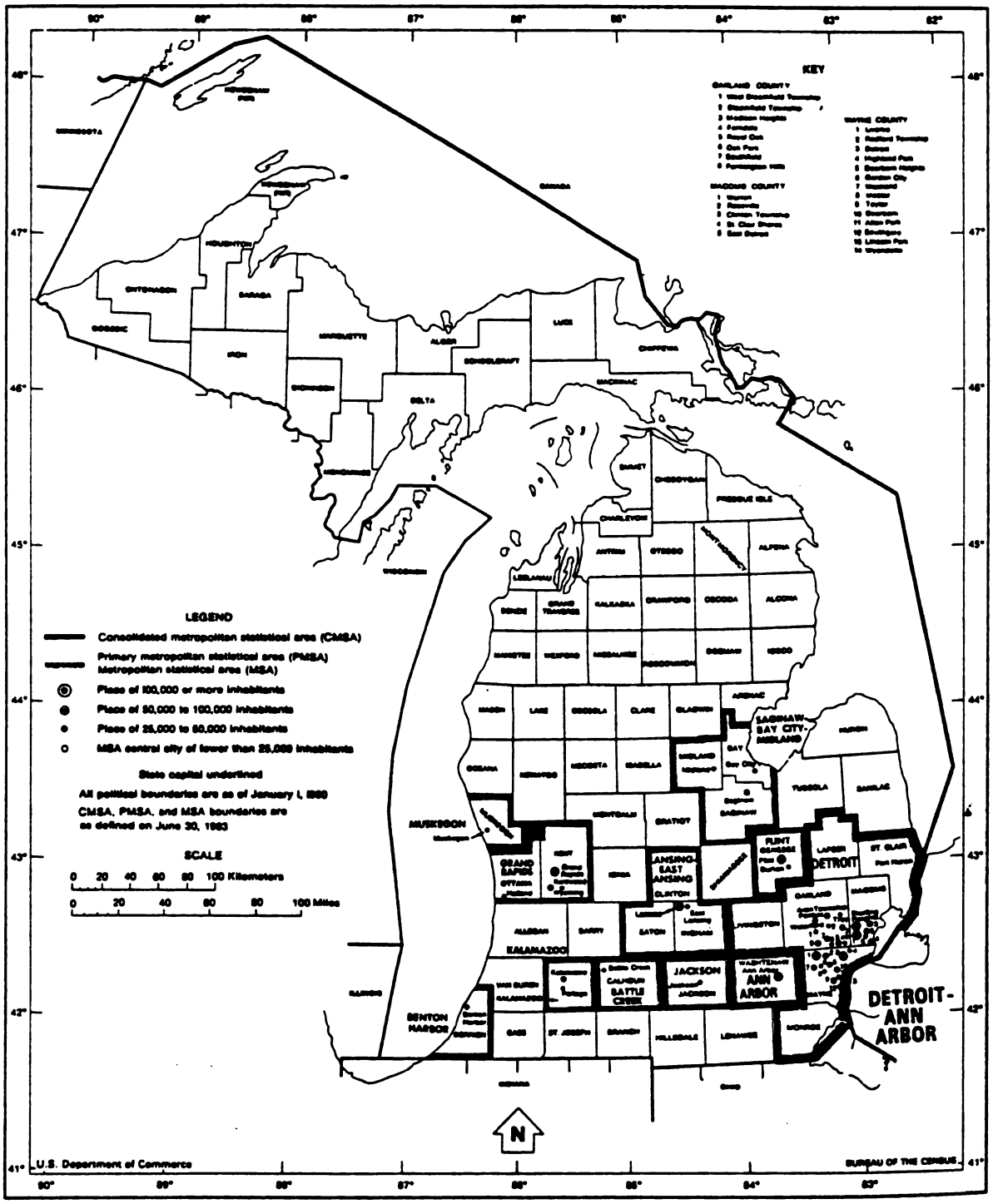

Figure 3.6: Michigan - County Locator Map

CHAPTER 4

SUMMARY AND CONCLUSION

The objectives of this study were to determine: (1) the extent of residential and employment segregation at the county level in the State of Michigan; (2) the patterns and distributions of both population and employment centroids; and (3) if significant differences exist in the distances and the directions for each centroid during each census period on these factors. Three different sources of data were used to determine population characteristics and employment opportunities for the period of this study. Centrographic methods were employed to determine location and distances of the White, Black, Hispanic and total populations for the State of Michigan. In addition, a total employment centroid was determined.

The following hypotheses were tested:

1. The patterns of residential location of racial groups is related to the pattern of location of employment opportunities.

2. Some racial groups are located closer to employment opportunities than other racial groups.

3. The patterns of residential concentration of racial groups and the patterns of location of employment oppurtunities are dynamic, that is changing from decade to decade.

Contrary to the first stated hypothesis, it was found that the BP centroid was the only minority population group segregated both residentially from all other population groups and economically from employment opportunities. During the 1960 census period, the OP centroid exhibited the greatest distance from both TP and TE. However, by the 1990 census period, the OP centroid exhibited the least differentiation both in direction and distance from the TP as well as the TE centroid.

The test of the second hypothesis revealed that both the WP and the OP centroids exhibited the least distances from the TE centroid. In fact, by the 1990 census period, the location of the OP centroid was nearly identical to that the of TE and TP centroids.

The third hypothesis held true for both the WP and OP centroids as well as the TE centroid. These centroids exhibited a significant change in location during each of the census periods. On the other hand, the BP centroid location changed an average distance of one mile during each census period. Basically, the BP centroid's change in location during each census period was negligible indicating that their pattern of concentration has

remained relatively constant.

During the forty year period of this study two important findings were revealed. First, the black population within the state of Michigan has been, and continues to be segregated from the center of gravity of the total population and the center of gravity for employment opportunities as well as from all other minority population groups. Since 1960, black residential location has centered in Wayne county as evidence in Figure 3.5. Secondly, the change of location and direction of the WP centroid precedes the change of direction and location of the TE and TP centroids. In other words, where the center of gravity of the white population resides, the center of gravity of the TP and TE centroids follow. On the other hand, where the white population resides, employment opportunities will follow. The opposite scenario has been true for blacks.

. The concern of this research was measuring the economic opportunity structure within the state of Michigan for various racial groups. Although previous research methods were adequate for determining small-area patterns and distributions of economic opportunities between various population groups, it was necessary to use centrographic methods to better assess broad patterns of economic opportunities.

Understanding the dominance of Detroit and the southeast Michigan region is crucial since not only does this area contain a large share of the population, industry, and income of the state, it is also the largest city[1] in the United States in which the majority of the total population is black. A major source of new jobs in Michigan is and will

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1

The District of Columbia contains the highest proportion of Blacks amongst a given population but is not considered a city but rather a "District".

continue to be small businesses (those employing fewer than 100 workers, MESC 1992). The location of these small businesses has depended heavily on those areas that offer not only tax credits and tax abatements but a clean and safe environment as well as good schools and nearby recreational opportunities.

4.1: Conclusion

The social and economic consequences for blacks is crucial as the findings indicate. The general spatial trend of the TE and the TP centroids seems to indicate an increase in spatial segregation from employment opportunities and from the remaining population groups of the state since the 1970 census year. If this trend continues into the next century and beyond, the black population would continue to experience higher unemployment rates than the white majority, and other minority population groups.

Socially, blacks, the largest minority population group, has been disproportionately isolated in one county in the state. As other racial groups migrated westward to other counties within the state, blacks seem to have maintained their same location. Economically, the same case may be presented for employment opportunities. Since, the mid 1970s, the state has slowly begun a transformation of their economic structure from the intensive automobile manufacturing environment of the past into various other technologies and service industries. Spatially, the location of these new economic ventures have move outward from their original locations, further isolating the black labor force from employment opportunities.

Results from this study clearly indicate that blacks are located where jobs and the overall distribution of the state's population are not. Moreover, it is a trend that seems to be continuing. The location of all other racial population groups and jobs are becoming more and more spatially segregated from the black population. The findings here reveal that at this broader scale of analysis, the extent of residential and employment segregation between blacks and whites and between blacks and other racial population groups is a state wide phenomenon. Consequently, one can determine that progress for blacks since the Civil Rights Act of 1964 has been more symbolic than real as indicated during the forty year period of this study. Furthermore, residential and employment segregation remains virtually as pervasive today as over a quarter-century ago.

Further research might examine the state of Michigan's political processes by which legal policy is translated into "real world" changes in social-economic behavior. Also, similar centrographic measures might be employed to determine the extent in which blacks experience similar spatial phenomenon in other states.

APPENDICES

APPENDIX A

UTM Decimal/Cartesian Coordinates of Centroids for Total Population (TP), White Population (WP), Black Population (BP), Other Population (OP), and Total Employment (TE), 1960-1990

YEAR / POP	X COORD	Y COORD	X COORD	Y COORD
1960 TP	84.11423	42.80426	84°06'51"	42°48'15"
WP	84.16544	42.84304	84°09'55"	42°50'34"
BP	83.60158	42.40958	83°36'05"	42°24'34"
OP	84.39354	38.75419	84°23'36"	40°45'15"
TE	84.09844	42.76194	84°05'54"	42°45'42"
1970 TP	84.09810	42.80523	84°05'53"	42°48'18"
WP	84.15896	42.19611	84°09'31"	42°45'15"
BP	83.61360	42.41857	83°36'48"	42°25'06"
OP	84.15866	42.87854	84°09'31"	42°52'42"
TE	84.07694	42.75723	84°04'36"	42°45'26"
1980 TP	84.15066	42.84632	84°09'02"	42°50'46"
WP	84.22824	42.90976	84°13'41"	42°54'35"
BP	83.64477	42.42929	83°38'41"	42°25'45"
OP	84.11294	42.84784	84°06'46"	42°50'52"
TE	84.14464	42.81111	84°08'40"	42°48'39"
1990 TP	84.18149	42.82328	84°10'53"	42°49'23"
WP	84.31020	42.96581	84°18'36"	42°57'56"
BP	83.66751	42.44931	83°40'03"	42°26'57"
OP	84.12417	42.84522	84°07'27"	42°50'42"
TE	84.18548	42.84260	84°11'07"	42°50'33"

Appendix B

The following is the formula to determine distance between any two given UTM coordinate of centroids or points:

$$D = (X - X)^2 + (Y - Y)^2$$

$$= X + Y$$

$$= \sqrt{2}$$

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