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FACTORS ASSOCIATED WITH GROWTH AND DECLINE OF PLACES IN MICHIGAN 1930-1970

By

Joseph Akono Etua

A DISSERTATION

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ABSTRACT

FACTORS ASSOCIATED WITH GROWTH AND DECLINE
OF PLACES IN MICHIGAN 1930-1970

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This study was concerned with the change in size of places (communities) in Michigan that might have resulted from the impact of industrialization, urbanization, transportation, and communication over a forty year period, between 1930 and 1970.

Methodological problems in previous studies have hindered a better understanding of the processes of growth or decline of communities. The purpose of this study was to increase the understanding of these processes by providing greater precision of cause-effect relationships between factors of change and change in size of places, and to establish, if possible, a hierarchy among these factors.

All places in Michigan which in 1930 had 75 inhabitants or more, but less than 49,999 persons, were included in the analysis. Factors such as roads, state regions, initial size of a place, proximity to a freeway, proximity to the largest place in a county, proximity to a

metropolitan center, the change in industrial work force in a county, and farm characteristics in a county, were considered as independent variables affecting change in size of places.

It was asserted that the characteristics of a place and its hinterland influenced their change in size. To systematically study this process, a system framework was used as a model. Independent variables and the dependent variable were categorized and condensed, and multiple regression was utilized to: (1) increase the precision of determining relationships among the independent and dependent variables and consequently increase the understanding of change in size of communities; and (2) determine which factors were most influential on community size.

The study results showed that greater accessibility of a place to other places, through roads within the larger area, provided the most important source of growth to any place. Places more likely to grow were located on higher quality roads, in the more industrialized and more modern southern regions of Michigan. Interstate highways, improved state highways, high quality road intersections, and proximity to freeways, all appeared to be important variables enabling places to attract resources from the larger environment and therefore to increase their sizes.

The larger environment of a place, or the region, played a significant role in their change in size. The development of a region, as indicated by greater

industrialization and urbanization, stimulated growth of places found in that region.

The initial size of a place and the change in industrial characteristics of a county, also showed a positive relationship with change in their size. The rest of the factors showed a general low degree of influence on place change. However, at some specific degree of change, or quality of a given independent variable, significant relationships were observed.

The findings of this study had significant implications for development policy in general and for community development practice in particular, here in the United States and in developing countries of Africa. They indicated that policy makers interested in the growth of communities and in ways to stimulate population redistribution, would have to keep such important variables as transportation, regional characteristics and qualities of central larger communities in mind as they consider specific policies to further their goals. The results also indicated that community development practitioners could apply the methodology used in this study as a technique for analyzing community problems, in working with local communities toward their development. Finally, the findings reinforced the concept that community change theories have to recognize the multiplicity of interrelated variables influencing community growth or decline, in order to better explain the causes of these changes.

ACKNOWLEDGMENTS

Any event is an outcome of many contributing factors. This work is no exception. It is a product which came about as a result of the guidance and advice of several individuals. Despite their heavy schedules, these individuals were kind enough to devote a large amount of their time to discuss with me matters related to this effort.

My deep appreciation is expressed to several people. Richard Rodefeld, of the Department of Sociology, helped in the conceptualization and the direction of this study. His research project laid the foundation upon which this work was built. He spent considerable time discussing with me the concepts involved in this study. J. Allan Beegle, of the Department of Sociology, was the "structural architect" of this work. His assistance was extremely important in the conceptual and organizational structure of the test. Manfred Thullen, of the Department of Resource Development, served as my academic advisor and chairman of my guidance committee; a man of great understanding, consideration, and patience, in more ways than one, he made it possible that this work be completed in readable form. William Kimball, of the Department of Resource

Development, and Robert Stevens, of the Department of Agricultural Economics, provided constructive criticism which brought more focus to the findings of this work. Any shortcoming and weakness found in this work is solely the responsibility of the author.

My deepest gratitude goes to my wife, Philomine, and family, who supported me without reservation throughout these long years of academic preparation.

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CHAPTER I

INTRODUCTION

In this introductory chapter, the context and the purpose of the study are set forth. An attempt will then be made to clarify a series of concepts related to population centers and to specify the conceptualization of the problem addressed in the thesis. The practical as well as theoretical importance of places, and the significance of size and change in size are then reviewed. Finally, an historical overview of the formation and distribution of places is presented. Special attention is given to major changes in twentieth century America and their impact on places--industrialization and mechanization, urbanization, transportation, and communication.

The Context of the Study

The present study was basically one aspect of the third stage of the project directed by Rodefeld in 1974 to 1976 at Michigan State University's Department of Sociology.[1] The three basic assumptions of the project

[1]Richard D. Rodefeld, "Enumerating Michigan Population Centers (Places) and Determining their Size From 1930-1970: Rationale, Procedures, Problems and Results" (East Lansing: Michigan State University, Department of Sociology, February 1976).

were: (1) that there are causal forces (extractive industry technology, transportation, communication, and industrialization) behind the major size and economic base changes in population centers and communities of United States and other industrialized countries of the world in the twentieth century; (2) that size and economic base were highly related to other characteristics of centers and communities; (3) that changes in these places will also be observed in other characteristics. The major objective of the project was to "investigate and test these initial assumptions and other related questions."[1] A multi-stage design was formulated:

I. Enumeration of all Michigan population centers with size greater than 19 inhabitants between 1930-1970.

II. Compilation of cross sectional and longitudinal data on the size, economic base, and other properties of the enumerated centers and on the conditions and causal forces influencing the size and economic base of centers.

III. Analysis of the compiled cross sectional and longitudinal data.

IV. Drawing of random, stratified and analytic sample of population centers, community centers and/or communities.

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[1]Ibid., p. 1.

V. Intensive cross sectional and longitudinal study of selected centers and communities.

When the present study was being designed, the first two stages were almost completed.

Concurrently with the present study, two other studies utilized the compiled data to investigate the problem of census enumeration, and the problem of the deviant case, that of declining places in metropolitan counties. The first problem was studied by Melcher. His objectives were to determine the relationships between various place characteristics and the likelihood of census enumeration (or underenumeration) to determine the consequences of any such relationship for reported characteristics of places in the state.[1] The problem of declining places in metropolitan counties was studied by Barningham. He attempted to explain why some places in Michigan metropolitan counties declined from 1930 to 1970.[2] The present study uses the same data to study the change in size processes for places (non-metropolitan centers) in the entire state of Michigan.

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[1]John E. Melcher, "Census Underenumeration of Michigan Population Centers" (M.A. Plan B. Technical Research Paper, Michigan State University, Department of Resource Development, East Lansing, 1977).

[2]Douglas A. Baringham, "Deviant Case Analysis of Declining Places in Michigan Metropolitan Counties" (M.A. Plan B Technical Research Paper, Michigan State University, Department of Resource Development, East Lansing, 1977).

The Purpose of the Present Study

Though there were many purposes for this study, the primary or ultimate objectives were:

1. To determine the most influential factors of growth and decline of places in Michigan.
2. To determine the varying degrees of influence of each selected factor on different rates of change in size of a place; i.e., to specify what degree of influence a given causal force has on a given aspect (direction of change) and rate of change in size of a place. This objective was very important because it would show rather specifically and clearly how much a given important factor needs to be changed for a given desired level of change in size of a place or population center.[1]
3. To determine the total effect of the selected factors on change in size of places in Michigan.

A secondary objective of the research was:

4. To achieve a higher level of explanation of change in size of places in Michigan by considering all non-metropolitan places greater than 74 inhabitants, a larger number of independent variables, and a period of four decades.

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[1] "Place" and "population center" will be used interchangeably throughout the dissertation. They will be defined later in this chapter.

Place, Community, Neighborhood, and Settlement: A Distinction

The meaning of "place" or population center used in this study was more operational than conceptual. More emphasis was given on the physical setting of a population aggregation for spatial identification. The meaning was based, on the one hand, upon the operational identification found in Rand McNally Commercial Atlas,[1] and upon the conceptual definition found in Rodefeld's work.[2] "Place" according to Rand McNally referred either to an incorporated locality that had official legal boundaries, or to "the central built up section of a community, excluding the immediate hinterland," or "a central built up" open country locality that had a locally recognized name, but was "not a part of another locality."[3] On the other hand, Rodefeld defined a "place" as "clustering of occupied residences in space with high level of proximity (short distance) between

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[1]Rand McNally Commercial Atlas and Marketing Guide, 194th edition (1963), p. 4.

[2]Richard D. Rodefeld, "Enumerating Michigan Population Centers (Places) and Determining their Size From 1930-1970: Rationale, Procedures, Problems and Results," p. 3.

[3]"Place" in Rand McNally also refers to railroad station, factories, mines, power plants, etc. These references are not adopted in the present study. It may also be noted that the definition in the Census also emphasizes the "build up" section of an area for enumeration purposes.

the residences." Thus, a place in this study referred to the "central built up" section of an incorporated or unincorporated locality with "high level of proximity" between homes and other buildings.

A distinction between "place" and "community" is necessary to eliminate any confusion that may arise when, in the course of the study, properties are attributed to the "place," and not to the "community."

A "community" is, as most definitions would emphasize, a geographical location in which interacting people living in it have one or more ties in the form of interests, goals, attitudes, or beliefs.[1] Other definitions emphasize the sociological interaction of groups of people living under similar conditions in limited localities, having common concerns so interrelated as to bring about some sense of unity.

According to the first definition, a community includes the central place and its hinterland, or a "town-country" entity--since interacting people with common interests will be found in the central place and in the hinterland. However, operationalizing the "community" defined in terms of town-county is difficult for several reasons: (1) physical boundaries are difficult to determine.

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[1]George A. Hillery, Jr., "Definition of Community, Areas of Agreement," Rural Sociology 20 (June, 1955), pp. 111-123.

Galpin's method of delineation, similar to that of central place theories, recognizes the instability of the boundaries of a community defined in town-country context.[1] To attempt to delineate the boundaries by this method would require a continuous costly operation; (2) the boundaries of each community would have to be assessed frequently for each study because service delivery may expand or contract according to some transferable cost; (3) the boundaries of a given community may vary according to the market of different goods and services; and (4) boundaries of one community may overlap with those of another adjacent community. For these reasons and others, many studies of community have implicitly limited their observations to the central place of the community.

A place as defined in this study, therefore, is an integral part of the community with a high density of residences, businesses, and other institutions and services. It is the nucleus of the community. It is geographically distinct with recognizable boundaries which are independent from the market of the place's services in the hinterland. When used loosely, "place" and "community" can mean the same thing. But in this study the basic difference was in the density of residences and other buildings within a

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[1]G. J. Galpin, The Social Anatomy of an Agricultural Community, Research Bulletin No. 34 (AES, The University of Wisconsin, 1915).

recognizable named locality. "Place" excluded the hinterland, while "community" included the hinterland.

Although the definition of "place" in this study is similar to that of neighborhood, as defined by Sanderson,[1] the "place" is different from the "neighborhood" to the extent that the latter, in many cases, is part of the former, and not vice versa. The neighborhood cannot be considered "the nucleus" or the center of a community. Sanderson defines "neighborhood" as consisting of "but a group of houses fairly near each other, with possibly one or two institutions."

Furthermore, a place as used in this study was different from a settlement to the extent that a settlement is a newly-established locality. It can mean a place; but mostly the age of the locality determines whether or not (in the writer's view) a place is called a settlement.

A Place as a System Within a Larger System of Places

Conceptually, a place or population center was approached as a dynamic spatial social system with internal and external interaction. Internal interaction or operation occurs between the component parts of a place. These include the economic, social, political, and others.

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[1]Dwight Sanderson, The Rural Community; The Natural History of a Sociological Group (Boston: Ginn and Co., 1932), p. 6.

Places would have these sub-parts in varying degrees of conspicuousness. Some may have one or two of these components' parts within the center while others may have all of them. Elements of these subsystems interact in time and space with each other and with the environment or system network of other places, producing results which, on the one hand, are "exported."

The external interaction takes place with the immediate or near hinterland (environment), and with the more distant hinterland with which the place has established linkages through channels such as transportation and communication infrastructures. The interaction with the environment to a certain degree creates interdependence on the basis of functional specialization within the network of places.[1] Thus, a population center is regarded as an open system with variable levels of interaction with its hinterland.

It is both the internal and external outcomes or "products" of these interactions that determine the direction and the rate of change in the population size of places. Inefficient operation of one or more component parts of a place or a maladjustment to hinterland change, would likely bring about a size reduction. An increase in size, on the other hand, is an indication of efficient

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[1]Carle C. Zimmerman, The Changing Community (New York: Harper and Brothers, 1938), pp. 26-28.

operation of its parts and adequate adjustment to changes taking place in its environment, or the network system of other places.

Thus, a place was conceptualized as a system which exists within a network of other areas and places. When change in a place is studied, causal forces of change must be viewed as embracing internal characteristics of the population center itself as well as external forces in the larger system or systems of which the population center is a part. This conceptual approach allows an analysis of place change which does not overlook either of the two sources of potential change, i.e., the internal system of the place and the larger external system within which it is located. Therefore, whatever interest there may be regarding a place, it is important to visualize it as a system in a network of other places. This conceptualization is represented in Figure 1.

Strategic Importance of Places

Places have traditionally played a significant role in spatial population distributions of modern societies. They have been centers for social, political, and economic activities. They contain social institutions: schools, hospitals, churches, and headquarters for different organizations. They serve as residences for most people. This latter function is perhaps the basic raison d'etre for most small places in modern America. They provide homes

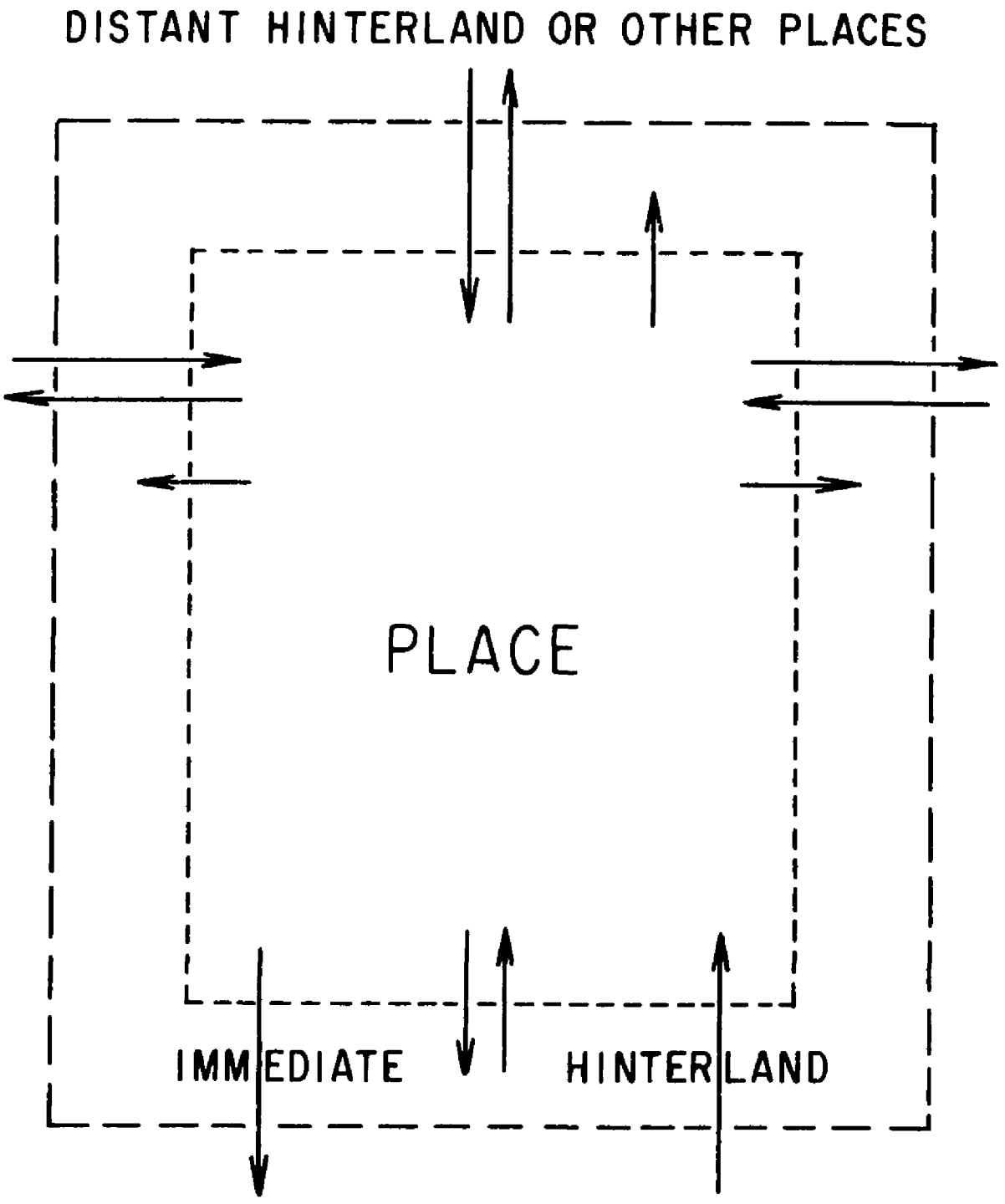

Fig. 1.--A graphic representation of the relationship between a place and its hinterlands. Arrows show the exchange of outputs between subsystems of the place through the black box and between the place and its hinterland.

for millions of Americans: commuting workers, nonfarm residents and their families, retired farmers, and other old people.[1]

A place functions as a link between the populations of low density aggregations and high density aggregations. For example, a village provides a connection between population of its immediate hinterland and that of the town; a larger place is a connection between population of small towns and that of larger areas. Places hold varying degrees of inducement in regard to a higher standard of living. Residents at a lower level in the hierarchy of places tend to orient themselves toward certain cultural, social, or economic "higher values." It is at the place level that any impact of the larger unit (national or international societies) meets the families or residents of places of smaller size.

Compared to its hinterland, a place offers a better location for most firms. It provides inputs such as labor, financial services, institutions and other amenities needed for successful operation. On the other hand, a place provides economic and social welfare to its residents both in the center and the hinterland: work opportunities, market opportunities, financial services, recreational activities, etc. A place functions both as

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[1]Charles P. Loomis and J. Allan Beegle, Rural Social Systems: A Textbook in Rural Sociology and Anthropology (New York: Prentice Hall, Inc., 1950), pp. 222-223.

a production and consumption unit.[1] Thus a study of places, particularly their change in size, has a twofold importance: practical and theoretical.

Practical Importance

In regional development, economists examine growth pole theory (or growth center theory) as a tool for development policy. But there is still a need for basic knowledge of the processes of change in the parameters of the unit (growth center) as it is observed by certain scholars. Hansen observed:

> . . . despite the contributions of growth center theory . . . specific criteria for identifying relevant urban center, or deciding what kind of investment should be placed in them have not been spelled out.[2]

The "relevant urban center" may be interpreted as centers in which factors of potential growth are present. Lloyd Rodwin of MIT wrote:

> Economists and city planners in dealing with growth centers are still learning the ABC's of their calling. They still have to figure out how and where growth "geni" can be called into being when needed, or bottled up when they seem to be getting out of hand.[3]

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[1]Albert J. Reiss, Jr., "The Sociological Study of Communities," Rural Sociology 24 (1959), pp. 118-130.

[2]Niles M. Hansen (ed.), Growth Centers in Regional Economic Development (The Free Press, 1972), p. IX.

[3]Cited from Hansen, Ibid.

And Morgan wrote:

> One of the deficiencies that adversely affect the utility of the growth pole notion as a policy instrument is the lack of knowledge concerning the processes of growth within pole over time.[1]

Finally Hermansen observed:

> Growth pole theory, when applied to geographical space, should be regarded as conditional theory of regional growth that establishes conditions under which accelerated regional economic growth may occur. The more intricate problem of establishing both necessary and sufficient conditions for regional economic growth seems, however, to remain unsolved.[2]

Whether growth pole theory, theory of development, or growth theories, all have remained vague in explaining why economic growth and development occur in some centers and not in others, and how growth is transmitted to other places in the region. Analysis of causal forces of growth and decline as proposed here may fill, to some degree, the gap in this area by providing the knowledge concerning the necessary conditions for growth. This knowledge would thus become complementary to growth theory in its application for development.

Secondly, the study of places is important to community development practitioners or those interested in planned change. Field and Dimit observed:

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[1]Thomas D. Morgan, In Hansen, Ibid., p. 50.

[2]Tormod Hermansen, "Development Poles and Development Centres in National and Regional Development: Elements of Theoretical Framework," in Growth Poles and Growth Centres in Regional Planning, Antoni Kirklinsser (ed.), Mouton, Vol. 5, pp. 1-67.

> If we are to determine the kind of adjustment needed to build communities for the future, we must first identify those factors associated with growth. Then our task is to measure the results of effects which such patterns of change have on the growing and declining community.[1]

The findings of this study may, therefore, provide the information needed to serve as a tool for successful completion of community programs.

It has been a universal characteristic of communities that their members are concerned about its life cycle. In most part, members want to see their place grow, at least until quite recently. Some people have begun to question the "ethics" of growth for all places. However, it is reasonable to assume that inhabitants of any given place would like to see its growth (or at least stability) but not its decline.

Whether they are interested in stimulating growth or maintaining stability, or avoiding decline by undertaking certain measures, they must know or understand the factors related to growth and decline, whether social, economic, or psychological. Failure to understand these factors would, in most cases, lead to failure of any program to stimulate growth, or to avoid decline. Examples of such situations are numerous in many parts of the world. The understanding of these factors would

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[1]Donald R. Field and Robert M. Dimit, "Population Change in South Dakota Small Towns and Cities, 1941-1960," South Dakota AES Bulletin 571 (March 1970).

enable public as well as private planners to make decisions that would serve to attain their objectives. Even stimulating legislation, as Spiegel suggests at the federal level, to create new places necessitates the understanding of these factors.[1]

Increasingly governments have become concerned with the provision of services to rural and urban communities. Therefore, it is important for the officials of a given state to know which place is growing or declining because of the presence or absence of certain forces so that a network of services can be provided. In other words, if information can be provided concerning the permanency of a place and its change trends, an appropriate system of services may be established.

The findings also may help government officials adopt a policy of "even" distribution of population and socio-economic activities at a time when there is concern over large concentrations of people and activities in certain areas. This point is even more relevant in countries where governments are undertaking resettlement and decentralization programs, and where people have the interest of moving to small towns. In the United States, for example, there is a growing interest by the federal

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[1]H. B. C. Spiegel, "Changing Assumptions About Community Change," Journal of Community Development Society, Vol. 2, No. 140 (Fall 1971), 11.

government in population redistribution.[1] Presidential commissions and some congressional hearings have dealt with this topic. See for example, U.S. Department of Agriculture, (1968); Advisory Commission on Intergovernmental Relation, (1968); President's National Advisory Commission on Rural Poverty, (1967); U.S. Congress Joint Economic Committee (1967).

Americans in recent years have shown a preference for rural and small town living. A Gallup Poll survey in 1968 showed that 56 percent of the respondents would had preferred to live in rural areas and small towns if jobs were available; in 1966 the percentage was 49. A Wisconsin survey showed 61 percent would prefer small cities, towns and rural areas.[2] The relatively recent movement from cities to small towns and rural areas is still continuing.[3]

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[1]Edwin S. Mills, "Economic Aspects of City Size," in Population Distribution and Policy: The Commission on Population Growth and the American Future, Research Reports, Vol. V, edited by Sara M. Mazie, (1972), p. 381. See bibliography for other references.

[2]Glenn V. Fuguitt and James J. Zuiches, "Residential Preferences and Population Distribution: Results of a National Survey," Paper given at the Annual Meeting of the Rural Sociological Society, 1973.

[3]Roy Reed, New York Times, (May 17, 1975).

The Theoretical Importance

A study of places may provide basic knowledge, a means to build or expand theories of community growth and/or decline. Studying a large number of places with an attempt to explain the forces of change would give a clearer picture of the life cycle of places. Consequently, this picture would lead to a more integrated, formulated, widely applicable theory of community change, and this picture could provide a strong explanatory and predictive capability. Sanders has pointed out that if one were to measure the shortcomings of many community development programs, it would have to be in terms of failure to apply the accepted sociological theories of community organization and its operation.[1] This does not mean that there is a complete array of theories sufficient to deal with the community, and particularly there is no integrated theory of change in size of places because empirical findings indicating the cause of change are still needed.

Significance of Size and Change in Size of Places

It is true that an increase in the size of a place measured by population increase does not universally imply economic or social growth. However, a positive

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[1] Irwin T. Sanders, "Theories of Community Development," Rural Sociology, Vol. 23, No. 1 (March 1958), p. 5.

relationship between increase in size and economic growth in a place may be assumed in industrialized countries of the world.[1]

A number of economists find a relationship between size and the division of labor, the cost increase or decrease in production, the level of agriculture production, the level of employment, the cost of providing services, and other economic conditions.[2] Population size of a given place would represent actual or potential economic growth, ceteris paribus; e.g., the larger the size of the population of a place, the more diversified the economic activities, the greater the potential division of labor, and the greater the variety of skills available.

Larger places offer larger market cost variations, larger local markets bring variety for greater consumer choice, and a greater number of sellers promote competition in price and quality.[3] The larger the place, the more

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[1]Donald J. Bogue and Calvin L. Beal, "Recent Population Trends," in James H. Copp (ed.), Our Changing Rural Society: Perspectives and Trends (Ames: Iowa State University Press, 1964), pp. 106-126.

[2]Lance E. Davis, Ibid. (1965); Edgar M. Hoover, Ibid. (1971).

[3]Wilbur R. Thompson, "National System of Cities as an Object of Public Policy," Urban Studies, Cameron G. C. and D. C. Nicholls, eds. (London: University of Glassgow, Longman Group LTD, 1972), pp. 99-116.

it becomes "self generating" of local employment, i.e., more local jobs are dependent on the export jobs.[1] For example, a town of 10,000 inhabitants is on the average 68 percent export, 32 percent local (internal) employment, that is, a ratio of 1 export worker to less than ½ local worker. A city of 270,000 is 50 percent export and 50 percent local, a ratio of 1 to 1. A place of about 1,700,000 is 40 percent export and 60 percent local, a ratio of 1 to 1.5. And a place of 15,000,000 inhabitants is 28 percent export and 72 percent local employment, a ratio of 1 exporting employment to 2.6 local employment. With increased size of a place, productivity increases as a result of agglomeration economies and economies of scale.[2]

Larger size places also offer a greater variety of social institutions, greater opportunity for social contact and interaction. However, the general hypothesis about large size would be supported up to a certain size,

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[1]Edward L. Ullman, Michael F. Dacey, and Harold Brodsky, The Economic Base of American Cities (Center of Urban and Regional Research, University of Washington, Seattle, The University of Washington Press, 1971), p. 97.

[2]Niles M. Hansen, "A Growth Center Strategy for the United States," Review of Regional Studies, 1 (1970), pp. 161-173.

not determined as part of this study.[1] Beyond this optimum size, a place would begin to incur diseconomies: pollution, noise, congestion, flight of businesses to suburbs, high crime rates, etc.[2]

In general, the size determines in part the nature, the number, the variety, and the quality of services offered in a place. More specifically, the number and the nature of services present in a place is a function of its size, its hinterland, and other factors.[3]

Size also plays a major role in the way a place responds to national trends. For example, Jacobson and Nelson (1941) showed that the depression of 1929-1933 accelerated the growth of larger trade centers and the

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[1]There is a debate on the optimality of city size for growth, see Harry W. Richardson, "Optimality in City Size, System of Cities and Urban Policy; A Sceptic View," Urban Studies, 9 (1972), pp. 29-48; Niles M. Hansen, Ibid.; Brian Berry and William Garrison, "Alternative Explanations of Urban Rank Size Relationship," Annals, Association of American Geographers, 48 (1958), pp. 83-91; C. Tisdell, "The Theory of Optimal City Size: Elementary Speculations about Analysis and Policy," Urban Studies, 1 (February 1975), pp. 61-70.

[2]Clarence Schettler, "Relation of City-Size to Economic Services," American Sociological Review, 8 (February 1943), p. 60.

[3]Harry W. Richardson, Ibid., Amos H. Hawley, "An Ecological Study of Urban Service Institutions," American Sociological Review, 6 (October 1941), p. 629-639.

decline of primary or smaller centers. Medium places showed a moderate gain in business unit establishment during the depression. During the period of economic recovery, major centers averaged a gain of 16.8 percent while medium centers gained 11.8 percent in business establishments. Growth of business establishments was mainly in the nature of restaurants and taverns in small dependent centers where they more than doubled.[1]

It may further be observed that small places attract mostly economic activities oriented to "primary" input such as land. Such activities become the sole employer for the local market, and the monopoly of prices of local services. In some cases, when services offered are of poor quality and prices high, local customers may seek outside services, thus bringing a decline in local demand. This may result in closing down of some activities, and further decline in size of a place. With additional decline, a place is bound to sustain additional losses of other services. This may be reflected in schools, churches, health or even government agencies. As the size declines, the place becomes more and more dependent upon the outside places.

The importance of size and change in size is shown in the United States government's current concern

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[1]Lowry Nelson and Ernst T. Jacobson, "Recent Changes in Farm Trade Centers in Minnesota," Rural Sociology, 6 (June 1941), pp. 99-106.

about size of places for economic development and the general welfare of the citizens. On the one hand, it is held that certain places have grown so large as to "impair the welfare of residents." On the other hand, it is held that small places need government help to achieve size, at which they can realize the advantages of larger scale public and private activity.

Places: Historical Overview of the Development and Change in Population Centers

An examination of the history of the establishment of places in the United States, and particularly in Michigan, may reveal purposes of settlement, establish a trend in early geographical patterns, and shed light on the evolution of early population centers. Most countries in Africa, Asia, and Europe have places so old that it is difficult, if not impossible, to establish the reason as to why people settled where they did, what the early geographical settlement pattern was like, and how the pattern changed over time. This section attempts to describe briefly why, how, and where places were established in the United States and in Michigan in particular, and to trace the impact of important societal changes. The description is based largely on the works of Fuller (1916), Kolb (1926) and Denney (1970).

Why and How Places Were Established

The establishment and distribution of early settlements in many states was largely unplanned. That is no central planning and coordinating body existed to decide where places were to be established in relation to others. This was particularly true in Michigan and other states settled later than the original colonies. Some settlements were designed as large plantations, others as large farms, federal estates, and still others were composed of isolated homes in the wilderness.[1]

The formation of places was a result of the efforts of a group of individuals, who gave little or no consideration of the location of other places. Groupings from twelve to forty families banded together primarily for protection and mutual aid. When interests were shared by those settled in a given geographical area, the settlers organized and integrated their interactions through a common locality, which emerged as a center. The settlers often created a center with spatial patterns based upon familiar patterns known to them in the Old World.

Groups of settlers frequently shared similar background, nationality, religious beliefs, and interests.

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[1]Carl Taylor et al., Rural Life in the United States (New York: Alfred A. Knopf, 1949), p. 13.

In the frontier environment, they were dependent on each other to meet common social, economic, educational and religious needs. As settlements grew in the West, places tended to become more heterogenous in terms of the background of the settlers.[1] Some places were originally populated by diverse groups of adventurers, but most of the people moving into unsettled areas in the West were basically farmers or had some knowledge of farming.[2]

In order to meet various social and economic needs, dispersed settlers would organize a school, a post office, and other institutions at the center, thus forming neighborhoods.[3] Later such neighborhoods became rather self-sufficient as inhabitants of the area set up other churches, stores, cheese factories, mills, saw mills, creameries, saloons, taverns, and blacksmith shops. A large settlement would have included a relatively large number of such services and institutions to form the main component parts. Methods of farming and production of

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[1]Albion W. Small and George W. Vincent, An Introduction to the Study of Society (New York: American Book Co., 1894), pp. 127-141.

[2]John H. Kolb, Emerging Rural Communities (Madison: The University of Wisconsin Press, 1959), pp. 3-11, 86.

[3]Harold Underwood Faulkner, American Economic History (New York: Harper and Brothers Publishers, 1960), p. 197.

other goods and services were developed locally for small scale production. Thus, as a place grew, it became less dependent upon remote places.

Trade became one of the most important functions of early places. Although transactions occurred between village dwellers, most of the trade and services were with the predominantly farm population living in the immediate hinterland,[1] of one to eight miles in all directions. The store became a channel for the importation of goods and the exportation of products. Warehouses were built for the storage of grain, and other material from the region.

New arrivals settled in the established places and the market for agricultural products and other services expanded. Non-farm immigrants moved in as merchants, innkeepers, money lenders, roadbuiders, lawyers, sellers of farm products and implements. Functional specialization began to emerge as extractive and non-extractive industries expanded. Trade and industries which were chiefly centered in the households were gradually taken over by specialized establishments. A division of labor emerged which necessitated village organization and finally resulted in the establishment of specialized industries in certain places.

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[1]Lynn T. Smith, "The Role of the Village in American Rural Society," Rural Sociology, 7 (March, 1946), pp. 16-17.

Transportation infrastructure and the location of exploitable natural resources (farm land, minerals, and others) largely accounted for the location of population centers and the distribution of settlements. This pattern was true in Michigan, where most settlements in the southern part of the state occurred in the first half of the nineteenth century.

Places were established along main trails or roads such as the Chicago road which traversed counties on the border with Indiana and Ohio and where a great axis of settlements emerged; the Grand River route (Grand Haven-Detroit) which went through Ottawa, Kent, Ionia, Clinton, Shiawassee, Oakland and Wayne counties; and the Kalamazoo valley route. Streams and rivers also attracted settlement sites--rivers such as the St. Joseph, Kalamazoo, Grand, Clinton, and St. Clair. Pettibone Creek in Oakland County offered many village sites because of its fall of about a hundred feet in eight miles.[1] Such sites served as a source of power, especially for sawmills and grits mills. Rivers also served as transportation routes for materials and merchandise. For example, rivers extended the service of one lumber mill on a stream to all the settlements downstream before reaching another mill. In this way, linkages were established between a set of

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[1]George H. Fuller, Economic and Social Beginning of Michigan (Lansing, 1916), p. 27.

given places. The amount of materials that could be transported by water was significant. Goods, for example, landed at the mouth of a river and then were transported in canoes, pole boats, or small steamers to places up the river.[1]

Particular importance was given to sites at intersections of trails, roads, and junctions of rivers because they offered greater trade opportunities with the immediate and distant hinterlands. Places were established at regular two to four mile intervals to accommodate the walking home distance or the one-day team-haul of residents in the hinterland.[2]

By the end of the nineteenth century, the entire state of Michigan was settled. The state was divided into counties and townships and the entire system of places was well established. A place was an entity within the township, the county, and the state. Farming and exploitation of other resources was fully established by the early part of the twentieth century.

Up to this point the sizes of population centers had been assumed to be equal. But it was known that from

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[1]Ibid., p. 70.

[2]Hugh Denney, Decongesting Metropolitan America (Columbia: University of Missouri, 1972), pp. 5-7; John A. Kinneman, The Community in American Society (New York: F.S. Crofts and Co., Inc., 1947), p. 91.

the very beginning of the settlement period, places were of varying sizes; and as time passed, the sizes of all places changed. Why this change in size? This is a legitimate question which has interested social scientists and which has invited answers from many different perspectives. That is, certain causal forces have been emphasized to the exclusion of others: economic determinism, [1] technological,[2] sociological,[3] and natural forces.[4] Change in size of a place, it is argued here, results from an interplay of economic, technological, social, and natural forces within the subsystems of a place and those of a larger system.

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[1]Ernest Untermann, Marxian Economics (Chicago, 1927), pp. 61-62; Charles L. Leven, "Changing Sizes, Forms, and Functions of Urban Areas," in Commission on Population Growth and American Future, Research Reports, 5, Population Distribution and Policy, Sara Mills Mazie, ed. (1972), pp. 399-418.

[2]Alvin W. Gouldner and Richard A. Peterson, Technology and the Moral Order (Indianapolis, Ind.; Bobbs-Merrill, 1962); F. R. Hart, D. C. Miller, W. F. Ogburns, and M. F. Nimkoff, Technology and Social Change (New York: Appleton-Century-Crofts, 1957).

[3]John W. Lewis, "The Social Limits of Politically Induced Change," in C. Morse et al., Modernization by Design: Social Change in the Twentieth Century (Ithaca: Cornell University Press, 1969), pp. 1-33.

[4]W. H. Friedland, "A Sociological Approach to Modernization," in C. Morse et al., Ibid., pp. 34-84.

Major Changes and Their Impact on Places

The factors affecting changes in society in general and change in size of places in particular, could be viewed as either primary or secondary. Primary factors refer to those phenomena that commence the chain of impact upon society or a unit of society. Secondary causes refer to consequences of the primary causes which generate a second "generation" of consequences. On this basis, most observers would agree that the primary cause in size of places as well as in other dimensions of society has been the application of technology in the operation of the elements of subsystems found in the place or in its environment: economic, mechanical, social, and others.

A number of writers have argued that technology and applied science have been dominant and crucial forces in causing change in modern societies.[1] The consequences of this application have been manifested in such areas as industrial production and mechanization, urbanization or modernization, and transportation and communication. It is under these general changes that specific causal forces related to change in the size of places could be identified, classified, and analyzed. The manifestation of the results of technology in these areas has been in varying

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[1]Francis R. Allen, Social Cultural Dynamics: An Introduction to Social Change (New York: The MacMillan Co., 1971), pp. 91-94; Ralph Linton (ed.), The Science of Man in the World Crisis (New York: Columbia University Press, 1945), p. 212.

degrees of intensity throughout the evolutionary change processes of places. An attempt is made to analyze changes in these areas and their impact within the framework of a place, its characteristics, and its larger environment (its immediate hinterland and distant hinterland).

Industrialization and Mechanization

Industrial change, or industrialization has generally been characterized by division of labor and specialization, by extensive and intensive uses of chemicals, power driven aids in production, and by new combinations of the factors of production.

In the United States, the most striking characteristic in the twentieth century has been the mechanization and massive scale of production of goods and services. This large scale industrial production has been evident, for example, in agricultural machinery and equipment.[1] Between 1930 and 1970, farm tractor production and fertilizer consumption grew 510 percent and 385 percent, respectively.[2] Massive numbers of machines were produced

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[1]Some writers have designated World War II as the turning point of the impact of the impact of mechanization on agriculture: Wayne C. Rohrer and Louis H. Douglas, The Agrarian Transition in America: Dualism and Change (New York: The Bobbs-Merrill Co., 1969), p. 64.

[2]Most statistical data come from the Statistical Abstracts of United States: National Data Book and Guide to Sources Annual editions from 1930 to 1973. Department of Commerce, Bureau of the Census.

in every aspect of production: food, textile, wood products, fuel, metals, chemicals, transportation equipment, motion picture, health equipment, etc. The average production per worker in half an hour became the equivalent of the entire day's production per worker a century earlier. To put it somewhat differently, between 1930 and 1970 labor production doubled. The labor force increased from 38 million to 78 million workers.

The value added to the economy as a whole by manufacturing grew 377 percent in the same period (1930-1970). This massive output stimulated massive distribution and consumption of goods and services through wholesale and retail trade. As a consequence, nonagricultural industry rose in importance. For example, the nonagricultural labor force in 1930 was 31.1 percent of the total population; by 1970 it rose to 96 percent. Table 1 provides a summary of the general trend in agricultural and nonagricultural industries.

All sizes of places, metropolitan and nonmetropolitan, felt the impact of industrialization and mechanization. Metropolitan places became centers of wholesale, and retail trade, industry, finance, transportation, communication, marketing, recreation, culture, health

Table 1.--Percentage Distribution of the American Working Force by Industrial Sectors, 1930-1970.

Year	Working Force				
	Agriculture	Mining, Manufacturing, Construction	Transportation, Trade Finance	Services Government	Total
1930	21.8	31.7	25.8	20.8	100
1940	18.3	33.1	25.2	23.4	100
1950	12.1	33.4	29.8	24.8	100
1960	9.2	34.1	30.3	26.4	100
1970	4.6	31.6	31.3	32.5	100

Source: U.S. Department of Commerce, Statistical Abstract of the United States (Washington, D. C., 1950); U.S. Department of Labor, Handbook of Labor Statistics, 1975 Reference Edition (Washington, D.C., Government Printing Office, 1975), pp. 26, 105.

care, and the collection and distribution points for agricultural products in their respective areas.[1]

Independent and small manufacturing industries in medium size nonmetropolitan places (10,000-49,999) declined or disappeared completely. These industries either became "old fashioned," unable to compete with large modern corporations, or the demand for their products declined or became obsolete because new products were discovered by new technology, or because industries became more and more centralized by mergers and controlled by a few. On the other hand, most places in this category diversified their industrial functions and services to meet the demands of new technology in business and industry. They attracted new businesses in the form of branches of big manufacturing corporations, financial institutions, institutions of higher learning, health facility complexes, etc. The new adjustment to change put these places in a more prominent position in the network of other places.

The same dual effect of industrialization and mechanization was reflected in smaller places (less than 10,000 people) to the extent that small independent family-owned businesses closed down while others survived in other small places to serve, (in a more or less limited capacity) the needs of local people without any prospect

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[1]Part of the aspects of change and their impact on metropolitan and medium size nonmetropolitan places are taken from Alchin's paper: "Change and Nature of Contemporary Community" (Institute for Community Development and Services, Michigan State University, East Lansing, 1970).

for significant growth.[1] At the same time, branches of some industries found their ways into small towns, notably meat packing, sawmills, salt mining, automobile parts, electrical and electronic equipments, furniture, candy, and other industries needing ample space. As the unemployment rate rose in small places as a result of declining industry and business, the outmigration rate of workers and their families increased. This outmigration meant the inmigration to other small places that had adjusted economically to change.

The impact of mechanization on the hinterland's economic activities in turn had significant repercussions on the size of places and their economic activities. In places where mining in the immediate hinterland was the principal source of income of the population of the place, utilization of machines in mining accelerated the scale of production leading to the depletion of stock resources or reducing them to the level where further exploitation became unprofitable. Consequently, without economic adjustment, a place became "baseless" economically, causing a high level of unemployment and thus making these places potential sources of outmigration. Coal and copper mining, or forest exploitation provide good examples of this phenomenon.

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[1]Stanley Brunn, "Changes in the Service Structure of Rural Trade Centers," Rural Sociology, 33 (June 1968), pp. 200-206.

The immediate hinterland of most small places experienced a reduction in the number of farms and farm population, a result of new farm technology.[1] Farm numbers declined 58 percent between 1935 and 1970 (from 6,814,350 in 1935 to 2,895,000 in 1970). In Michigan the reduction was 30 percent, from 119,372 farms in 1950 to 84,000 in 1970. Since farming became a business requiring large capital investment for equipment, planting, and other inputs, few farmers could afford operating a profitable farm. Those farmers who went out of business, and unemployed farm labor became attracted to nonagricultural work existing in other places. It became difficult for farm youth to find careers as operators of adequate size commercial farms.[2] Farmers remaining in agriculture enlarged their farms by buying from existing farmers or from public land during the 1930-1970 period; the average size farm increased 50 percent in Michigan and 153 percent in the United States. This enlargement of farms was made possible because the work output per farmer increased due to mechanization and new combinations of inputs.

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[1]This effect was also observed by J. P. Roberts, "The Exodus from the Farm," Proceedings of the Tenth Annual Agricultural Colleges and Experiment Stations (Washington, 1897), pp. 80-82. Calvin L. Beale, "Rural Development; Population and Settlement Prospects," Journal of Soil and Water Conservation, 29 (January-February 1974), p. 23.

[2]Calvin L. Beale, "Rural Population in the United States: Some Demographic Consequences of Agricultural Adjustment," Demography, 1 (1964), pp. 264-272.

Furthermore, the labor force needed by farmers was reduced. The acquisition of capital technology reduced most labor force requirements. Family workers and hired workers declined 48 percent and 51 percent, respectively, between 1950 and 1970 in Michigan. Again, the unemployed agricultural hired labor force became a potential pool for nonagricultural work in other places. Table 2 shows the trends in agricultural labor force between 1880 and 1960.

Urbanization

Industrialization was accompanied by urbanization.[1] Urbanization is regarded as a consequence of industrialization. The labor force was attracted to factory work, nonagricultural employment, and to other amenities in the urban areas. Industrial and business establishments were built in close proximity to others for external economic reasons or for agglomeration economies present in larger places. The exodus from rural to urban places or from small places (less than 2,500 people) to larger places has been the order of the period. Larger places grew steadily in importance economically, culturally, and politically.[2]

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[1]Some students would place the beginning of urbanization shortly before the Civil War. Edwin S. Mills, "Economic Aspects of City Sizes," Commission on Population Growth and the American Future, Research Reports, Vol. V, Population Distribution and Policy, edited by Sara Mills Mazie (Washington, D.C., 1972), pp. 387-394.

[2]Bogue and C. Beale, "Recent Population Trends," in James H. Copp (ed.), Our Changing Rural Society: Perspective and Trends (Ames: Iowa State University Press, 1964), p. 124.

Table 2.--Percentage Change in the Number of Workers in Agriculture Between Censuses, 1880-1970.

Decade	Percentage Change
1880-1890	9.0
1890-1900	16.6
1900-1910	6.2
1910-1920	-1.2
1920-1930	-8.5
1930-1940	-16.4
1940-1950	-19.8
1950-1960	-39.3
1960-1970	-36.6

Source: Wayne C. Rohrer and Louis H. Douglas, The Agrarian Transition in American Dualism and Change (New York: The Bobbs-Merrill Company, Inc., 1969), p. 109.

They offered relative higher levels of living and jobs. Outmigrants from smaller places universally sought to achieve their occupational and educational aspirations in larger places.[1]

By 1970 the urban areas of the nation contained three-fourths of the United States population. The trend was much the same in Michigan. In 1900, 39.3 of the total population lived in urban areas and 60.7 in rural places. By 1970, 75 percent of the total population was urban while 25 percent was rural.[2] The growth of large places was a result of both the rural-urban migration and the tendency of new migrants from other countries to settle in large places. Rural migrants came from places where pools of unemployed and underemployed labor existed.

Again, the direct negative consequence was the diminution in size of places which did not diversify their functions as a process of adjustment to the new technological environment. Gibbs observed that urbanization is in

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[1]Jon H. Rieger, J. Allan Beegle, and Philip N. Fulton, Profiles of Rural Youth: A Decade of Migration and Social Mobility (East Lansing: Michigan State University, Agricultural Experiment Station Research Report 178, January 1973), p. 13.

[2]The definition of "rural population" is that of the U.S. Census of Population. It defines "rural population" as people living in places of less than 2,500 or open country.

fact the major factor in population concentration in certain places.[1] According to Gibbs, it occurred in five stages: (1) rural population percentage exceeds that of urban; (2) urban population percentage exceeds rural percentage; (3) rural population undergoes an absolute decline; (4) population of small communities or towns undergo absolute decline; and (5) finally, a more even spatial distribution takes place. Gibbs believed the increase in per capita food production and the improved transportation seemed to be the major determinants of population concentration, or urbanization. However, one may also observe that the development and improvement of transportation and communication were among the most important factors playing a significant role in urbanization.

Transportation and Communication

Despite the dramatic changes in the twentieth century, records show that transportation had a significant influence on changes in place, size, and pattern of settlement even in the nineteenth century. In Michigan, for example, road improvement, the introduction of rail transportation, the replacement of the birchbark canoe by steam navigation, and the construction of the Erie Canal had an impact on migration into Michigan.[2]

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[1]Jack Gibbs, "The Evolution of Population Concentration," Economic Geography, 29 (1953), pp. 119-129.

[2]Small et al., Ibid.

In the first half of the twentieth century, further significant developments continued in transportation. Water, rail, and air transportation expanded in volume.

However, the most revolutionary form of transportation was the introduction of the automobile. It stimulated the highway network development in the United States and Michigan between cities or places, and between states. The Federal-Aid Highway Act of 1916 provided the sharing of highway construction cost between the state and federal government.[1] This program produced two types of road systems. The primary system connected all principal cities, county seats, post offices, manufacturing areas and other traffic generating areas. The secondary system consisted of important feeder roads linking farms, factories, distribution outlets and smaller places with the primary system. In 1956 the national system of interstate and defense highway continued to be extended with an appropriation of 37 billion dollars in the 1957-1971 period. Table 3 shows the change in mileage of public roads in U.S. and Michigan between 1930 and 1970.

Another aspect of transportation change was the increase in family automobile ownership from 57 percent in 1950 to 83 percent in 1970, and the increase of buses and trucks. The total number of motor vehicles in

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[1]Statistical Abstracts of United States, 1950.

Table 3.--Change in Public Roads Mileage and Motor Vehicles in United States and Michigan, 1930-1970.

Item	Year				
	1930	1940	1950	1960	1970
U. S.					
Mileage of county and township roads	3,016,281	2,990,000	2,990,000	3,116,000	3,152,000
Black top surface roads	693,559	1,340,000	1,679,000	2,165,000	2,362,000
Mileage of state roads	324,496	410,000	451,000	506,000	537,000
Black top surface roads	226,221	319,000	424,000	499,000	530,000
Michigan					
Total Mileage			92,758	110,000	114,170
Nonsurface			24,125	20,231	18,257
Surface			68,633	73,393	76,768

Source: U.S. Department of Commerce, Statistical Abstract of the United States (Washington, D.C., 1940, 1960, 1973), pp. 494-511.

Lynn C. Myers and Lawrence F. Pinson, Michigan Statistical Abstract (Michigan State University, 1976), pp. 415-419.

Michigan increased from 2,432,000 to 4,569,000 between 1950 and 1970, allowing greater spatial mobility to people and materials.

The communication network also experienced significant expansion. While the number of post offices in the U.S. declined from 75,688 in 1900 to 32,102 in 1970, the utilization of postal services expanded from 7,130,000 pieces of mail to 84,882,000 a year. The number of telephones increased from 13 million to 120 million between 1920 and 1970. While 31 percent of all households had telephones in 1930, 92 percent had a telephone in 1970. Rural electrification service changed from 20,000 miles of line to 502,000 miles between 1940 and 1965. The total number of broadcast stations authorized and on the air increased from 969 in 1940 to 6169 in 1964 (A.M. Radio from 908 to 4040; F.M. from 52 to 1468; T.V.from 9 to 661). The percentage of households with T.V. sets increased from 67 in 1955 to 93 in 1964.

Transportation and communication function as "veins" and "arteries" in the system of places. Migration was stimulated from economically, socially and culturally deprived places, mostly smaller ones, to larger places. Transportation, mostly automobiles, facilitated the movement of the would-be migrants between places while it facilitated the location of some industries in other places. At the same time, the automobile and the truck

destroyed the monopoly of rail transportation, thus accelerating the decline of certain places located on the railways. Through transportation and communication, larger places extended their selective influence on smaller places.

Better transportation allowed farmers to trade and obtain services in distant places. It made agricultural products grown in distant places available in other places. For example, refrigerator trucks made it possible to support markets of fruits and dairy products in distant places. Before 1900 the markets of perishable commodities were almost entirely local. Today the production of these commodities are concentrated in specialized areas such as California (vegetables), Wisconsin (dairy products), Virginia and Florida (fruit).

Transportation has also allowed the influx of nonfarm population into the immediate hinterland of many places. Small places in the hinterland of larger places often became "bedrooms" for commuting workers. Industries were attracted to the fringes of large cities and the suburbs and their new industries became one of the main features of this impact.

Mass media--printed materials, radio, and television--became instrumental in increasing peoples' knowledge in various fields of interests. They brought to farmers as well as to residents of towns and cities information about the care and the use of machinery,

soil management, livestock care, building repair, farm management, social organizations, expert information about any improvement of any aspect of modern living. As a consequence, understanding in specific areas increased. Favorable adoption of scientific practices in farming and other industries became widespread. Knowledge in any given field became widespread. Orr found in 1957, for example, that a higher degree of exposure to printed materials and radio programs related to farm practices innovation increased the level of knowledge of farmers about the activities of local co-operatives and the level of business transactions between farmers and their co-operatives. And more specifically, business transactions were higher among listener-readers than among non-listener-readers.[1]

This relationship has been found to exist in other industries; i.e., the more the exposure to the information related to the industry, the higher the effectiveness or the output of that industry. When this kind of relationship exists in a place between the exposure to scientific information in a given industry through mass media and the higher level of activities in that industry, residents

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[1]Andrew C. Orr, A Study of the Effect of a Farm Cooperative Marketing Agency's Radio and Print Communications (A Master's Thesis, Michigan State University, East Lansing, 1957), p. 39.

of the place were less likely to become mobile. The place may experience growth or stability.

Another impact (it may be indirect) of rapid communication was that it saved people from wasting their time traveling to different places in search of a given service. The availability of the telephone system in almost every home has made it possible to locate easily where the needed service is. The saved time could be devoted to other productive and rewarding activities. The telephone allowed residents of any place to seek technical, legal, or professional advice from specialists in distant places. As control centers of mass media became established, they extended their influence in distant smaller places.

In summary, this introductory chapter has attempted to provide a background setting for the problem addressed in this dissertation. In the first section, an attempt was made to clarify concepts and to portray a place as a system within a larger system of places.[1] Attention was also given to potential sources or causes for change in the size of places. The second part of this chapter was devoted to an overview of the history of development of population centers. Major forces bringing about

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[1]It may be pointed out at this point that the larger system of a place influencing its change may include other places in the county, the region, the state or other influential places outside the state or other states. However, the effect outside the region might be difficult to measure at this time.

change--technology, industrialization, and mechanization, urbanization, transportation and communication--were treated in terms of their impact upon size of places and their networks.

In the next chapter, relevant descriptive and empirical literature is reviewed. Chapter III contains an explicit definition of the research problem, a specification of the variables, a statement of the hypotheses, and the methods and statistical tests used. The findings from the analysis are presented in Chapter IV. The final chapter is devoted to a presentation of a summary and conclusions based upon the research.

CHAPTER II

REVIEW OF LITERATURE

The review of literature, contained in this chapter, attempted to attain several objectives. They were: (1) to show the contribution of earlier studies to the understanding of growth and decline of places or population centers; (2) to establish a background of a problem which the writer feels has not been solved, namely, a better understanding of the "life cycle" of places; and (3) to establish a fundamental footing for the present study. Sources were reviewed within the framework of a system and major changes within systems discussed in Chapter I. The literature review is presented within a framework of the causal forces of change affecting a place and its environment--causes emanating primarily from economic forces such as industrialization, transportation, and communication, and from social forces manifested in urbanization, population characteristics, and political events.

The review found in this chapter did not provide an exhaustive listing of all theoretical and empirical work in the area. However, it was believed that those presented were representative, and perhaps the most

definitive to date, of the current state of knowledge in the area of growth and decline of communities or places.

Two Categories of Literature

Studies on the growth and/or decline of places could be classified into two major groups. The first group has been primarily concerned with the general growth and decline of places at a given period in time. Their main objective was to describe the trend of change, not to analyze and explain the causal forces of growth and decline. The second group sought to explain the determinants of changes in the size of places.

Descriptive Literature

Most of the pioneering studies were concerned with the numerical change of population in places and the change in size classes. The major questions addressed were: (1) whether or not places, particularly rural places, were growing; (2) what the future change trend would be for rural places; and (3) what the trend of change showed according to size classes of places. Perhaps because early students of these questions utilized different methods and made their observations in different parts of the United States at different periods in time, the results often were inconclusive, conflicting, and confusing.

After observing in 1923 that 40 percent of the villages under 500 people were losing population and that

nearly three-tenths of all places under 2,500 persons were declining, Gillette concluded that small places were declining. He proceeded to predict a bleak future for the small village and considered the small town as a center for village-country organizational activities to be inappropriate.[1] Based on general observations, he identified the following as the main causes of decline: (1) the dominant, larger places gained population at the expense of smaller ones; (2) the negative conditions produced by the locality, i.e., the exhaustion of natural resources such as coal and forests; (3) consolidation of farms; (4) speculation concerning projected railroads that never materialized; (5) competition between small and larger centers in trade and industry; and (6) relatively poor transportation and communication. Gillette indicated that the causes he cited were not based on a survey, or other objective data but were based on simple observation. He apparently did not foresee certain modern measures such as conservation, irrigation in agriculture, and reforestation, to offset the negative conditions that induced decline of places. Nevertheless, he did point out some of the main causal forces of change and stimulated interest in further research by others not satisfied with his pessimistic conclusions.

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[1]John M. Gillette, Rural Sociology (New York, Macmillan Company, 1923).

At the Institute of Social and Religious Research, Columbia University, Fry sampled 177 places representing agricultural areas in the U.S. in 1926. Suburban villages, lumbering villages, mining villages, and the like were excluded. He focused on village growth or decline, racial composition, proportion of foreign and native-born whites, sex distribution, and marital status in the regions of the United States.[1]

Fry's findings did not support Gillette's conclusions that small places in the U.S. were declining. Middle Atlantic villages grew 18 percent, and villages in the South grew as rapidly as the cities between 1910 and 1920. Growth was also rapid in the villages of the mid-West and far West, 8.4 percent and 47 percent, respectively. The difference in percentage change between the West and the rest of the country was due to the then recent settlement of the Western areas. Cases of decline in certain villages were found especially in the gold-producing areas.

Since the main purpose of this study was to counter the belief that villages were declining or even disappearing, little or no effort was made to answer the question as to why the size of villages was changing. Fry asserted that small towns were not on a course of disappearance, but an important element of the nation's rural population.

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[1]C. Luther Fry, American Villages (Doubleday, Doran and Company, 1926).

The same question as to whether villages in the United States were growing or declining was again researched by Brunner and Kolb in 1933.[1] They carefully designed their methods of measuring the growth and decline of places. First, the size of places were traced from 1910 to 1930 to observe the trend. This step was necessary to avoid the loss of a place due to growth into an urban class. Second, three measures were used to monitor the trend of change: (1) rate of growth; (2) the number and percentage of villages growing and declining more or less than 20 percent in twenty years; and (3) the amount of growth or decline by 100-person intervals. The three measures showed that 35.5 percent of the villages grew in the 1910-1930 period; 24.7 percent were stable, and 23.4 declined or fell into smaller class intervals. Among the interesting observations made were the following: agricultural villages showed less growth but greater stability; villages in industrial areas were more likely to show decrease; resort and old villages showed less increase; the size of a place and corporate status were significant in size change. The validity of the impact of these characteristics on the size change of places was debatable

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[1] E. Brunner and Kolb, Rural Social Trend (New York: McGraw Hill Book Company, 1933). See also C. E. Lively, "The Appearance and Disappearance of Minor Trade Centers in Minnesota, 1905-1930," Social Forces, 10 (October 1931), 71-75.

because of the lack of statistical testing of the relationship between the characteristic and the size change of a place.

An interest in the trend of population change in places continued as the total population of the United States grew. Brunner's study in 1951 presented such trends with respect to population behavior of an important group of communities between 1940 and 1950.[1] This study included 7,324 nonsuburban rural incorporated places listed in the U.S. Census, which in 1940 had between 1,000 and 2,499 inhabitants, and smaller places which grew beyond the 1,000 mark.

The Brunner study suggested several geographical and economic factors as causal forces of size change. He found that the region in which a place was located had an influence on size change. Less than half of the large villages in the Middle Atlantic and Mountain Regions showed significant losses (10 percent or more), while the Pacific States showed the greatest growth. This difference in size change between regions was due to the differentiation in economic nature of these regions in general and the economic base structure in particular places. Mining towns or one-industry towns in the Mountain regions had

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[1]Edmond des Brunner, "Village Growth, 1940-1950," Rural Sociology, 16 (June 1951), pp. 111-118.

the sharpest decline. As mechanization of agriculture increased, as industrial production rose, and as electrification expanded, small towns increased in size. Brunner observed that some of the increase in size was also due to the increase in services in the population centers. The increase in services in the population centers was the result of the improved economic status of agriculture in the 1940s, the great increase in automobile travel, the number of government services in county seat towns, the accelerated rate of retirement of farmers, some degree of industrial decentralization, the increased number of births, type of farming, village amenities (lower taxes, pleasant surroundings, quietness, etc.), radio and television, the adoption of a five-day work week and attitude change toward nonfarm living, all had some influence on the size change of places.

Again, these relationships were general observations on the part of the researcher and were not tested statistically. Since the main objective of the study was to show trends in population change, it was not surprising that there was no attempt to indicate how each of these factors influenced the rate of growth or decline. However, these observations indicated where further research was needed (in economic, social, and political systems of places and society) to increase the understanding of the forces affecting the size of places.

From the variable discussed, it was possible to suggest that: (1) the improved economic status of agriculture in the hinterland of a place increased the size of a place; (2) the great increase in automobile travel decreased the size of a place; (3) increase in industrialization of a place increased its size; (4) the degree of farming in the hinterland of a place affected the size change of a place; (5) increase in the number of radios and television sets brought stability or no change in size of a place; (6) industrial decentralization in larger places increased the size of smaller places.

Empirical Literature

From a simple assessment and description of the trends of population change, later studies have focused their interest in identifying and explaining factors affecting size change of places. They formed the second group of studies addressing the question of why the change in place size. They stressed various factors emanating from the major changes occurring within a place and within its environment.

The following section was arranged in terms of studies stressing economic, social, political, and natural forces of change. The accent on these particular causal forces of change did not mean that the investigator did not examine other sources of change. A factor or factors found to be emphasized more than others in different

studies helped to organize the frame of analysis for the present study. Studies dealing with the size of a place, its industry, transportation and communication were subsumed under economic forces; social services and facilities, population characteristics, social organizations, education and religion or beliefs were included under social forces; seat of government, political affiliation, leadership, and corporate status composed the political forces; and natural forces referred to the topography, the climate, the type of soil, the geographical region in which a place is located. These were reviewed in the framework of the place and its environment.

The Initial Size of a Place as a Factor of Change

The initial size of a place has been regarded as a significant factor affecting its subsequent growth or decline, whether by migration or by natural increase. Most research findings have shown that the size of a place was an essential factor of the rate and direction of its change.[1]

It has been indicated that certain size classes at the two extremes of the size spectrum of places (under 1,000 to 1,000,000 people) adversely affect size increase.

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[1]Any study dealing with population change of small towns or nonmetropolitan places reports the relationship between initial size and the posterior size change of a place. A list is provided in the bibliography.

The smallest size class and certain large size classes had a higher probability of declining than did other size classes. Northam's study indicated these probabilities.[1] Places in the 500,000-1,000,000 size class and in the less than 1,000 size class had higher declining probabilities, .5555 and .4570 respectively. Figure 4 shows the probabilities for all other size classes.

Table 4.--The Probability of Declining Urban Centers by Size Group: 1940-1960.

Size Group	Number of Urban Centers (1940)	Number of Declining Urban Centers (1940-1960)	Probability of Declining Urban Centers (1940-1960)
1,000,000 or more	5	0	.0000
500,000-1,000,000	9	5	.5555
250,000-500,000	23	5	.2173
100,000-250,000	55	18	.3272
50,000-100,000	107	26	.2429
25,000-50,000	213	32	.1502
10,000-25,000	665	92	.1383
5,000-10,000	965	175	.1813
2,500-5,000	1,422	269	.1891
1,000-2,500	3,205	805	.2508
1,000-under	10,083	4,608	.4570

Source: Ray M. Northam, "Population Size, Relative Location, and Declining Urban Centers: Conterminious United States, 1940-1960," Land Economics, XLV, 3 (August 1969), p. 315.

[1]Ray M. Northam, "Population Size, Relative Location, and Declining Urban Centers: Conterminious United States, 1940-1960," Land Economics, Vol. 65 (August 1969), pp. 313-322.

Though initial size seemed detrimental to the growth of places in the categories indicated, qualifications have been made about the impact of the initial size of a place upon its subsequent size change. It has been shown that the presence of certain industries, even in small places (less than 2,500), neutralize the detrimental effect the small initial size may have on the subsequent increase of the place's size. Ratcliffe (1942) observed the increase in size of small places in the states of Maryland, Pennsylvania, and West Virginia. The presence of small foundaries, small shoes factories, etc., compensated for the negative impact of the small initial size of a place during the 1930-1940 period.[1]

Although the initial size has been found to be inversely related to the natural increase (difference between births and deaths) of a place's size, social factors have been found to counteract the effect of small initial size. When poor housing was controlled in places of different sizes, variations in the rate of natural increase, by size, was significantly reduced. Furthermore, size had practically no effect when housing rent was held constant.[2] Rent

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[1]S. C. Ratcliffe, "Size as a Factor in Population Changes of Incorporated Hamlets and Villages, 1930-1940," Rural Sociology, 7 (September 1942), pp. 323 ff.

[2]Otis Dudley Duncan, "Fertility of the Village Population in Pennsylvanie, 1940," Social Forces, 28 (March 1950), pp. 304-309.

and poor housing were the most significant factors affecting positively the natural increase by the size of a place. The fertility ratio was found to be higher in villages where average monthly rent was lower and housing lacked needed major repairs or lacked private baths.

A series of studies by Fuguitt and Beale (1971, 1972, and 1976) reported qualifications concerning the impact of the initial size of a place upon later change in size. These studies inquired into the population trends of incorporated nonmetropolitan places of the United States since 1940. They found that the initial size had more impact on smaller places than it did on large places. However, the size increase of smaller places took place in certain regions of the United States, particularly in the South and in the Southwest.[1] It was observed that when the entire region experienced an increase, most places would also increase their sizes. The regional increase was itself the reflection of the general population redistribution trends in the nation. It was also shown that some

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[1]Glenn V. Fuguitt, "The Places Left Behind: Population Trends and Policy for Rural America," Rural Sociology, 36, 4 (December 1971), pp. 249-269; "Population Trends of Nonmetropolitan Cities and Villages in the United States," in Population Distribution and Policy: The Commission on Population Growth and the American Future, Research Reports, Vol. V, edited by Sara M. Mazie (1972), pp. 109-126; G. V. Fuguitt and C. L. Beale, Population Change in Nonmetropolitan Cities and Towns, ERS, USDA, Report No. 323 (February 1976).

decades showed a larger proportion of growing places by initial sizes than did others. This reflected the general population change in the nation. Moreover, the growth of places under 10,000 was stimulated in counties with the largest place having over 10,000 people. This reflected the decentralization process occurring in the largest place. These findings together with other studies clearly indicated that size was only one of the factors affecting the growth or decline of small places.[1]

Specific Economic Characteristics as Forces of Size Change

A general indication of the correlation between migration and opportunity for employment, between retail services and size change has been reported in a number of studies.

Hassinger attempted to develop an approach to classify agricultural trade centers on the basis of non-agricultural industry and to relate the classes to the degree and nature of population change.[2] Seven types of retail stores were developed by the Guttman scaling

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[1]Ray M. Northam, "Population Size, Relative Location, and Declining Urban Centers: Conterminous United States, 1940-1960," Land Economics, XLV, 3(August 1969), pp. 313-322.

[2]Ed Hassinger, "The Relationship of Retail Service Patterns to Trade Center Population Change," Rural Sociology, 22 (September 1957), pp. 235-240; see also his unpublished dissertation, 1956.

technique. Centers which offered more specialized retail services in a greater range and variety (higher in score, based on the number and nature of stores) were more in harmony with the secular trend in rural society and therefore, showed a size increase. That is, the greater the variability of services the greater the increase in size of a place. Further, it was found that if a place gained in retail service types over time, it also gained in population size during the same period. Those that remained unchanged in retail service types were almost equally divided between those that gained and those that did not gain significantly. A variety of services in a center would augment the place's amenities, tend to attract industry and employment which would bring more people to the center.

Fuguitt and Deeley replicated Hassinger's study in Wisconsin to investigate the association between services, size of a place, and population change of 410 places under 2,500 inhabitants between 1950-1960.[1] They sought to determine the extent to which each factor was statistically related to small town population change when other factors were controlled. A positive relation between service scale, initial size, and increase in size of a place was

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[1]Glenn V. Fuguitt and Nora Ann Deeley, "Retail Service Patterns and Small Town Population Change; A Replication of Hassinger's Study," Rural Sociology, 31 (March 1966), pp. 53-61.

established, with higher order places in the service hierarchy more likely to be losing 5 percent.

A slight degree of centralization in the hierarchy of places explained the correlation between the three factors. Larger places and places with larger number of services were growing, drawing population and services from smaller places. Or, services in the larger place expanded and improved as a result of new technological improvements. As a possible consequence, services in small towns could move to larger towns for agglomeration reasons, or more people became willing to travel long distances for various services which the small town could not provide, or the quality provided in the small town was poor. This trend was also found in the Wisconsin study.[1]

A more refined measurement of the effect of change in the number of non-agricultural jobs on population change was attempted by Tarver and Beale.[2] The number of workers in different industries and businesses in a place positively correlated with population change. The number of

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[1]Glenn V. Fuguitt, "Growing and Declining Villages in Wisconsin, 1950-1960," Population Series, No. 8 (Madison: Dept. of Rural Sociology, University of Wisconsin, 1963).

[2]James D. Tarver and Calvin L. Beale, "Relationship of Changes in Employment and Age Composition to the Population Changes of Southern Nonmetropolitan Towns," Rural Sociology, 34 (March 1969), pp. 17-28.

employed civilians, and the number of armed forces employees were associated with the 1950-1960 population change of nonmetropolitan areas in the South. Towns which had an increase of 2,000 civilian employees or more, doubled their average population. Those with a decrease of 500 or more civilian workers lost 20 percent or more people. For every increase of 100 civilian jobs and 100 military jobs, there was an increase of 248 and 279 persons, respectively. In other words, for every 100 civilian jobs 148 non-workers were added; and for 100 military jobs, 179 non-workers were added. Changes in manufacturing employment exerted the greatest influence on the 1950-1960 population changes of towns, followed by changes in the number of public adminstration workers, and wholesale and retail trade workers.

Such correlations existed because working people tended to move with their families. Assuming that the average family was three persons, and that jobs were offered to the heads of families, 300 people were expected to be added to the place for every 100 jobs. Another reason for correlation was the multiplier effect of certain industries. That is, how much increase in total employment opportunities in a place occurred as a result of each additional man employed in producing for export. Change in manufacturing employment exerted the greatest influence on the population change of towns, followed (in decreasing

order of influence) by public administration, wholesale, and retail trade. The civilian and military employments accounted for 93 percent of the variation in the numerical 1950-1960 population changes of the towns.

Tarver used type of industrial functions as factors in population change in 1950-1960, 1960-1970, and 1950-1970 time periods for places with identical functions in 1950-1960 and for places with specified change in functions.[1] An attempt was also made to determine whether or not the 1950-1960 population trend of various types of towns persisted between 1960 and 1970, and throughout 1950-1970. Cities were classified as diversified towns, one-specialty towns, and multiple-specialty towns. Diversified towns were those without high concentration of employment in any one industry. One-specialty towns were those with an unusually large proportion of workers in only one of the ten industrial functions. Multiple-specialty towns had a proportionally large number of workers in two or more of the ten specified industrial functions. It was revealed that the important factor in growth was not the number of major industries. These properties permitted the prediction of future changes in size of nonmetropolitan towns and cities.

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[1]James D. Tower, "Patterns of Population Change Among Southern Nonmetropolitan Towns, 1950-1970," Rural Sociology, 37 (March 1970), pp. 53-72.

This meant, for example, that the greatest future size changes of nonmetropolitan places in the South would tend to be those characterized by tertiary industries such as professional, public administration, related services, recreation and retirement activities.[1]

It could be pointed out at this point that there was a debate as to which one of the two variable preceeds the other, industrial and business establishments or the increase in population size of a place--an instance of the "chicken and egg" problem. Stafford's study indicated a positive relationship between the number of new establishments and population increases.[2] The findings emphasized the responsiveness of the number of establishments to population change. Nevertheless, Stafford observed that population changes were quickly reflected by change in the number of establishments over time. Kenyan's study showed that the number of establishments maintained a constant ratio with population in places of varying sizes.[3]

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[1]Calvin L. Beale, The Revival of Population Growth in Nonmetropolitan America (Washington, D.C., USDA, ERS, No. 605).

[2]Howard A. Stafford, Jr., "The Functional Bases of Small Towns," Economic Geography, 39, 2 (April 1963), pp. 165-175.

[3]James B. Kenyan, "On the Relationship Between Central Function and Size of Place," Annals of the Association of American Geographers, 57, 4 (1967), pp. 736-750.

Other economic characteristics of the place and its hinterland have received light examination in the investigation of growth and decline of places; a few studies have examined the average size of farm, the type of farming, average income, the rent rate and the average price of a house, and others. Studies by Hassinger (1956), Anderson (1960), Tarver and Gurley (1965) all found no significant relationship between change in size and the level of family income.[1]

Empirical studies related to the economic characteristics of a place reviewed up to this point have suggested that:

1. Initial size of a place at any given period was more likely to determine the rate of its subsequent size change.
2. Nonextractive industry correlated positively with the size change of a place.
3. The number of services provided in a place correlated positively with the size change of a place.
4. Certain industries affected places' size change more than did others.

Transportation as a Factor of Places' Size Change

Several studies have focused on the effect of transportation on the growth or decline of places. Though

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[1]See later references in bibliography.

findings were inconclusive, the general conclusion of these investigations was that transportation had a dual effect on the size change of places. Generally, it has been found that improved transportation infrastructures would stimulate size increase of certain places while, at the same time influence size decreases in other places.

Zimmerman and Lively, in their respective studies of farm trade centers in Minnesota in the 1930's, indicated that small trade centers on highways became relatively more important. However, as transportation improved, these centers were likely to die.[1]

In certain cases, transportation facilities proved to be a very important factor in places' size change. Sakagami et al. wrote:

> There have been cases where an area with less population, virtually no industry in its past, changed into a functional district through improvement of its transportation facilities. In such cases, a trend in the areas' growth profitability or income per capita in the preceding period do not give sufficient explanation regarding factors that cause development.[2]

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[1]Carle C. Zimmerman, Farm Centers in Minnesota, 1905-1929, Minnesota AES Bulletin 269 (St. Paul, September 1930); Charles E. Lively, Growth and Decline of Farm Trade Centers in Minnesota, 1905-1930, Minnesota AES Bulletin 287 (St. Paul, 1932).

[2]Koyu Sakagami, Nobuyoshi Kobayashi, and Ryoichi Kinoshita, "Economic Potential and Its Application for a Regional Growth Model with the Investment Plan of Transportation Facilities," The Annals of Regional Science, 3 (December 1963), pp. 1-14.

The size increase due to transportation was, it may be stressed, a function of the type and number of transportation modes. Different lines of transportation had varying degrees of impact on the size increase of places. This differential effect has been observed on places located on railroads, rivers and lakes, electric railways, steam railways, and two or more railways (steam or electric).[1] The volume of goods and services, and the speed to transfer or deliver them may explain the difference in impact of transportation modes. Larger volume and faster consumption (or higher consumption) evidence a growing market or an increased size of a place. Vogt indicated that a higher number of places located on two or more lines grew faster than did places located on one line.

Humphrey listed a number of recent studies supporting a positive correlation between improved highways and growth in population size of places.[2] An improved highway, or the introduction of an interstate highway served as a "booster" for the change in size of a place. If the time element was introduced, it could be observed

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[1]Paul H. Vogt, Introduction to Rural Sociology (New York: D. Appleton & Co., 1918).

[2]Craig R. Humphrey, "The Demographic Impact of Controlled Access Highways On Nonmetropolitan Communities, 1940-1970," H. Kirk Dansereau, "Five Years of Highway Research," Highway Research Record, No. 75 (January 1965), pp. 76-82.

that the first years when the highway was being constructed a place would experience a slow increase in size, or this could take place shortly after the highway opened. Some years later, growth could become more rapid. After some decades, the impact of a highway could taper off and let other factors of size increase takeover. Humphrey pointed out that the impact of a controlled access highway went through these three stages. It was also shown in the study that the impact of the controlled access highway depended upon the location of the place relative to the highway. The farther the place was located from the highway, the lesser the impact on size increase.

Contrary to these findings, Lybecker's study showed that the effect of the distance of a place from an interstate highway was not statistically significant, and contributed little toward explaining size change of the 159 census listed places of twenty-one counties in Illinois.[1]

Another dimension was that of highways coming to small places which had been offering important functions to farm families in a relatively dense area. The highway would stimulate the increase in size of the small place by diversifying functions. Whitney's study showed that

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[1]Donald W. Lybecker, Selected Factors Affecting the Population Decline of Southern Illinois Towns (Carbondale: Southern Illinois University, Dept. of Agricultural Industries, August 1974).

a relatively larger number of small centers continued to develop to serve the farm families nearby where development of modern communication and highways were taking place.[1]

On the other hand, transportation had detrimentally affected other places. There are numerous examples where the closing of rail services in certain places led to their decline. Chittick explained the decline of places in South Dakota in terms of change in transportation services in the area. Disappearance of 125 trade centers and the decline of others between 1930 and 1951 came after curtailment of train services and the abandonment of depots in many small trade centers between the larger places on railroad lines.[2] Brunner and Smith speculated that the disappearance of places in the South between 1930 and 1940 was in part a result of the advent of the automobile and hard top roads, i.e., improved transportation.[3] The

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[1]V. H. Whitney, "The Rural Nonfarm Population: Patterns of Growth in a Piedmont Area," Social Forces, 24 (October 1945), pp. 81-89.

[2]Douglas Chittick, Growth and Decline of South Dakota Trade Centers 1901-1951 (Brookings: South Dakota Agricultural Experiment Station, BUlletin 448, 1955).

[3]Edmund des Brunner and T. Smith, "Village Growth and Decline, 1930-1940," Rural Sociology, 9 (June 1944), pp. 103-114.

automobile encouraged small center populations to travel farther for better goods and services.[1]

The main information that could be obtained from studies concerning the impact of transportation was that transportation in itself was not the major factor for size change of places, either growth or decline. A place had to have certain characteristics or properties that interacted with the transportation system to produce either size increase or decrease. An introduction of an improved transportation line would accelerate the rate of decline if properties of a given place were predisposed to decline. Conversely, new transportation lines would accelerate the rate of increase if other factors of growth were present in a given place. Therefore, transportation had to be assessed in conjunction with other factors to reach a qualified conclusion regarding its impact upon size change of places. Furthermore, a more precise assessment of the degree of influence on the highway variable on a place change would help reduce the inconsistencies. Considering the stage of highway development or the age of the highway in a given place could help assess its impact more correctly. The results of a study undertaken two years after

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[1]John F. Hart and Neil E. Salisbury, "Population Change in Middle Western Villages: A Statistical Approach," Association of American Geographers Annals, 55 (March 1965), pp. 140-160. For other related experiences see Baringham's Technical Report.

the construction of the freeway would be different from that which is undertaken ten or fifteen years later. To simply state that "highways do not have a significant effect on size change of a place" without making reference to a specific stage overlooks this important factor.

To recapitulate, different types of transportation modes had different degrees of effect on size change of places. Secondly, it seemed that the greater the number of transportation modes in a place, the greater its size increase. Thirdly, it appeared that the size increase of a place would be greater in larger places than it would in smaller places.

Proximity to Other Places

Proximity to other places was still another variable that was significant in the change of size of any place. It has been generally held, based on dominance theory or competition theory, that population change inversely correlated with distance.[1]

Vogt observed in 1917 that village growth appeared to be affected by their local relationship to nearby villages.[2] One could deduce that the presence of a

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[1]A. H. Anderson, Changes in Farm Population and Rural Life in Four North Dakota Counties. AES North Dakota Agricultural College, Bulletin 375 (April 1952).

[2]Paul H. Vogt, Introduction to Rural Sociology (New York: D. Appleton & Co., 1917).

sizable urban center was associated with a small number of villages and hamlets in the surrounding rural areas. On the other hand, a lack of urban centers meant a large number of villages and hamlets. In other words, ceteris paribus a sizable city would drain population from surrounding areas, thus eliminating certain villages or hamlets. This led to a line of reasoning that people would flock to the city until the point of saturation before a reversed trend occurred, producing new towns of growth in existing villages. Hence, small towns would be strongly affected by competition from very large places. Hoffsommer (1934),[1] and Nelson and Jacobson (1941)[2] found that a small center within the radius of five miles of the larger center experienced greater decline than small places in radius of fifteen miles or beyond. That is, the more distant a small center was from a major center, the less the decline.

Mitchell (1939), studying trends in rural retailing in Illinois from 1926 to 1938, observed that centers between 2,000 and 10,000 inhabitants were more active competitors than were centers over 10,000 inhabitants. A

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[1]Harold C. Hoffsommer, Relation of Cities and Larger Villages to Changes in Rural Trade and Social Areas in Wayne County (Ithaca, N.Y.: Cornell University, AES Bulletin 582, 1934).

[2]Lowry Nelson and Ernst T. Jacobson, "Recent Changes in Farm Trade Centers of Minnesota," Rural Sociology, 6 (June 1941), pp. 99-106.

reversal of the relationship was explained by Hassinger (1957) when he attempted to determine whether or not there existed a relationship between distance to larger places, size, and growth. He hypothesized that smaller places in proximity to larger ones were at a disadvantage in maintaining population growth. The percentage of smaller places (under 2,000) gaining 5 percent or more in population within a ten mile radius was smaller (39 percent) than the percentage of the same category of places beyond ten miles (59 percent). This led him to observe that the average size of incorporated places increased with distance from larger centers, and that centers of 2,000-4,999 inhabitants had more detrimental effect on small places than did centers of 5,000 inhabitants or more. In other words, proximity to a center with a population of 2,000 to 4,999 was more likely to be a factor in the failure of places in the 400-999 category to gain than it was for places under 400. But larger centers, 5,000 or more, did not have much effect on smaller places. The author suggested further research to determine whether or not there were similar differences with the zones around other size categories of large centers.[1]

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[1]Robert V. Mitchell, "Trend in Rural Retailing in Illinois 1929-1938," Bureau of Business Research (Urbana, Ill.: University of Illinois Bulletin, No. 59, 1939).

Hodge (1966) considered effect of distance in three regions of Canada.[1] His hypothesis that larger centers had debilitating effects on small nearby centers was confirmed in one region, but not conclusively confirmed in other regions. In one of the two regions in Eastern Ontario, the same tendencies regarding the density of small centers in relation to large centers was evident in the zone up to 9 miles but not beyond. When the rate of decline of small centers in proximity to large centers was examined, the picture was mixed and not clear. The rate of decline in the 10-14 mile zone was greater than that in the closer zone. The spread of larger central places, or urban dispersion were suspected of influencing the growth of small centers in zones closer to the large center, a consistent observation with that of Hassinger (1957).

Fuguitt and Butler (1970) replicated and extended Hassinger's study in Wisconsin. They studied incorporated small towns under 2,500 listed in the census between 1940-1950 and 1950-1960. The same pattern of relationship was found in most parts of Wisconsin between small town population change and distance in Wisconsin and Minnesota. The association of variables considered was generally the

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[1]Gerald Hodge, "Do Villages Grow? Some Perspectives and Predictions," Rural Sociology, 31 (June 1966), pp. 183-196.

same in remote regions of both states.[1] However, the data suggested two major forces: competition and symbiosis between larger and smaller places. Urbanization in the Southeastern part of the state caused the correlation between population change and distance from larger places to be negative. And rurality seemed to make this relationship positive. Nevertheless, the two characteristics had different degrees of influence in the two decades considered, reflecting different degrees of urbanization in the two decades. Correlation in urban areas of the state was weak or negative because there was a low degree of competition and a high degree of symbiosis between smaller and larger places. Moreover, there was a higher degree of commuting between the two size categories which explained growth of small places in urban areas. The positive correlation in the rural areas was reduced in the 1950-1960 decade because more "accommodation" of smaller places of the same size and more specialization in functions was taking place.

Studies by Hassinger (1956), Anderson (1960), Lybecker (1974), Tarver and Urban (1963) all included an assessment of the effect of proximity of smaller places to

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[1]Glenn V. Fuguitt and James E. Butler, "Small Town Population Change and Distance From Larger Towns: A Replication of Hassinger's Study," Rural Sociology, 35 (1970), pp. 397-409.

larger places. They indicated both an inverse and converse relationship between distance and the rate of size change.

Distance had one of the highest correlation coefficients with growth in Anderson's study among the forty-two variables analyzed.[1] The greater the distance of small towns from a town at least 1,000 people, the lesser their growth or the greater their decline. This relationship was a result of the type of services provided by towns or at least 1,000 people. However, there seemed to be a principle of "reversible effect" on smaller places, according to the size category of the larger places. This meant that smaller size category places would correlate positively with distance from a certain size category, i.e., the smaller the distance, the smaller the increase, and the greater the distance, the greater the increase in size.

Most recent studies put the larger size of the dominant place at 10,000 or less in the case where smaller places would decline due to their close location to the larger place.[2] On the other hand, correlation between distance and size change would be negative from places 10,000 inhabitants or more, i.e., the shorter the distance, the

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[1]Albert Anderson, "Population Changes in Incorporated Places" (Unpublished Master's Thesis, Iowa State University, 1960).

[2]Glenn V. Fuguitt, Ibid. (1972); Glenn V. Fuguitt and Calvin L. Beale, Ibid. (1976).

greater the increase in size. A situation in which a smaller place would grow as the distance from the larger place increased indicated a high degree of independence of the smaller place from the larger one, or a high degree of competition. This independence could be translated into more independent economic and other social systems and more local control. Where a reverse situation existed, the distant smaller place lost its ability to exist in symbiotic relationship with the larger place; the smaller place lost its ability to serve as a "bedroom" community to a larger place. Closer small places would grow because the larger place offered working opportunities and other amenities to the residents of surrounding small places.

As in most issues, when there has been no agreement on the premises or the definition of the unit to be analyzed, different results were obtained and different conclusions drawn. Certainly, there seemed to be agreement on two general propositions: (1) that the greater the distance of a small place (size debatable) from a larger place of certain size, the greater the decline of the smaller place; and (2) that the shorter the distance from the larger place the greater the increase.

The size of the larger place having effect on smaller places has been debatable. The competitive size (size affecting negatively the change in size of smaller places) has been found to range from 2,000 to 10,000

inhabitants in some studies, 2,000 to 5,000 inhabitants in some other studies, and 5,000 to 10,000 in still others. Above these respective ranges, the size of the larger place was found to relate positively to the increase in size of smaller places (see Table 5). A standard delineation of what the range of competitive and complementary larger size of a place influencing other small places would be helpful to produce results with wide applicability.

Other Place and Hinterland Characteristics as Factors

Other characteristics of a place mostly mentioned as related to the size change of a place have been county seat and corporate status. A number of studies have indicated a positive association between county seat and the increase in size of a place such as those by Landis (1933), Fanelli and Pederson (1956), and Kolb (1959).[1]

Fuguitt attempted to find the relationship between county seat and small town growth and decline, while controlling other variables such as size, location near a metropolitan center and region.[2] In general, it was

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[1]Paul H. Landis, The Growth and Decline of South Dakota Trade Centers, 1901-1933, AES Bulletin, No. 279 (April 1933), South Dakota State College, Brookings; A. A. Fanelli and H. A. Pederson, Growth Trends of Mississippi Population Centers 1900-1950 (State College: Mississippi State College, SOcial Science Community Series No. 10, 1956), pp. 13-17.

[2]Glenn V. Fuguitt, "County Seat Status as a Factor in Small Town Growth and Decline," Social Forces, 44 (December 1965), pp. 245-251.

Table 5.--Larger Size Categories of Places Considered by Different Authors to be Competitive and Complementary to Smaller Places According to Distance.

Author	Competitive Size	Shorter Distance Greater Decline	Longer Distance Greater Growth	Complementary Size	Shorter Distance Greater Growth	Longer Distance Greater Decline
Mitchell (1939)	2,000-10,000	-	+	10,000 plus	+	-
Hassinger (1957)	2,000- 5,000	-	+	5,000 plus	+	-
Butler and Fuguitt (1970)	2,500- 5,000	-	+	5,000 plus	+	-
Lybecker	5,000-10,000	-	+	1,000- 5,000	+ not significant	-
				10,000-20,000	+ significant	-
				20,000 plus	+ not significant	-
Fuguitt (1972)	2,500-10,000	-	+	10,000 plus	+	-
Fuguitt and Beale (1976)	" "	"	"	"	"	"
Hodge, Hart and Salisbury	0 0			0	+	-

revealed that county seats tended to grow faster than did other small towns in the United States between 1940 and 1960. However, the degree of association was the same in all regions; county seat status positively affected growth regardless of the size of a place in the South and in the North, in counties remote from SMSA central cities. But a differential effect occurred when the largest place status variable was introduced to help explain the association. In the North, the association existed because the county seat was also the largest place in the county. But in the South, county seat status and largest place status affected growth independently. In the West, county seats were not growing faster than other places due in part to the heterogeneity of settlement patterns, the high population density in fertile valleys and very low density elsewhere. Furthermore, growth patterns varied widely, making county seat status an insignificant variable in the West. Controlling for the size of a place, Tarver and Beale observed less influence of county seat status on population change.[1]

The tendency for public and private activities and services to centralize at the county seat in certain regions could explain the correlation between the county seat and the place's size change. However, county seat status was significant in development terms if the status

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[1]Tarver and Beale, Ibid. (1969).

already existed; if it did not, the variable could not be introduced in the area to stimulate growth. This was mainly true in the United States, but not in developing countries where programs of settlement are undertaken. Even in developing countries, it could not be introduced everywhere.

Other characteristics of a place found to have an association with increase in size were annexation, college enrollment, quality of soil and soil erosion, and topography of the place.[1] Moreover, demographic characteristics of a place and its hinterland have been found to contribute to its change in size. The presence of a large number of older people was not often associated with a large younger age population. Tarver and Beale found that Southern towns experienced an increase in the number of people 65 years or older. However, this increase had a negative influence on young and working population. In other words, the total population of these towns decreased. As the older population increased in these towns, a heavy out-migration occurred of young and mature productive people.[2] In the regression equation it was expected that

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[1]Fuguitt and Beale, Ibid. (1976); James J. Zuiches, "In-Migration and Growth of Nonmetropolitan Urban Places," Rural Sociology, 35, 3 (September 1970), pp. 410-419; Anderson, Ibid. (1960).

[2]Tarver and Beale, Ibid. (1969).

for every increase of 1,000 aged persons, there was an increase of 942 persons in the 762 towns. An aged population exerted a depressing influence on the total number of people in these towns.

The change in the density of a places' hinterland has also been found to affect the population change of a place. Non-village population change in counties where a place was located was shown to correlate positively with change in size of a place. Studies by Fuguitt and Hassinger revealed a strong association between the two variables, i.e., small places located in counties with a large increase of farm and nonfarm population grew faster than did places located in counties with low gain or decline in density. These findings were another indication of the close relationship between the place and its hinterland.

Other natural amenities or endowments of the hinterland (climate, bodies of water, mountains, and other natural resources) have been found to influence the size change of a place. These amenities have been found to attract migrants.[1] These and other characteristics have not received as much emphasis in the literature as have size, transportation, and proximity to larger places.

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[1]James L. Gibson, "The Amenities as a Factor in Arizona's Population Growth," The Annals of Regional Science, 3 (1969), pp. 192-203.

Nonetheless, they seem to have played a significant role in the growth of places, ceteris paribus.

In summary, it was observed that most descriptive studies reported inconclusive and conflicting results about the growth of small places. Their explanations of the forces of size change have been general and the theory tended to be based on simple observations. On the other hand, empirical studies have emphasized forces of change such as initial size of a place, the type of economic base and its structure, the size of the nonagricultural employment, transportation, and proximity to other places. These factors have been found to relate positively to the growth of small places. However, these findings have been qualified by results from recent studies. That is, when more variables were analyzed, their degree of relationship, which, when it was high, dropped significantly. This suggested the need for further careful analysis of a larger number of causal forces to attempt a more integrated explanation of size change of places.

We now turn to Chapter III in which the problem is defined, variables specified, hypotheses formulated, and the methods of analysis explained.

CHAPTER III

THE PROBLEM, HYPOTHESES, AND METHODS OF INVESTIGATION

The Problem

This investigation was concerned with better understanding the major problem of change in size and its determinants for places in Michigan. Such a problem has not been examined for the entire state of Michigan. The major question addressed was not whether Michigan places changed in size between 1930 and 1970, since this has been established in stage two of Rodefeld's research,[1] but rather what the determinants of change in size of places were and what their relative importance was.

Previous studies have pointed out some general as well as some specific forces of change in size.[2] One of the specific questions was, could the understanding of

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[1]Richard D. Rodefeld, Enumerating Michigan Population Centers (Places) and Determining their Size From 1930 to 1970: Rationale, Procedures, Problems and Results (East Lansing: Michigan State University, Department of SOciology, February 1976).

[2]Douglas A. Barningham, Deviant Case Analysis of Declining Places in Michigan Metropolitan Counties, A Plan B. Technical Research Report (Michigan State University, Dept. of Resource Development, East Lansing, 1977).

change in size of places be improved when a large number of causal forces was examined? To increase the understanding of the processes of change in size of places, additional causal forces of change could be added to the common factors mentioned by most studies, and the level of influence of each force could be specified. With such an examination, the explanatory power of change processes of places could be improved.

This investigation also attempted to answer the following specific questions: How much effect did each determinant have on the change in size of a place? Was the effect of a given determinant different when observed in "static," "marginal," or "changed" forms?[1] What kind of relationship could be observed between causal forces and change in size of a place when a period of observation was extended from one decade (as was done in most studies) to four decades? By considering all places in Michigan, could a better picture of the relationship between "traditional" causal forces and change in size emerge?

These were largely methodological questions which were important for the explanation of growth or decline of

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[1]"Static" form of an independent variable refers to a causal force considered at a fixed point in time; for example, the 1930 initial size of a place is in "static" form. "Marginal" form refers to the difference in number or quality measured of a given independent variable between two periods.

places in Michigan. Aspects of the problem are discussed below to illustrate some of the barriers to a firmer understanding of change in size of places.

The Problem of Restricted Numbers of Independent Variables

To increase the understanding of the change in size of a place, it was very important to take into account a large number of antecedents. This required a consideration of factors in addition to those that have traditionally been examined and pointed out as causes of change in size. It was recognized in this study that it was impossible to identify all possible factors affecting increase or decrease in size of a place. It has been pointed out, for example, that the birth and death of communities was not the result of a single act of man or nature. Denney observed:

> The great fire (and small ones too), the great fire past, the plagues, the economic reverses, the change in man's cultural environment, the development of new means of transportation and communication, these and everything else that one can mention, play their part in the development of every existing human settlement, and every act to be performed by man or nature will also impinge upon the present communities.[1]

Hassinger also made the same observation:

> It is recognized that circumstances partly account for growth or decline, for instance such things as the organizing ability of a local person, or a

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[1]Hugh Denney, Decongesting Metropolitan America (Columbia: University of Missouri, 1972), p. 5.

> natural disaster such as fire or flood. However, many circumstances of a more general nature affect trade centers.[1]

It was the position of this writer that an examination of a large number of factors was necessary. These determinants were to be found within the place or they could come from without, since social and economic ties now linked the inhabitants of all nonmetropolitan places with the larger American society or at least with the entire region.

The Problem of "Static" and "Changed or Marginal" Variables

Another limitation in previous studies was the failure to distinguish between "static" and "changed" variables. Considering independent variables in changed form would give another dimension to the assessment of the effect of given variables. A marginal change in an independent variable would permit investigators to discern how much of that variable was needed to achieve a certain level of change in the dependent variable. Furthermore, the "changed" form of an independent variable would enable any investigator to detect with a high degree of accuracy the changed direction of growth or decline when it occurred in a given place.

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[1]Edward W. Hassinger, Factors Associated with Population Changes in Agricultural Trade Center of Southern Minnesota 1940-1950. Doctoral Dissertation for the University of Minnesota (1956).

To avoid the preceding limitations, the present study examined the impact of a large number of independent variables upon all places in Michigan (except the very small and the very large) during the 1930-1970 period. The effect of independent "changed" variables was also measured.

The Problem of the Period of Study

Another area of limitation that could be noted in previous studies was the length of time considered. Most investigations have been restricted to periods of one decade. The results of studies dealing with a single decade would be to give a "short run" explanation of growing or declining places. For example, Gillette indicated that small places were declining in 1923, but Fry found that they were increasing in 1933. Brunner and Kolb were surprised by the stability of small town's growth in 1947 because there were declining and growing ones.[1] Does a period of one decade or a cross-sectional analysis provide the predictive power needed for the comprehension of the future change in places? Can this comprehension be improved when a period of two or four decades were considered?

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[1]John M. Gillette, Rural Sociology (New York: Macmillan Co., 1923); C. Luther Fry, American Villages (Doubleday, Doran and Co., 1926); E. Brunner and John Kolb, Rural Social Trend (New York: McGraw Hill Book Company, 1933).

A long period consideration might have indicated whether or not a specific factor did in fact cause a constant size change in a place through several decades. It might have allowed a description of evolutionary change by specifying variables or combination of variables that enter into the process of size change of a place. A short period gives relative great significance to individual independent variables. However, their effect might vary from decade to decade. If it could be established that certain given factors had a constant effect throughout an extended period of time the knowledge about change in size of a place would significantly improve and a sounder base for theory formulation could be provided.

Attempt was made in this study to see if a period of two or four decades could negate the differential effects that a short run situation may have had on the explanation of change in size of various places.

The Problem of Enumeration

The fourth problem found in previous studies has been the inconsistencies in enumeration of places included in the study. The first aspect of this problem concerned the criteria of places to be included in the study sample.

One group of studies considered incorporated centers or centers greater than 1,000 inhabitants as listed by the United States Census Bureau. Hart and Salisbury, for example, argued that unincorporated places

of less than 1,000 persons were excluded from their investigation because their populations were mere guesses, and consequently, they felt that these places lacked reliable information.[1] Brunner excluded places less than 1,000 persons from his study because they were not listed in the Census.[2]

A second group examined places between 250 and 2,500 persons, Fry (1926) and Marshall (1946).[3] A third group limited itself to places with a population between 1,000 and 2,500 inhabitants. A fourth group of studies considered places not less than 2,500 people in agricultural areas only. This fragmentary definition of the universe did not provide a comprehensive understanding of place processes of change at all levels or sizes.

The second aspect of the enumeration problem was the source from which the enumeration was taken. The majority of studies, if not all, have relied solely upon

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[1]John F. Hart and Neil E. Salisbury, "Population Change in Middle Western Villages: A Statistical Approach," Association of American Geographers Annals, 55 (March 1965) pp. 140-160.

[2]Edmond des Brunner, "Village Growth 1940-1950," Rural Sociology, 16 (June 1951), p. 111-118.

[3]C. Luther Fry, Ibid., D. G. Marshall, "Hamlets and Villages in the United States: Their Place in the American Way of Life," American Sociological Review, 11 (April 1946), pp. 159-165.

the census listing of places in a given region or state. In so doing, they left out a significant number of places in the particular area being studied. Since the census lists only legally incorporated places or places larger than 1,000 persons in size, a major bias in the sample was introduced.[1] Therefore, the census source was inadequate if all places in a given region were to be represented in the sample, or if the investigation aimed to analyze all places in a given area. Thus, results of studies based on census sources were suspect in any explanation of size change processes because their sample failed to represent the universe. Stein wrote the following concerning this problem:

> The problem of formulation of a theory of community is complicated by the fact that places on which investigations are made hardly represent all communities in America or any nation.[2]

In summary, the restricted number of independent variables problem, the "static" and "changed or marginal" form of independent variable problem, the period of the study problem, and the enumeration problem were only

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[1]Melcher's study found census over-representation of larger places greater than 500 persons. John E. Melcher, Census Underenumeration of Michigan Population Centers, M. A. Plan B Technical Research Report, Michigan State University, East Lansing, 1977. He mentioned W. Miller (1960), Marshall (1946), and Vincent H. Whitney (1945) as other writers who have pointed this problem out.

[2]Maurice R. Stein, The Eclipse of Community (Princeton: Princeton University Press, 1960).

aspects of the major problem of a better understanding of factors associated with change in size of places in Michigan, or the problem of providing a sound explanation of change in size of places.

Again, the purpose of the present study was to identify some of these factors, assess varying degrees of influence of each individual factor on varying rates of change in size, establish an hierarchy of influence among these factors, and assess their collective influence on the change in size of places. In the course of attaining the main objective, implied methodological objectives were to be attained through the design of the method of investigation.

Hypotheses

The following hypotheses were based upon suggestions emanating from the literature review and the theoretical and methodological considerations presented in the preceding chapters. A more specific rationale for selecting each causal force to be analyzed is discussed as each hypothesis is enunciated.

As was indicated in Chapter I, forces influencing change in size of places seemed numerous, but their relative influence was unknown in a given place. Factors selected to be analyzed in the present study were chosen for different reasons. Resources permitted the

consideration of a limited number of factors.[1] Second, data collected in Rodefeld's study included information on most independent variables. Third, independent variables were selected because they were the most frequently mentioned as factors of change in size. Since one of the objectives was to ascertain their relative influence, they were deemed important to be analyzed with other less mentioned factors. Fourth, the less mentioned factors were selected because of their relationship to the general major change forces discussed in Chapter I--industrialization, mechanization, transportation, communication, and urbanization. The factors selected were specific manifestation of these general change forces.

General conceptual assertions are stated non-directionally. Operational or more specific hypotheses are stated directionally when possible. All hypotheses were formulated within the conceptual frame of reference established in the first chapter, i.e., hypotheses related to the characteristics of a place, and those related to the characteristics of the environment.

First General Assertion

The first general assertion of this study was:

> The rate of change in size of a place is a function of the level of its urbanization.

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[1]Though "limited" in the present study, the number of independent variables is much larger than that of most previous studies, with very few exceptions if any.

The most conspicuous characteristic for the level of urbanity of a place is its size. This may be one of the reasons most studies have included size as a factor of future change in size of a place. It was indicated that the level of industrial development of a place depended on its size, in other words, the level of variation in economic and social activities in a place were a function of its size.

It has been pointed out that size of a place is important for its subsequent growth. Larger size places were more likely to attract various economic, social, cultural, and recreational activities. As a consequence, they would grow more than smaller places.

I: The larger the initial size of a place at a given point in time, the greater its future increase in size; conversely, the smaller the initial size, the greater its future decrease in size.

"Initial size" of a place referred to the numerical population size of a place at the beginning of the period of observation.

County seat as a factor. Though county seat status was not necessarily an urban characteristic but rather a political status, it could be observed that county seat places had services mostly found in large urban centers. Most county seat places are urban centers (urban referring to a place with 2,500 persons or more).

Services found in county seat places were likely to stimulate increase in size. A number of studies have included county seat as a factor of change in size of a place. Data for this variable were available in Rodefeld's project.

II: The county seat status of a place will stimulate greater rate of positive change in size of a place than will the absence of county seat status.

"County seat status" referred to a place that functioned as headquarters for county government.

Roads as a factor. Transportation infrastructure has traditionally influenced the location and the change in size of places. It was one of the means by which exchange took place between a given place and its larger environment. It could be observed that the intensity of this exchange stimulated at varying degrees the growth or decline of places. The growth of places, for example, has been explained by "communication theory" advanced by Meier in 1962. According to this theory, transportation and communication were the main media of interaction. Places originally developed and expanded because of opportunities for face to face transaction. With increased communication, the potential for growth increased.[1] One of the most influential modes of transportation has been

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[1]R. L. Meier, A Communication Theory of Urban Growth (Cambridge, Mass., M.I.T. Press, 1962), pp. 6-7.

road transportation and its corollary, the automobile. This has been indicated in Chapter I.

III: The higher the quality of roads present in a place, the greater the increase in size of a place; conversely, the lower the quality of roads present in a place, the greater the decrease in size of a place.

The "quality of road" referred to the size of a road ranging from two to four lanes, and to the kind of surface upon which traffic takes place; the quality of surface ranged from dirt to concrete surface.

The intensity of inflow and outflow or resources in a place could vary according to whether a place was located on an intersection or not. This intensity also depended on the quality of a given intersection.

IV: The higher the class of road intersection present in a place, the greater the increase in size of that place. Conversely, the lower the quality of intersection the lower the rate of increase in size of a place.

The "class of intersection" was determined by the same or different quality(ies) of roads crossing each other at a given location.

Second General Assertion

A place is in constant relation with other places in a county or a larger region or other states. The change in size of a given place could be the result of immediate or distant hinterland factors. Since data

related to county characteristics were made available in the project, some of these characteristics were considered as factors of change in size. The second general assertion for this study was:

> The change in size of a place is partly a function of the characteristics of the immediate and distant hinterland.

Presence of freeway in hinterland of a place as a factor. The presence of a freeway in the immediate or distant hinterland is one of the characteristics of the larger environment of a place. A number of writers have pointed out that freeways have some impact on the growth or decline of places in their proximity. A freeway supposedly brought greater accessibility to a place. It seemed to have differential impact on places according to their relative proximity. One could refer to tourist related industry in places because of the increase in the volume of travelers.

V: The closer a place is located to a freeway, the greater its increase in size. Conversely, the greater the distance of a place from the freeway, the greater its decline in size.

The county largest place as a factor. Another frequently used factor affecting the change in size of a place was the influence of the largest place which could be considered as the central place for the development in a county. It was assumed that the urban service functions of the largest

place and the pervasion of its growth into smaller satellite places would stimulate their growth. The growth pole theory and the diffusion theory all assumed that the trend of change in the largest or central or pole place would have positive or negative impact upon smaller surrounding places. This impact was also dependent upon the size of the largest place itself.

VI: The larger the largest place in a county, the larger the rate of growth of smaller places in the same county.

The "largest place" was in terms of the largest population size of a given place in a county.

Proximity to the largest place in a county. The nature of the influence of the largest place upon the change in size of smaller places seemed to be a function of the size category of the largest place and the proximity of smaller places to the largest place. This meant that when the proximity dimension was included in the analysis, the assessment of the influence of the largest place become more precise, and the impact at different distances become variable.

VII: The closer a smaller place is located to the largest place in a county, the greater the increase in the size of the smaller place.

VIII: The increase in size of smaller places is inversely related to the distance to metropolitan centers.

Region as a factor. The overall development (industrial, urban) of a region was likely to affect positively the change in size of a place. The higher the degree of industrialization, the larger number of employment opportunities, and consequently, the larger number of people working, or seeking jobs in the region. Consequently, smaller places in that region would tend to increase their sizes.

IX: The more industrialized and urbanized the region, the greater the rate of increase in size of places in that region. Conversely, the less industrialized and urbanized the region, the greater the likelihood for non-metropolitan places to decline.

"Urbanized" and "industrialized" region in the state of Michigan referred specifically to the parts of the state with more developed transportation and communication infrastructures, a higher degree of manufacturing industry, higher population densities, a larger number of urban places, and higher densities of metropolitan areas. "Rural" region referred to areas with less development in the preceding characteristics.

Farm characteristics as a factor of change in size of a place. It was pointed out earlier that one of the reasons for the decline of rural places was the impact of mechanization in agriculture and other extractive industries. The immediate consequence was the loss of occupations in agriculture and other extractive industries. Some of

the nonmetropolitan places could not retain this unemployed labor force. This surplus labor had to move to other places in search of employment. Therefore, to explain change in size of places which depended mostly on extractive industries, a factor such as farm characteristics needed to be assessed.

X: The greater the decrease in the number of farms in a county, the greater the rate of decrease in size of places in that county.

XI: The larger the increase in average size farm of a county, the higher the rate of decline in size of places located in that county.

XII: The greater the decrease in the number of farm population in a county, the greater the decrease in size of places in the county.

Labor force characteristics as a factor of change in size of place. Another characteristic of the hinterland (immediate or distant) of a place, supposedly affecting the change in size of a place, was the level of industrialization in the hinterland, as indicated by change in the size of the work force in a county. The change in the work force of a county would be reflected in the change in size of a place located in the same county. As a result of the influx of the displaced extractive and agricultural workers, places with non extractive industries were more likely to increase in size. Not only displaced farm and

extractive industry workers were likely to be attracted to nonextractive industries, but also new labor entering the industry.

XIII: The greater the decrease in the work force in extractive industry in a county, the greater the decrease in size of places in that county. Conversely, the increase in labor force of extractive industry will positively affect the change in size of places in that county.

XIV: The greater the increase in nonextractive industry work force in a county, the greater the increase in the size of places in that county.

"Extractive industry" specifically included forestry, mining and fishing. Agriculture was not included. "Non-extractive industry included mostly manufacturing industry.

It was hoped that the proceding operational hypotheses would help attain the objectives that were set for this study.

Method of Investigation

The Area Covered

This study covered the entire state of Michigan, a state that is both industrial and agricultural, urbanized and rural. The southern part could generally be characterized as urbanized and industrialized due to its numerous metropolitan areas and its large, diverse

manufacturing industries. The Northern part is dominated by forest exploitation, mining, and agriculture and is a vast nonmetropolitan area. These two major characteristics, rural and urban, allowed the investigation to assess the effect of a given antecedent upon places in both areas. They also made the state a "good laboratory" to carry out this kind of research. Most of the previous studies have focused either on rural or urban places, not both.

The Period Covered

The 1930-1970 period was selected for several reasons. First, it was the period delimitated in Rodefeld's project. Second, it was a four-decade-period which enables the investigation to assess the "long term" effect of individual determinants of change in size of places. The result of this examination could be compared to the results of "short term" influences. Third, and most important, most social scientists believe that within this period many changes have occurred that have had an impact on the change in size of places.

Some of these changes have already been discussed. Nevertheless, one or two examples in transportation and communication may suffice to illustrate the drastic change that occurred during the period. Up to 1930, there were 2,661,793 miles of dirt roads in the United States, 54,825 miles in Michigan. Only 662,435 miles of surface roads in the United States, and 26,281 miles of surfaced

roads for Michigan. But in 1970, the situation was completely reversed: 739,684 miles of dirt roads for the United States and 16,900 miles for Michigan; 2,435,970 miles of surface roads for the United States, and 81,809 miles for Michigan.[1] Television was invented in September 1927. But it was not until after World War II, in 1948, that the first commercial set was sold to the public. After this date, the entire system of communication in the United States was revolutionalized. The medium experienced a rapid distribution between that date and 1970.

For these three reasons the period was deemed to be significant for studying the impact of the selected forces on the change in size of places in Michigan.

Enumeration of the Universe of Places: Data Sources

The enumeration and other properties of places, counties, and regions come from the Rand McNally Commercial Atlas, and the Census of Population and Agriculture published by the United States Bureau of Census. Although these sources had shortcomings, they were complementary and provided the most adequate list of places for any given area.

Census listings were considered and found inadequate to obtain a complete enumeration. Rand McNally

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[1] Historical Statistics of United States, Colonial Times to 1970 (Washington, D.C.: United States Department of Commerce, Bureau of the Census: Bicentennial Edition, 1975), p. 121.

listings were obtained to supplement the census listing. This source was rather complete since it contained all population centers--incorporated and unincorporated--in each state, and it reported "the number of people residing in the central built-up section (excluding farm and open country residents)." The source was relatively reliable because, according to its authors, the information on incorporated centers was a result of a survey of local authorities. These authorities particularly included postmasters, chambers of commerce, planning officials, and municipal authorities. However, there were also some shortcomings in this source: (1) information on the methodological procedures used to arrive at this given data was sketchy or non-existent in the published volumes; (2) little information existed on either the accuracy of unincorporated center enumeration or the estimated sizes of these centers; and (3) since the Rand McNally defined "places" in terms of a "recognizable name," recent places might not have been included in the listing, since the name of a place depended upon that place's age and size.

Determination of the Population of Places[1]

An alphabetical listing of names of places was obtained from the 1930 and 1970 census of population and

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[1]This particular portion is somewhat a summary of the procedure followed in Rodefeld's study in which the writer was one of the assistants. Enumerating Michigan

from the Rand McNally 1920, 1940, 1950, 1960, and 1973 volumes. Since the population estimates of the Rand McNally volumes are retained for eight to ten year intervals before estimates are updated, the figures for 1930, 1950, 1960, and 1970 were extracted from 1940, 1952, 1961, and 1973 volumes, respectively.

After a careful checking, listings which clearly were not centers (industrial plants, shopping centers, township, hospitals, prisons, colleges, parks and recreation centers), places not exceeding 19 people or with no population reported, or with reported zero population in 1930, and places forming a part of other places, were eliminated. This resulted in a universe of 2,063 places.

The problem of missing data in particular decades between 1930-1970 was solved by mid-point estimation for a relatively small number of cases.[1] That is, many cases had reported populations both before and after missing assessment points. The difference between the two most proximate estimates was determined and was allocated to the intermediate point(s) with missing populations.

Population Centers (Places) and Determining their Sizes from 1930-1970: Rationale, Procedures, Problems and Results (MSU, February 1976).

[1]Mid-point estimation was calculated by dividing the difference between the two end point figures of population numbers of a decade by the number of end points of decades.

Moreover, local sources such as mail carriers, postmasters, township supervisors, private citizens, and other officials were contacted through a one-page questionnaire for more information concerning the existence, size and other properties of places.[1]

Further elimination was undertaken. Places with less than 75 people in 1930 were excluded because they had high rates of missing population data. Second, it was assumed that the social and economic structure of these places would be extremely simple and undeveloped, and a very small percentage of either the total or rural population would be found to reside in such centers. Third, most of these smaller centers consisted either of open-country housing clusters or the centers of rural neighborhoods. Places which in 1930 had less than 75 people but exceeded 74 people in size, in census periods after 1930 were also excluded. They are viewed as factors related to the environment affecting a place's size increase. Metropolitan places (50,000 or more) were excluded because it was assumed that their size changes were the result of more complex set of determinants. After this second phase of elimination, 1,248 places were left to compose the universe of this study.

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[1]Ibid., pp. 24-34.

Measurement of Variables

The Dependent Variables

Consensus was lacking among scholars as to what was the most appropriate index to measure a place's change when concern was focused on growth or decline. One group of students, for example, suggested per capita income of the place, the degree of provision of services measured by revenue or sale taxes, or the number of business establishments present in a place.[1] The problem with these indices was that they might reflect growth or decline in other aspects of the population center. High per capita income might not reflect the growth of other services in the center, e.g., people in the center may earn their income outside the center. The number of business establishments was an inadequate measure because a place might not grow in number of business establishments, but its population size could increase, e.g., a "bedroom" community (place) could be characterized as declining or non-existent on the basis of business establishments while its population size was growing. Measuring change in terms of size of a place did not present these problems.

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[1]Lance E. Davis, Jonathan R.T. Hughes, and Duncan M. McDougall, American Economic History: The Development of National Economy (Homewood: Richard D. Irwin, Inc., 1965), pp. 104-107; Edgar M. Hoover, An Introduction to Regional Economics (New York: Alfred A. Knof, 1971), pp. 200-201.

Studies concerned with the change in size of places have had a tradition of measuring change in size (the dependent variable) in various percentage categories.[1] These various ways of defining the dependent variable were, to some extent, arbitrary. There could be two categories of change: growing (more than 0 percent), and declining (less than 0 percent) places. Or there could be three or six or more percentage categories. In such cases, change in size could be subdivided in categories such as 5 percent or higher (growth), -5 and less (decline), and between -5 and 5 (stable). Or growth and decline could be subdivided into four or six or more categories. Or, the dependent variable could also be measured in actual percent change of individual places. In most studies examined, the change in size was defined in one of the above alternative definitions. The problem of one alternative was that it left uncertainty as to whether or not the model used had the highest level of explanatory and predictive power. This study attempted to define the dependent variable in several ways and use different regression models accordingly.

Examination was made on the extent to which independent variables explained the "overall" change in size

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[1]Paul R. Ebert and Frank W. Young, "Sociological Variables of Development, Their Range and CHaracteristics," in Sociological Perspectives of Domestic Development, George M. Beal et al. (eds.) (Ames: Iowa State University Press, 1971), pp. 110-145.

of places. The first model dealt with the dependent variable defined in terms of actual percent change in individual places. This was done to establish some base for latter comparison with other models. Second, the percent change was defined in terms of growth (percent change greater than 0) and decline (percent change less than 0). This procedure was designed to give a picture of independent variables which had more influence on growth or decline.

Growth and decline in the second model were subdivided into seven categories. Growth was measured by the following categories: 10 to 29.9 percent, 30.0 to 49.9 percent, 50.0 to 99.9 percent, and 100.0 percent or more. Categories of decline were as follows: -10.0 to -29.9 percent, -30.0 to -49.9 percent, and -50.0 to -100 percent. It was hoped that this procedure would provide information regarding independent variables associated with change in size at different levels. By determining independent variables that induce size change at a given rate, community leaders or government officials interested in change could choose the level of growth desired in any given place.

Independent Variables

The limits imposed on the following classes and categories of the independent variables were rather arbitrary in most cases. Few independent variables

offered classes or categories that could be used without any further categorization.

Initial size of a place. Initial size was reported in the actual number of people residing in a place. The 75-49,999 range of initial size was broken down into the following categories: 75-149, 150-299, 300-499, 500-749, 750-999, 1,000-1,499, 1,500-2,499, 2,500-4,999, 5,000-9,999, 10,000-49,999.

County seat status. The county seat status was measured simply by the presence of the headquarters of county government in a given place.

Quality of road. Michigan roads were classified into five classes: expressway or freeway or interstate; multilane state highway; county paved road; designated county road; and gravel road.

Class of highway intersection. This variable was closely related to quality of roads. The classification is solely based upon the criss-crossing of two or more roads of the same quality. Intersections were classified in the following categories: expressway intersection, i.e., the criss-crossing of two or more interstate roads at a given place; multilane intersection of a state highway; county paved road intersection; designated county road intersection; and gravel road intersection.

Proximity to freeways. Proximity was measured in miles. The range of proximity in relation to a freeway was

broken down into the following mile zones: 5 mile zone, 6 to 10 mile zone, 11 to 15 mile zone, and beyond 15 mile zone.

Proximity to the largest place in a county. This variable was divided into: 1 up to 9.9 mile zone; 10.0 up to 19.9 mile zone; 20.0 up to 29.9 mile zone; 30.0 up to 39.9 mile zone; and 40.0 miles and over. The range of mile zones was changed around metropolitan centers due to their more extensive influence in the hinterland. Categories for mile zones around metropolitan centers were as follows: 25 mile zone, 50 mile zone, and beyond 50 mile zone.

The largest place in a county. The sizes of the largest places in counties were assessed and reported in actual number of residents living in each by the enumeration sources. Different sizes were grouped in the following categories: less than 1,999, 2,000 to 4,999, 5,000 to 9,999, 10,000 to 24,999, 25,000 to 49,999, and 50,000 inhabitants and over.

The region of the state. These were arbitrarily delimited. However, the broad criteria such as the degree of industrialization and urbanization were taken into account. The southeastern part of the Lower Peninsula seemed to be the most industrialized and urbanized of the six regions. It was followed by the southwest of the Lower Peninsula. The northern part of the Lower Peninsula was next in industrialization and urbanization, while the east and west of the

Upper Peninsula were less industrialized and mostly rural.

The number of farms. The number of farms in a county was registered in actual number of farms. However, the change in the number was measured in the following percentage categories: 0 to -39.9; -40.0 to -49.9; -50.0 to -59.9; -60.0 to -69.9; -70.0 to -79.9; and -80.0 to -100.0.

The size of farms. Average size of farms was reported in actual numbers of acres of an average sized farm in a county. The change in average sized farm was then measured in the following percentage categories: -100 to 0; 0.00 to 29.9; 30.0 to 49.9; 50.0 to 69.9; and 70.0 to 100 percent.

Extractive and non-extractive work force. The variables were reported in actual numbers. The change in size of the work force in a county between 1930 and 1970 was measured in percentages. The categories for the change in extractive industry work force were as follows: 0.0 to -59.9; -60.0 to -69.9; -70.0 to -74.9; -75.0 to -79.9; -80.0 to -84.9; -85.0 to -89.9; and -90.0 to -100.[1]

The change in size of work force in non-extractive industry in a county was grouped into the following percentage categories: -100 to 0; 0.0 to 34.9; 35.0 to 69.9; 70.0 to 99.9; 100.0 to 149.9; 150.0 to 199.9; 200.0 to 249.9; and 250.1 to 1,000.

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[1]The range of the first category is large because in the preliminary run, not enough cases were in categories with smaller ranges between 0 and -59.9.

The Test of Hypotheses

Several basic statistical methods were used to measure the effect of each independent variable upon the change in size of places and the collective effect of all the determinants. A cross-tabulation was provided to present the percentage distribution of places among the categories of the independent variables. This percentage distribution would, in a simple form, show the pattern of relationship between categories of a given independent variable and categories of change in size. The hypothesis was preliminarily supported if percentages were increasing or decreasing in the same direction with the hypothesis. For example, if the percentage rate of growth become larger as size of places become larger, then there were indications that the hypothesis was supported.

Next, simple correlation was used to test the degree of association between each independent variable and the overall change in size. Tau c and Pearson product moment were the two major tests of correlation. A preliminary picture could thus emerge from this method and which would show weak and strong relationships between independent variables and the change in size of places.

Thirdly, for predictive purposes, a multiple regression analysis was used to determine or estimate the influence of the independent variables acting together upon the dependent variable. In other words, multiple

regression would have allowed the indication of change in size of a place from a linear combination of independent variables.

In summary, it was pointed out that there was a need for a more precise understanding of change in size of places in Michigan. Precision in terms of knowing (1) some of the important factors associated with change in size, and (2) the degree to which a change in any given factor would induce change in size of any given place. It was pointed out that the problem for limited understanding involved methodological considerations: the restricted number of factors analyzed, the "static" versus "marginal" or "changed" form of the independent variable, the period of study, and the enumeration of places. Each of the factors was believed to have either a positive or negative influence on the change in size of a place. These factors were either characteristics of a place itself or the environment. They were related to the major changes which occurred in the twentieth century and particularly between 1930 and 1970.

CHAPTER IV

RESULTS

The findings of different tests performed on the same variable are reported in this chapter. This approach could establish which tests were preferable, since the interest was focused on identifying a better method for understanding the processes of places' change in size. Second, it provided a more solid ground for conclusions or observations about a given variable. Third, it could help to focus more specifically on the impact of certain variables upon the phase and degree of change in size.

Results are first presented in tables for the fourteen independent variables. Measures of the degree of relationship--tau c and Pearson product moment are reported immediately after a table of each independent variable. More attention was given to the degree of relationship between independent and dependent variables by the application of the Pearson product moment correlation at different categories of both independent and dependent variables. Brief observations are made about the feasibility of partial correlation. Finally, multiple regression analysis is used

to examine the degree of variability in the dependent variable explained by all the independent variables considered.

A brief discussion or possible explanation of the nature of the relationship of a given variable and change in size follows each independent variabie analyzed. It was hoped that this approach would help illuminate the extent to which valid generalization could be made concerning a given relationship.

Characteristics of a Place and Its Change in Size

Initial Size and the Change in Size of a Place

Hypothesis I stated that:

> The larger the initial size of a place at a given point in time, the greater its future increase in size; conversely, the smaller the initial size, the greater its future decrease in size.

Table 6 summarizes the initial size of places in Michigan in 1930 that were used in the analysis. The 1229 places were categorized into 10 size classes as shown in this table. As could be expected, with a few exceptions, the number of places decreased sharply as size-class increased. About 6 out of 10 places had a population under 500; about 3 out of 10 had a population of between 500 and 2,500; and about 1 out of 10 had a population between 2,500 and 50,000.

Table 6.--Distribution of Places Greater than 74 and Less than 50,000 by Size in Michigan, 1930.

Size	Number	Percent
75-149	285	23.2
150-299	326	26.5
300-499	205	16.7
Subtotal	816	66.4
500-749	99	8.1
750-999	58	4.7
1,000-1,499	77	6.3
1,500-2,499	63	5.1
Subtotal	297	24.2
2,500-4,999	49	4.0
5,000-9,999	36	2.9
10,000-49,999	31	2.5
Subtotal	116	9.4
Total	1229	100.00

As indicated in Chapter II, most studies concerning change in the size of places (however operationalized) indicated that initial size was an important determinant of future size. In this study of Michigan places, therefore, it was expected that smaller places would grow less rapidly than larger places and that declines would be more severe for the former than the latter, in the time period under study. Detailed rates of change between 1930 and 1970 for each of the 19 size classes of Michigan places are found in Appendix A, Table 1.

Overall, less than one-tenth (7.8 percent) of all places were relatively stable between 1930 and 1970, that is, a percentage change between plus and minus 9.9 percent. About one third of places sustained or decline of more than 10 percent in population, and about the other two third experienced growth greater than 10 percent.

As could be observed from data, the largest number of places declining more than 10 percent were less than 300 inhabitants in size. On the other hand, the other size classes had larger number of places increasing in the +10.0 to +49.9 percent or in the +50.0 to +99.0 percent rates. While each size class exhibited some variability over the range of change rates, the tendency to grow (but not necessarily at greater rates of growth) increased with increasing size of place.

When change in size[1] was categorized into three broad classes (decline, stable, and growth) as shown in Table 2 in Appendix A a pattern emerged. More places in Michigan, regardless of initial size, experienced growth than decline. However, the number of places growing was only slightly larger than the number of places declining when initial size was small, i.e., 75 to 149 and 150 to 299.

The proportion of places declining between 1930 and 1970 generally was inversely related to initial size. This relationship was not without exception, however, as shown in Figure 2. Much the same in inverse holds for the number and proportion of Michigan places that have gained. A larger proportion of places in size categories from 750 and larger increased than in the size categories under 750. However differences in proportions did not vary widely.

When size classes were grouped into five broad categories and related to broad categories of change, as depicted in Table 8, a pattern similar to that found in Table 7 emerged. The proportion of places declining increased with increasing size of place but not without exceptions. The proportion of places increasing failed to exhibit a clear pattern of association. The proportion of places remaining stable (-9.0 to +9.9 percent) clearly

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[1]In the text "change in size" will normally mean the 1930 to 1970 change in size of places. When referring to change in size for other periods, these will be specified, e.g., 1930 to 1950 and 1950 to 1970.

Fig. 2.--Declining places in Michigan 1930-1970, by size class in 1930.

Table 7.--Distribution of Places in Three Change Categories by Initial Size Classes in Michigan, 1930-1970.

Size Class	Decline		Stable		Growth		Total	
	#	%	#	%	#	%	#	%
75-149	124	43.5	24	8.4	137	48.1	285	100
150-299	132	40.5	23	7.1	171	52.5	326	100
300-499	54	26.3	18	8.8	134	65.4	205	100
500-749	28	28.3	6	6.1	65	65.7	99	100
750-999	10	17.2	1	1.7	47	81.0	58	100
1,000-1,499	7	9.1	5	6.5	65	84.4	77	100
1,500-2,499	12	19.0	5	7.9	46	73.0	63	100
2,500-4,999	7	14.3	1	12.2	41	83.7	47	100
5,000-9,999	4	11.0	7	11.1	25	69.4	36	100
10,000-49,999	3	9.7	6	9.7	22	71.0	31	100
Total	381		96		865		1229	

Table 8.--Distribution of Michigan Places in Three Categories of 1930-1970 Change in Size by Five Broad Classes of 1930 Initial Size.

Size Class	Decline		Stable		Growth		Total
	#	%	#	%	#	%	#
75-499	310	37.9	65	8.0	442	54.2	816
500-1,499	45	58.4	12	5.1	177	75.6	234
1,500-4,999	19	16.9	6	5.4	87	77.7	112
5,000-9,999	4	11.1	7	19.4	25	69.4	36
10,000-49,999	3	9.6	6	19.3	22	71.0	31
Total	381		96		865		1229

increased with increasing size of place, but again, not without exceptions.

The overall trend of change indicated that initial size was significantly related to change in size of place in future periods. However, the strength of the relationship as measured by tau c was only .1434, which was weak by normal standards.

Similarly, the Pearson product moment correlation indicated a negative weak relationship between the 1930 initial size and change in size for all time periods: for the 1930 to 1970 period it was -.0131; for the 1930 to 1950 period, -.0238; and the 1950 to 1970 period, -.0080 (see Table 9). This meant that larger places experienced slower growth than smaller places.

Table 9.--Correlation Between Initial Size Class and the 1930-1970 Change in Size of Michigan Places.

				Percent Change in Size 1930-1970									
				% Growth Rates					% Decline Rates				% Stable
	1930 to 1970	1930 to 1950	1950 to 1970	Greater than 0	10.0 to 29.9	30.0 to 49.9	50.0 to 99.9	100 and over	Less than 0	-10.0 to -29.9	-30.0 to -49.9	-50 to -100	-9.9 to +9.9
1930 Initial Size of a Place	-.0131	-.0238	-.0080	.0496	.0253	.0696	-.0290	.0104	-.1126	-.0045	-.0486	-.1007	.1042
75-149	.0404	.0422	-.0222	-.1431	-.0460	-.0743	-.1024	-.0145	.1474	.0495	.0387	.1243	-.0059
150-299	.0503	.0127	-.0116	-.1042	.0045	-.0265	-.0592	-.0467	.1202	.0741	.0616	.0524	-.0778
300-499	.0356	-.0337	.0315	.0373	.0591	.151	-.0509	-.0430	-.0489	-.0047	-.0143	.0170	-.0177
500-749	-.0156	-.0222	.0922	.0256	-.0294	-.0214	.1146	-.0293	-.0161	-.0035	-.0059	-.0138	-.0187
750-999	.0194	.0167	.0093	.0843	.0212	.0074	.0646	.0373	.0651	.0396	-.0203	-.0386	-.0506
1,000-1,499	-.0134	-.0194	-.0052	.1216	-.0053	.0445	.0851	.0387	-.1212	-.0419	-.0013	-.0791	-.0122
1,500-2,499	-.0015	-.0175	-.0047	.0551	.0358	-.0137	.0747	-.0182	-.0590	-.0569	-.0109	-.0240	.0015
2,500-4,999	.0067	-.0152	-.0044	.0928	.0118	.0315	-.0060	.0803	-.0226	-.0157	-.0113	-.0730	-.0431
5,000-9,999	-.0013	-.0130	-.0057	.0285	.0080	.0590	-.0604	.0343	-.0738	.0169	-.0497	-.0721	.0751
10,000-49,999	-.0157	-.0121	-.0100	.0314	.0340	.0564	.0253	.0104	-.0734	-.0113	-.0265	-.0668	.0694

The strength and the direction of the association became higher and more clarified when change in size was defined either as decline or growth. A positive correlation with growth (+.0496) supported the hypothesis associating positive change in size with larger places. The negative correlation between initial size and decline (-.1126) meant that larger places were more unlikely to decline than smaller places. Larger places were also more likely to remain stable.

The results also indicated that the highest correlation between initial size and growth occurred at the 30 to 49.9 percent rate (+.0696) while the strongest negative association occurred with decline at the 50 to 100 percent rate.

Of all the ten initial size classes, the two smallest ones (75 to 149 and 150 to 299) correlated the highest with 1930 to 1970 change in size (+.0503 and -.0404, respectively), with growth (-.1431 and -.1042), and with decline (+.1474 and +.1202). These coefficients and the rest of the data in Table 9 confirmed the hypothesis more impressively with relatively higher correlations. They also revealed the higher sensitivity of smaller places to change. This meant that this sensitivity could be found in rural counties of the Upper Peninsula where a great majority of places were under 300 persons. In percentage terms, growth or decline was more marked in smaller places than in larger places. In general, recent studies of

population change since 1970 showed that nonmetropolitan centers grew more rapidly than metro areas.

The Pearson product moment coefficients of initial size and change in size (1930 to 1970) found in this study were significantly different in degree and direction from those found in previous studies; for example, those by Hassinger (1956), and Hart and Salisbury (1965).[1] This differences could have stemmed from several sources: the length of the period studied; the change in size being observed; the initial size at the beginning of each decade and change in size at the end of the decade; and the nature of the population of places studied, i.e., whether they were rural or urban places.

The negative correlation between initial size and the 1930 to 1970 change in size could indicate that larger places were slower growing than smaller places. The importance of the initial size will be discussed further in the multiple regression analysis section.

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[1]E. W. Hassinger, Factor Associated with Population Changes in Agricultural Trade Center of Southern Minnesota 1940-1950. Doctoral Dissertation for the University of Minnesota, 1956. J. F. Hart and Salisbury, "Population Change in Middle Western Villages: A Statistical Approach," Association of American Geographers Annals, 55 (3, 1965), pp. 140-160.

County Seat Status and Change in Size

Hypothesis II stated that:

> The county seat status of a place will stimulate greater rate of positive change in size of a place than will the absence of a county seat status.

Table 2, Appendix A, shows the distribution of growing and declining places according to the county seat status.

The data found in this table were consistent with those of previous studies in supporting the hypothesis. None of the county seat places declined more than 50 percent. Only six places, or 7.8 percent of the 77 county seats declined between 10 and 50 percent. Twelve places, or 15.8 percent, remained "stable," that is, changed between -9.9 and +9.9 percent. The rest of the county seats, 35 or 45.5 percent, grew between 10 and 50 percent. Seventeen places, or 22.1 percent, grew between 50 and 100 percent; and seven places, or 7.8 percent, grew more than 10 percent.

This pattern of distribution indicated a significant relationship. However, a Kendall's tau c test of the degree of the relationship showed a strength of +.0186, indicating that the variables were weakly related. The Pearson product moment correlation did not show a strong relationship between county seat status and the 1930 to 1970, 1930 to 1950, and 1950 to 1970 changes in size (-.0287, -.0159, and -.0189, respectively). However,

county seat status correlated higher with three broad categories of 1930 to 1970 (change in size) and with specific rates of 1930 to 1970 change in size (see Table 10).

The positive correlation with growth (+.8680) confirmed the hypothesis that county seats were more likely to grow than noncounty seats. Specifically, they were likely to grow at from 10 to 100 percent. Correlations at different rates in this range were about the same. Over the 100 percent growth rate, correlation became negative, meaning that county seats were less likely to grow at this rate.

The correlation coefficients between urban county seats and 1930 to 1970 change in size were higher than that between rural county seats: -.2778 and -.0191, respectively.[1] The stronger urban than rural associations were evident for the 1930 to 1970 period as well as for other levels of change in size. The inverse relationship with change in size could be explained in part by the size of the county seats themselves, since larger size places tended to grow more slowly.

In most cases, and particularly in the northern part of the state, the county seat was often the largest place in the county. Therefore, given the slower change in size of larger places (established in the preceding

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[1]Rural county seat referred to a county seat with less than 2,500 people; and a county seat with a population 2,500 or more was referred to as an urban county seat.

Table 10.--Correlation Between County Seat Status and the 1930-1970 Change in Size of Michigan Places.

	1930 to 1970	1930 to 1950	1950 to 1970	Percent Change in Size 1930-1970									
				% Growth Rates					% Decline Rates				% Stable
				Greater than 0	10.0 to 29.9	30.0 to 49.9	50.0 to 99.9	100 to over	Less than 0	-10.0 to -29.9	-30.0 to -49.9	-50 to -100	-9.9 to +9.9
County seat status	-.0287	-.0159	-.0189	.0680	.0706	.0813	.0605	-.0835	-.1079	.0002	-.0489	-.1040	.0625
County seat	-.0295	-.0195	-.0166	.0804	.0861	.0866	.0480	-.0818	-.1284	-.0299	-.0486	-.1074	.0753
Noncounty seat	.0300	.0197	.0168	.0779	.0826	-.0832	.0538	.0844	.1241	.0196	.0499	.1086	-.0725

discussion), county seats experienced increases in size but at a slower pace. As for any larger place, social, governmental, economic, and recreational activities played a significant role in giving the county seat the ability to increase its size over time (or to be more stable). Characteristics such as the headquarters of social services and county government, gave the county seat its viability. It is at the county seat level that federal, state and local agencies deal with the needs of citizens in the county. It is at the county seat that county organization headquarters will be found. This is most characteristic for rural regions such as the northern part of the state.

Road Quality and the Change in Size of a Place

Hypothesis III stated that:

> The higher the quality of roads present in a place, the greater the increase in size of a place; conversely, the lower the quality of roads present in a place, the greater the decrease in size of a place.

Type of roads as an independent variable has not often been tested in studies of growth and decline of places.

Table 3, in Appendix A, gives a distribution of Michigan places in ten change in size categories between 1930 and 1970, by quality of roads in 1970.

Five hundred and seventy four places, or 46.7 percent, were located on multilane state highways; 483

places, or 39.3 percent, were on improved two-lane highways; 6.3 percent were on designated county highways; about the same number of places (5.9 percent) were on the expressways; and 1.8 percent were on gravel roads.

Comparing the percentages in all rates of change categories, it could be observed that expressways had the highest percentage of places growing more than 500 percent (31.5 percent), while gravel roads had the highest percentage of places declining more than 50 percent (63.6 percent).

The pattern of distribution of places in every rate of change category was, with some exceptions, consistent with the hypothesis. In every rate of change category shown in Table 11, the trend of change clearly indicated that places tended to grow as the quality of roads improved. In other words, the proportion of places on gravel roads more often declined than places located on better quality roads. The reverse of the trend was true with growth. However, the -.1425 tau c coefficient indicated a weak relationship.

The Pearson product moment correlation showed that the association between the two variables reflected the tendency of improved roads to be associated with growth (+.1072). This was even more evident between 1930 and 1950 (+.1511). However, the degree of association was lower (-.0733) in the 1950 to 1970 period.

Table 11.--Distribution of Michigan Places in Three Categories of the 1930-1970 Change in Size by Class of Roads.

Class of Road	Decline		Stable		Growth		Total	
	#	%	#	%	#	%	#	%
Gravel Road	17	77.2	1	4.5	4	18.1	22	100
Designated County Road	42	54.6	1	1.3	34	44.2	77	100
County Paved Road	162	33.6	43	8.9	278	58.4	483	100
Multilane State Highway	156	27.1	44	7.7	374	65.2	574	100
Expressway	4	5.5	7	9.6	62	84.9	73	100
Total	381	31.0	96	7.8	752	61.2	1229	100

When the 1930 to 1970 change in size was defined simply as growth or decline, the correlation values increased: +.1806 for growth, and -.2107 for decline. The value of the correlation between quality of roads and the specific rate of change was lower than those with growth and decline. The highest value (-.1904) occurred at the 50 to 100 percent rate of decline category. Furthermore, the data shown in Table 12 indicated that the expressway, more than any other class of road, correlated with growth, a value of +.1871. The improved fourlane highway and the improved twolane highway correlated positively with growth rates between 10 and 100 percent, and negatively with 50 to 100 percent rates of decline. Other classes of roads

Table 12.--Correlation Between Quality of Roads and the 1930-1970 Change in Size of Michigan Places.

				Percent Change in Size 1930-1970									
				% Growth Rates					% Decline Rates				% Stable
	1930 to 1970	1930 to 1950	1950 to 1970	Greater than 0	10.0 to 29.9	30.0 to 49.9	50.0 to 99.9	100 to over	Less than 0	-10.0 to -29.9	-30.0 to -49.9	-50 to -100	-9.9 to +9.9
Road quality	.1072	.1511	-.0733	.1806	.0306	.0795	.0374	.0937	-.2107	.0326	.0778	.1904	-.0349
Expressway	.1762	-.0182	.1376	.1209	-.0211	-.0035	.0306	.1871	-.1374	-.0388	-.0589	-.1043	.0171
Multilane	-.0213	-.0700	-.0285	.0711	-.0794	-.0794	.0442	-.0548	.0730	-.0015	-.0221	-.0772	-.0033
Improved two-lane	-.0560	.0056	-.0324	-.1005	-.0290	-.0633	-.0215	.0275	.1054	.0263	.0433	.0842	.0009
Gravel road	-.0236	.2587	-.0145	-.0987	-.0365	-.0515	-.0293	-.0218	-.1157	-.0228	.0239	.1505	-.0202

had negative correlations with all growth rate categories. It was also shown that expressway correlated higher with growth rates of more than 100 percent for rural than urban places (+.1927 and +.1552, respectively). In other words, rural places were more sensitive than urban places to the impact of expressways at more than 100 percent growth rate. Other types of roads were relatively more associated with change in size at different rate categories in urban than in rural places.

Findings related to the quality of roads supported the hypothesis that the higher the quality of road, the lower the percent of declining places; or the lower the quality, the higher the percentage of declining places.

The higher percent of declining places among places on lower quality of roads reflected the limited accessibility (in and out of these places) to various services and opportunities. Lower quality meant a certain degree of isolation. Therefore, places located on lower class roads had less attraction to new residents, services and industries. It limits the opportunity of residents to commute daily to work in larger places. Commuting usually becomes intensive when roads are improved.

Road Intersections and the Change in Size

Hypothesis IV stated that:

> The higher the class of road intersection present in a place, the greater the increase in size of that place.

Conversely, the lower the quality of intersection, the lower the rate of increase in size of a place.

Closely related to the quality of road variable were the intersections and class of intersection variables. First, the data showed that the percentage of growing places was higher among places located at intersection than places not located at intersection (see Table 13).

Table 13.--Distribution of Michigan Places in Three Categories of 1930-1970 Change in Size by Intersection Status.

Intersection Status	Decline		Stable		Growth		Total
	#	%	#	%	#	%	#
Intersection	204	23.8	65	7.6	586	68.5	855
No Intersection	175	47.2	31	8.4	165	44.5	371
Total	379		96		751		1229

Second, further examination on the relationship between class of intersection and 1930 to 1970 change in size was made. Table 4, Appendix A, showed a detailed distribution of Michigan places in the 1930 to 1970 change in size categories, by class of intersection. Of the 855 places at intersections of Michigan roads, about 6 out of 10 places were at intersections of improved two-lane highways; and 3 out of 10 were at intersections of multilane highways. The rest were at intersections of expressways (5.6 percent),

and gravel roads (2.5 percent). Forty percent of the 35 places located at expressway intersections grew 500 percent or more. The rest of the classes of intersection each had less than 12 percent of their totals in this rate of growth category (500 or more). At the other extreme, 51.6 percent of the 31 places at gravel intersections declined in the 50 to 100 rate category, the highest in all classes of intersection. With some exceptions, the trend of change in every change rate category seemed to support the hypothesis, suggesting a positive relationship between class of intersection and growth.

The pattern of growth or decline that emerged after grouping change in size rate categories (decline, stable, and growth) distinctly indicated that the percentages of places growing rose with increased quality of intersection (see Table 14).

Both tau c (+.0575) and Pearson product moment correlation (-.0139) indicated a weak relationship between quality of intersection and 1930 to 1970 change in size. Neither during the 1930 to 1950 nor the 1950 to 1970 change periods did the strength of association between the variables improve (-.0461 and -.0333 for the respective two periods). The class of intersection exhibited similar correlation "behavior" with the 1930 to 1970 rate of change categories as did class of roads.

Correlation coefficients were relatively higher when the 1930 to 1970 change in size was categorized as

Table 14.--Distribution of Michigan Places in Three Categories of the 1930-1970 Change in Size by Class of Intersections.

Intersection Class	Decline		Stable		Growth		Total	
	#	%	#	%	#	%	#	%
Gravel Intersection	18	61.3	2	6.5	10	32.4	30	100
Designated Intersection	32	46.4	4	5.8	33	47.6	69	100
County Paved Intersection	127	24.4	35	6.6	365	69.2	527	100
State Two or Four Lane Intersection	26	13.2	20	10.2	151	76.2	197	100
Expressway Intersection	2	5.8	4	11.4	29	84.9	35	
Total	205	23.9	65	7.6	588	68.5	858	100

growth, decline, and stable, and in condensed rate of change categories. The multilane highway intersection, more than any other class of intersection, showed the highest positive correlation with growth and a negative correlation with decline (+.1360 and -.1659, respectively). Improved county highway intersections also had a relatively moderate positive relationship with growth, while gravel intersections correlated positively with decline (+.1009). This pattern of correlation supported the hypothesis that correlation would be positive and higher between growth and higher improved intersections, while it would be

negative and higher between less improved roads and decline (see Table 15).

As can be examined in Table 15, each class of intersection showed its highest correlation with a specific rate and nature (plus or minus) of change in size. It could be observed that small places, located at expressway intersections, could be expected to increase in size by 100 percent or more. In other words, more than any other class of intersection, expressway intersections were more associated with growth of 100 percent or more. The negative coefficients simply indicated that an intersection, such as an expressway intersection, was inversely related to a given specific change in size. Places located at gravel intersections, for example, correlated negatively with growth at all rates, but positively with decline at all three levels. These places would be more likely to decline than grow.

One could deduce that in general a place located at an intersection had a higher degree of accessibility than a place not so located, and consequently was more likely to grow. The class of intersection would condition the degree of accessibility of a place to the larger hinterland. Higher classes of intersection gave a rapid rate and a variety of input to a place. Services and other forms of economic activities could find it easier to move in a place, and to have rapid communication if the transportation system were improved, everything being equal.

Table 15.--Correlation Between Class of Road Intersection and the Change in Size of Michigan Places, 1930-1970.

	1930 to 1970	1930 to 1950	1950 to 1970	Percent Change in Size 1930-1970									
				% Growth Rates					% Decline Rates				% Stable
				Greater than 0	10.0 to 29.9	30.0 to 49.9	50.0 to 99.9	100 to over	Less than 0	-10.0 to -29.9	-30.0 to -49.9	-50 to -100	-9.9 to +9.9
Quality of intersection	-.0139	-.0401	-.0333	.1319	.0834	.0043	.0630	.0305	-.1199	-.0178	-.0564	-.0999	-.0331
Expressway intersection	.0724	-.0125	.0195	.0751	-.0345	.0462	-.0321	.1076	-.0927	-.0341	-.0489	-.0579	.0234
Multilane intersection	.0155	-.0325	-.0072	.1360	.0445	.0955	.0107	.0798	-.1659	-.0204	-.0665	-.1502	.0389
Improved two-lane intersection	-.0177	-.0356	-.0237	.1096	.0782	.0139	.0852	-.0181	-.0893	-.0138	-.0032	-.1030	-.0453
Gravel intersection	-.0209	.0318	-.0124	-.0906	-.0303	-.0585	-.0412	-.0017	.1009	.0057	-.0275	.1472	-.0092

Communication with other places and exchange in resources and materials could be facilitated between a given place and other places. It could be further observed that the rate of influence of the class of intersection diminished as the class became lower.

The four preceding operational hypotheses strongly suggested that the nature of change in size of a place was in part a function of the level of its urbanity: its size, the presence of the headquarters of county government, the quality of roads, and the quality of intersections present.

Hinterland Characteristics and Change in Size of Places

The second set of hypotheses was concerned with proximity of places in relation to freeways, largest place in the county, and the metropolitan center in the region.

Distance to Freeway and the Change in Size of Places

Hypothesis V stated that:

> The closer a place is located in relation to a freeway, the greater the increase in its size. Conversely, the greater the distance of a place from the freeway, the greater its decline in size.

In some of the previous studies, proximity to a freeway was thought to have a relationship with the change in size of places.

In Table 5, Appendix A, Michigan places are distributed in ten rate-of-change categories between 1930 and 1970 by zones of distance to a freeway.

About a third of all the places, or 30 percent, were within a 5 mile zone, 12.8 percent in a 6 to 10 mile zone, 7.4 percent in a 11 to 15 mile zone, and about half (49.7 percent) were beyond a 15 mile zone.

The pattern in most rate-of-change categories showed that as distance from the freeway increased, percentages of declining places became larger, or percentages of growing places become smaller. The 10.0 to 49.9 percent rate of growth category was an exception and thus the proximity hypothesis did not hold for growth at this level. However, when the ten categories were condensed into three broad categories (decline, stability, and growth, as in Table 16), the pattern of change in size supported the inverse relationship between distance and growth.

This inverse relationship was also reflected by the Pearson product moment correlation coefficients of distance with the 1930 to 1970 change in size (-.1510), and more so with either the 1930 to 1970 growth (-.3393) or decline (-.3143). The negative correlation with growth reflected mostly the association between distance and growth at a 100 percent rate or more (-.3754). This meant that it was difficult to find a place growing more than 100 percent at the greater distances as a result of freeway impact. There were some deviant cases from this general

Table 16.--Distribution of Michigan Places in Three Categories of the 1930-1970 Change in Size by Proximity in Relation to Freeways.

Distance to Freeway	Decline		Stable		Growth		Total	
	#	%	#	%	#	%	#	%
Five Miles	40	10.9	19	5.1	232	83.9	369	100
Ten Miles	42	26.8	9	5.7	106	67.5	157	100
Fifteen Miles	21	23.4	10	11.1	59	65.4	90	100
Beyond Fifteen Miles	274	45.1	58	9.5	276	45.4	608	100
Total	377	30.8	96	7.8	673	55.0	1224	100

tendency. Some places grew in the 10 to 29.9 percent rate at greater distances as a result of freeway impact (+.0613), but places at greater distance from the freeway would be more likely to decline, especially in the 50 to 100 percent rate (+.2479) (see Table 17).

With specific distance zones, it was found from the data (see Table 17) that the -.3745 correlation value between distances and the more than 100 percent growth rate was, more than in any other zone, likely to occur in a 5 mile zone (+.3654). The strength of association between this zone and other growth rate categories was much lower. On the other hand, it could be observed that places located beyond 15 miles from a freeway had the highest negative correlation with 100 percent or more (-.3331).

Table 17.--Correlation Between Distance to Freeway and the Change in Size of Michigan Places, 1930-1970.

	Percent Change in Size 1930-1970											
				% Growth Rates					% Decline Rates				% Stable
	1930 to 1970	1930 to 1950	1950 to 1970	Greater than 0	10.0 to 29.9	30.0 to 49.9	50.0 to 99.9	100 to over	Less than 0	-10.0 to -29.9	-30.0 to -49.9	-50 to -100	-9.9 to +9.9
Proximity to freeway	-.1510	.0296	.0833	-.3393	.0613	-.0287	-.0562	-.3745	.3143	.0935	.1176	.3479	.0748
Five mile zone	.1652	-.0792	.0917	.3047	-.0583	.0039	.0392	.3654	-.2838	-.1029	-.1211	-.1982	-.0646
Ten mile zone	-.0235	-.0287	-.0154	.0476	-.0031	.0314	.0262	.0115	-.0334	-.0017	.0281	-.0631	-.0289
Fifteen mile zone	-.0285	.0230	-.0134	.0260	.0070	.0548	-.0084	-.0097	-.0471	.0374	-.0341	.0651	.0340
Beyond fifteen mile zone	-.1196	.0253	-.0660	-.3176	.0549	-.0502	-.0500	-.3331	.2984	.0668	.1124	.2519	.0630

In summary, these data supported the inverse relationship between distance from a freeway and increase in size of a place. The converse was equally supported, i.e., the greater the distance, the greater the decline.

Further observations were made on the degree of association between distance and change in size of urban and rural places. In all three periods of change in size the values of correlation coefficients between the distance from a freeway and change in size were higher for urban than rural places. Correlation coefficients for the former were -.3410 for 1930 to 1970, -.3739 for 1930 to 1950, and -.4162 for 1950 to 1970. The values of coefficients for the latter were -.1534 for 1930 to 1970, +.0277 for 1930 to 1950, and -.0879 for 1950 to 1970. Both urban and rural places would be most likely to grow more than 100 percent if they were located within 5 miles of the freeway. Both categories of places showed correlation coefficients of significant strength: +.3744 and +.3581, respectively. Some urban places would increase their sizes by 30 to 49.9 percent, others by 50 to 100 percent. Rural places in the same zone were not significantly associated with growth between 10 and 49.9 percent. Some were associated with growth at the 50 to 100 percent rate. Further comparisons could be made from the data in Table 17, but the trend of change in both areas supported the hypothesis.

Proximity to freeway, and change in size, was yet another example of the principle of accessibility discussed

previously. Distance to freeway would be more detrimental to a small place if roads connecting it with the freeway were of lower quality.

Largest Place in a County and Change in Size of Places

Hypothesis VI stated that:

> The larger the largest place in a county, the larger the rate of growth of smaller places in the same county.

Before the question of proximity of smaller places to the largest place in a county could be examined, it was necessary to first establish varying degrees of influence by classes of the largest place. It was logical to think that the larger the dominant place in a county, the higher its positive influence on the change in size of smaller places.

A detailed distribution of Michigan places, by largest place, in ten rates of change categories between 1930 to 1970 is presented in Appendix A, Table 6. The data showed that counties with the largest place between 10,000 and 24,999 population had the largest number of smaller places (23.1 percent). Counties with the largest place between 5,000 and 9,999 had the second largest number (22.4 percent). Third were counties with the largest place over 50,000 people (18.1 percent), followed by counties whose largest place was between 2,000 and 4,999 (17.7 percent). Fifth were counties with the largest place between 1,000

and 1,999 (13.3 percent). Finally, counties whose largest place was between 25,000 and 49,000 had the smallest number of places (5.5 percent).

The pattern of increase or decrease of percentages in each rate-of-change category did not support the hypothesis. The percentages of declining places could be lower in the smaller of the largest size class than in the next higher class of largest place. The reverse could also be true, as in the case of the 1,000 to 1,999 class and intermediate classes between 10,000 and 24,999.

The data (from Table 6, Appendix A, and in Table 18) clearly showed the inconsistent pattern of increase or

Table 18.--Distribution of Michigan Places in Three Categories of the 1930-1970 Change in Size by Largest Place in a County.

Largest Size Class	Decline		Stable		Growth		Total	
	#	%	#	%	#	%	#	%
1,000-1,999	58	35.6	15	9.2	90	55.4	163	100
2,000-4,999	92	42.2	19	8.7	107	59.2	218	100
5,000-9,999	93	33.8	23	8.4	159	57.8	275	100
10,000-24,999	103	36.3	22	7.7	159	56.0	284	100
25,000-49,999	12	17.9	6	9.0	49	73.1	67	100
50,000-over	23	10.4	11	5.0	188	84.7	222	100
Total	381	31.0	96	7.8	752	61.2	1229	100

decrease of percentages. The 2,000 to 4,999 class has the highest percentage of declining places (or the lowest percentage of growing ones), followed by the 10,000 to 24,999 class. The former seemed to exert the most detrimental effect on smaller places. The negative effect found for the 2,000 to 4,999 class seemed to be consistent with the findings of some previous studies.[1]

The +.2402 tau c coefficient supported the existing relationship between the largest place in a given county and change in size of smaller places in the same county. The product moment correlation for the two variables indicated a weak relationship (-.0899). It rose when change in size was specifically defined in terms of growth or decline (-.1625 for growth, +.1960 for decline). Furthermore, there was no wide difference in change in size among places located in counties with the largest place between 5,000 to 9,999 and 10,000 to 24,999. They could exert the same degree of influence on smaller places.

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[1]Edward W. Hassinger, Factors Associated with Population Changes in Agricultural Trade Center of Southern Minnesota 1940-1950. Doctoral dissertation for the University of Minnesota (1956). James E. Butler and Glenn V. Fuguitt, "Small Town Population Change and Distance From Larger Towns: A Replication of Hassinger's Study," Rural Sociology, 35 (1970), pp. 397-409.

Proximity to the Largest Place in a County and Change in Size

Hypothesis VII stated that:

> The closer a smaller place is located to the largest place in a county, the greater the increase in the size of the smaller place.

The pattern of size change based on the largest place in a county was more revealing when proximity to the largest place was considered according to largest size categories. Proximity to the largest place in a county generally showed an inverse relationship, as a number of other studies have shown, and as indicated in Table 19.

But proximity could be more systematically approached by creating distance zones. Smaller places were first

Table 19.--Distribution of Michigan Places in Three Categories of the 1930-1970 Change in Size by Proximity in Relation to the Largest Place in a County.

Distance Category	Decline		Stable		Growth		Total	
	#	%	#	%	#	%	#	%
1-9.9 Miles	85	21.2	32	8.0	283	70.6	400	100
10-19.9 Miles	199	37.5	32	6.0	300	56.5	531	100
20-29.9 Miles	62	36.7	15	8.9	92	54.5	169	100
30-39.9 Miles	24	52.2	3	6.5	19	41.2	46	100
40 Miles and Over	5	45.5	1	9.1	5	45.5	11	100
Total	375	32.4	83	7.1	697	60.2	1157	100

defined in terms of less than 1,000 population and then defined in terms of less than 2,500 population. Smaller places were then examined around the largest size class places. The degree of correlation between each distance zone and change in size were compared in each largest size category to find competitor and complementary largest places in relation to smaller ones as defined above.

Largest places in the 1,000 to 1,999, 2,000 to 4,999 population categories were found to be competitors of smaller places in increase in size. The data (in Table 20) showed that smaller places located within the ten mile zone of each of these largest size categories were negatively related to growth, even growth at the smallest rate (10.0 to 29.9 percent). (Change in size of places located within the ten mile zone of the 5,000 to 9,999 could not be assessed because correlation coefficients were not made available by the computer.) Largest place in the 10,000 to 24,999 category or higher proved to be a source of increase in size of smaller places located at shorter distances. Distance to the largest size place above 10,000 was inversely related to the increase in size of smaller places. Metropolitan places showed the strongest positive influence on the change in size of smaller places (+.2189 correlation between five mile zone and increase in size) while the 2,000 to 4,999 largest size class seemed to be the strongest competitor to smaller places (with the

Table 20.--Correlation Between Proximity to the Largest Place in a County and the Change in Size of Michigan Places, 1930-1970.

	1930 to 1970	1930 to 1950	1950 to 1970	Percent Change in Size 1930-1970									
				% Growth Rates					% Decline Rates				% Stable
				Greater than 0	10.0 to 29.9	30.0 to 49.9	50.0 to 99.9	100 to over	Less than 0	-10.0 to -29.9	-30.0 to -49.9	-50 to -100	-9.9 to +9.9
Largest Place 1,000-1,999													
1.0 to 9.9 mile	-.0190			-.0217	-.0340	-.0087	-.0109	-.0362	.0275	-.0113	-.0265	.0643	
10.0 to 19.9 M	-.0291			- .0553	.0205	-.0358	-.0306	-.0271	.0484	-.0141	.0965	.0019	
20.0 to 29.9 M	-.0152			- .0217	.0026	.0401	-.0540	-.0114	.0051	.0260	-.0460	.0206	
30.0 to 49.9 M	-.0101			- .0398	-.0339	.0244	-.0385	-.0050	.0375	.0377	-.0259	.0387	
50.0 and over	-.0059			- .0359	-.0107	-.0102	-.0121	-.0152	.0426	.0086	-.0082	.0682	
Largest Place 2,000-4,999													
1.0 to 9.9 mile	-.0263			-.0754	-.0227	.0416	-.0090	-.0941	.0576	.0152	.0750	.0070	
10.0 to 19.9 M	-.0412			-.0667	.0150	-.0360	.0412	-.0980	.0939	.0435	.0238	.0705	
20.0 to 29.9 M	-.0267			-.0624	.0380	-.0351	.0068	-.0897	.0393	.0236	-.0201	.0476	
30.0 to 49.9 M	-.0115			-.0288	.0044	.0408	-.0321	-.0404	.0430	.0548	.0190	-.0011	
50.0 and over*													

Table 20.--Continued.

	1930 to 1970	1930 to 1950	1950 to 1970	Percent Change in Size 1930-1970									
				% Growth Rates					% Decline Rates				% Stable
				Greater than 0	10.0 to 29.9	30.0 to 49.9	50.0 to 99.9	100 to over	Less than 0	-10.0 to -29.9	-30.0 to -49.9	-50 to -100	-9.9 to +9.9
Largest Place 5,000-9,999													
1.0 to 9.9 mile*													
10.0 to 19.9 M	-.0251			-.0074	.0245	.0451	.0068	-.0683	.0103	.0093	.0693	.0120	
20.0 to 29.9 M	-.0251			-.0074	.0245	.0451	.0068	-.0683	.0103	.0075	-.0201	.0225	
30.0 to 49.9 M	-.0104			-.0067	.0371	.0069	-.0321	-.0145	.0197	-.0229	.0597	-.0011	
50.0 to over	-.0036			.0225	.0107	.0793	-.0121	-.0152	-.0190	-.0086	-.0082	-.0119	
Largest Place 10,000-24,999													
1.0 to 9.9 mile	.0269			.0414	-.0346	-.0079	-.0050	-.0861	-.0543	-.0217	.0089	-.0603	
10.0 to 19.9 M	-.0056			-.0552	-.0442	-.0097	-.0051	-.0176	.0759	.0334	-.0288	.0940	
20.0 to 29.9 M	-.0239			-.0418	-.0100	-.0196	.0411	-.0161	.0639	.0305	.0197	.0446	
30.0 to 49.9*													
50.0 to over	-.0202			-.0901	.0329	-.0448	-.0532	-.0511	.0875	-.0212	-.0200	.0365	

Table 20.--Continued.

	1930 to 1970	1930 to 1950	1950 to 1970	Percent Change in Size 1930-1970									
				% Growth Rates					% Decline Rates				% Stable
				Greater than 0	10.0 to 29.9	30.0 to 49.9	50.0 to 99.9	100 to over	Less than 0	-10.0 to -29.9	-30.0 to -49.9	-50 to -100	-9.9 to +9.9
Largest Place 25,500-49,999													
1.0 to 9.9 mile	.0609			.0845	-.0145	-.0117	-.0088	.1275	-.0789	-.0417	-.0395	-.0405	
10.0 to 19.9 M	-.0181			.0101	-.0288	.0564	-.0109	.0010	-.0173	-.0113	.0126	-.0231	
20.0 to 29.9 M	-.0015			.0092	.0545	-.0307	.0427	-.0459	-.0159	.0083	-.0246	-.0089	
30.0 to 49.9 M	.0017			.0227	-.0107	-.0102	-.0121	.0531	-.0190	-.0086	-.0082	-.0019	
50.0 to over													
Largest Place 50,000-over													
1.0 to 9.9 mile	.2053			.2189	-.0821	-.0501	-.0278	.3831	-.1919	-.0913	-.0846	-.1150	
10.0 to 19.9 M	.0024			.0575	-.0601	.0223	.0509	.0536	-.0649	-.0238	-.0174	-.0508	
20.0 to 29.9 M	-.0073			.0376	.0044	-.0271	.0575	.0113	-.0270	-.0229	.0190	-.0314	
30.0 to 49.9 M	-.0018			.0319	-.0151	-.0144	.0381	.0268	-.0268	-.0122	-.0115	-.0168	
50.0 to over													

*Could not be computed.

highest positive correlation with decline +.0576 within the ten mile zone).

Briefly stated, distance was positively related to increase in size of smaller places whose largest place size was between the 1,000 to 1,999 and the 5,000 to 9,999 categories. On the other hand, distance was negatively related to the increase in size of smaller places whose largest place size was above 10,000 population.

Data in Table 20 could be used to specify the distance from specific class of largest size place at which a specific change in size of a smaller place was likely to occur.

Proximity to Metropolitan Center and Change in Size of Places

Hypothesis VIII stated that:

> The increase in size of smaller places is inversely related to the distance to a metropolitan center.

Proximity to metropolitan places was simply an extension of the preceding section dealing with distance from the largest place. The interest was focused on the distribution of Michigan places by zones around metropolitan centers and their trend of growth or decline. As shown in Table 21, 4 out of 10 places in Michigan were located within a 25 mile zone around metropolitan centers. An equal number of places (4 out of 10) was located beyond 50 miles from metropolitan centers; and 2 out of 10 were within the 26 to 50 mile zone. In other words, 6 out of 10 places in

Table 21.--Distribution of Michigan Places in Three Categories of the 1930-1970 Change in Size by Proximity in Relation to Metropolitan Center.

Distance	Decline		Stable		Growth		Total	
	#	%	#	%	#	%	#	%
25 mile zone	67	13.9	23	4.8	394	81.4	484	100
50 mile zone	66	25.4	25	8.8	171	65.9	260	100
Over 50 miles	247	51.7	49	10.3	182	38.2	478	100
Total	380	31.2	95	7.7	147	61.1	1222	100

Michigan were located within commuting distance from metropolitan centers.

The data (see Table 21) clearly showed that growth was inversely related to distance from a metropolitan center. This could be interpreted as saying that about two thirds of Michigan places would experience growth. This was close to the actual situation, because out of the 1229 places considered, 800 experienced growth while the rest experienced decline.

Both tau c and Pearson product moment coefficient correlation supported the hypothesis that the greater the distance from a metropolitan center, the greater the rate of decline of smaller places. All the values of the product moment coefficients were relatively high. The correlation of proximity to metropolitan places with growth within 25 mile zone was higher for urban than for rural

places (+.4429 for urban and +.3160 for rural). Urban places also showed higher correlation with growth within the 26 to 50 mile zone (+.1187 for urban and +.0415 for rural).

Michigan Regions and Change in Size of Places

Hypothesis IX stated that:

> The more industrialized and urbanized the region, the greater the rate of increase in size of places in that region. Conversely the less industrialized and urbanized the region, the greater the likelihood for non-metropolitan places to decline.

In addition to the influence of places from the larger environment, state regions were hypothesized to exert differential influence upon smaller places.

Table 7, Appendix A, gives a detailed distribution of Michigan places in ten change in size categories. Since there were many empty cells in this table, the number of regions was reduced from eight to six after regions in the Upper Peninsula were combined. Table 22 in the text was then constructed. The boundaries of the regions were rather arbitrary (see Figure 3).

It could be observed from the data (Table 22) that the largest number of Michigan places (a total of 779) was found in the southern Lower Peninsula. Four hundred fifty-eight were found in the southeastern portion, and three hundred twenty-one in the southwestern portion of the state.

Table 22.--Distribution of Michigan Places in Three of the 1930-1970 Change in Size by State Regions.

Region	Decline		Stable		Growth		Total	
	#	%	#	%	#	%	#	%
UPW	129	74.1	13	7.5	32	18.4	174	100
UPE	46	54.1	12	14.1	27	31.8	85	100
LPNW	47	38.5	16	13.1	59	48.4	122	100
LPNE	21	30.4	8	11.6	40	58.0	69	100
LPSW	63	19.6	23	7.2	235	73.2	321	100
LPSE	75	16.4	24	5.2	358	78.4	458	100
Total	381	31.0	96	7.8	752	61.2	1229	100

The rest of the places were found in the Upper and Lower Northern Peninsula.

In the western part of the Upper Peninsula the number of declining places was the highest (74.1 percent); only 18.4 percent grew more than 10 percent, and 7.5 were stable. The pattern of change in size of places was very consistent with the regions of the state in that the number of growing places became higher with urbanized regions of the southern part of the state. The pattern in the change in size of places reflected the degree of urbanization of the state regions, with the southeastern Lower Peninsula being more urbanized than the northern Lower and the Upper Peninsulas.

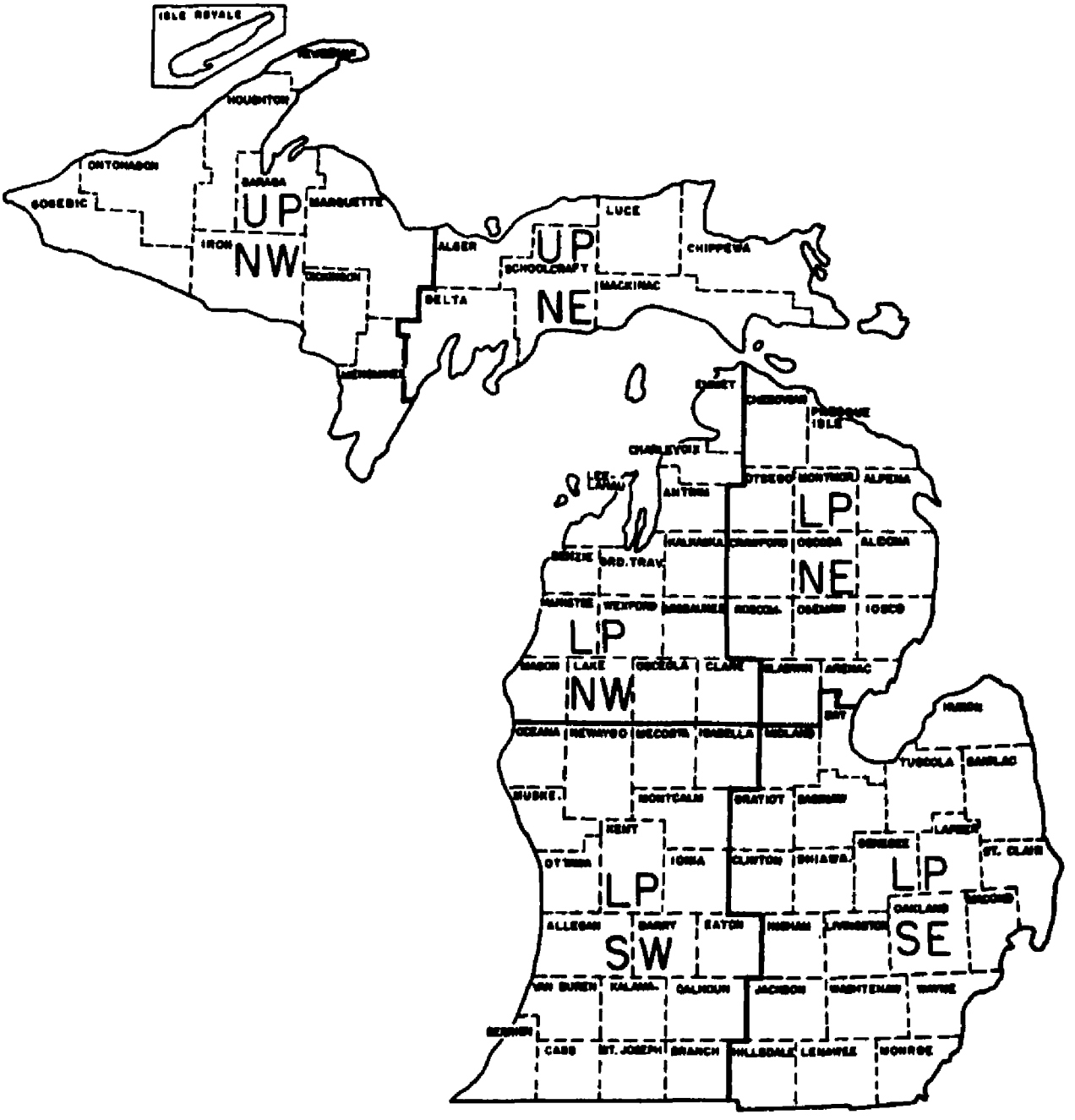

Fig.--Michigan regions.

This change-in-size pattern seemed to support the hypothesis that the urban regions would stimulate the size increase of smaller places more than rural regions. However, the association between regions and change in size is weak in the 1930 to 1970 (+.1063), 1930 to 1950 (-.0905), and 1950 to 1970 (+.0572) periods. During the 1930 to 1950 period, places in urban regions were growing more slowly than those in rural regions.

As with other independent variables in this study, the region variable showed a relatively stronger relationship when change-in-size was defined as growth or decline (+.4320 and -.4242, respectively). The direction and the value of these coefficients indicated that a general change in a region would affect change in size of smaller places within the same region in the same direction. Industrialization or urbanization of a region would be reflected in the general trend of urbanization or industrialization of individual places in that region. More specifically, places would tend to experience growth or decline depending upon the regional pattern.

When the state was categorized into six distinct regions, all of them, except the industrialized regions of the south, reflected a negative weak association with change throughout the 1930 to 1970 period. The rural region of the western Upper Peninsula, for example, showed a negative relationship with change in size (-.0473), suggesting a high degree of rurality of the region with

less growth of its places and very little or no stability (+.0016). The data showed that at different levels of growth, coefficients for the Upper Peninsula's western region suggested that if there was growth at all, places in this region would be expected to grow at the 10 to 30 percent rate (+.0597). But places in this region were more strongly associated with decline (+.2377) at the 50 to 100 percent rate. Other predominantly rural regions of the northern portion of the state did present an exception to this pattern.

In the industrialized south, the east and the west regions had positive associations with the 1930 to 1970 change in size, with the southeastern region showing a stronger relationship (+.1024) than did the southwestern region (+.0020). Though the association of the latter with the 1930 to 1970 change in size was not evident, it became clear that places in the region did correlate with stronger growth (+.1458). Besides showing a stronger association with growth, the southeastern region also had a higher degree of stability of places than any other region (+.0727).

What rate-of-change places are these regions specifically more likely to have? The correlation of the northwestern region of the Upper Peninsula with growth was discussed above. All regions in the rural north of the Lower Peninsula showed a negative correlation with almost every level of growth, or a positive correlation with all levels of decline. On the other hand, the southwestern

region showed weak positive associations with various rates of growth (see Table 23). The southeastern region correlated positively with all rate categories of growth except the 10 to 29.9 percent rate category. This region registered the highest correlation coefficient value with the 1930 to 1970 increase in size at the rate of 100 percent or more (+.2274).

The preceding findings lead to the observation that the pattern of correlation of regions and change in size of nonmetropolitan places supported the hypothesis that the less the urbanization or industrialization, the greater the decline in size of places. As in other independent variables discussed above, higher correlations occurred when independent and dependent variables were categorized.

Farm Characteristics and Change in Size

This section reports the findings concerning farm characteristics in a county as they related to change in size of places in the same county.

Change in the Number of Farms and Change in Size of Places

Hypothesis X stated that:

> The greater the decrease in the number of farms in a county, the greater the rate of decrease in size of places in that county.

The data showed that there was a tendency for places to decline as the number of farms declined. In

Table 23.--Correlation Between State Region and the Change in Size of Michigan Places, 1930-1970.

	1930 to 1970	1930 to 1950	1950 to 1970	Percent Change in Size 1930-1970									
				% Growth Rates					% Decline Rates				% Stable
				Greater than 0	10.0 to 29.9	30.0 to 49.9	50.0 to 99.9	100 to over	Less than 0	-10.0 to -29.9	-30.0 to -49.9	-50 to -100	-9.9 to +9.9
Region	.1063	-.0905	.0572	.4320	.0465	.1001	.1717	.2432	-.4242	-.1161	-.1514	-.3479	-.0540
UPW	-.0473	.1230	-.0251	-.2502	.0597	-.0726	-.0951	-.1075	.2647	.0252	.1164	.2377	.0016
UPE	-.0274	-.0135	-.0114	-.0996	-.0242	-.0049	-.0239	-.0723	.1045	.0136	.0373	.0974	.0009
LPNW	-.0408	-.0250	-.0224	-.0889	.0569	-.0333	-.0732	-.0600	.0553	.0366	.0177	.0362	.0662
LPNE	-.0296	-.0151	-.0145	-.1292	-.0233	-.0181	-.0378	-.0862	.0572	.0465	.0068	.0730	.0846
LPSW	.0020	-.0050	-.0180	.1458	.1289	.0532	.0275	.0041	-.1454	-.0342	-.0246	-.1440	-.0142
LPSE	.1024	-.0415	.0676	.2681	-.0853	.0562	.1276	.2274	-.2406	-.1000	-.0940	-.1645	-.0727

other words, the greater the decline in the number of farms in a county, the higher the percentage of declining places in the same county (see Table 8, Appendix A). For example, the highest percentage of declining places (38.0 percent in the 50 to 100 percent rate and 37.0 percent in the 10 to 49.9 percent rate of decline categories) was found in counties where the reduction in the number of farms was between 80 and 100 percent. At the other extreme, those counties in which farms declined between 0 and 39.9 percent, had the lowest percentage of places declining at the rate below 50 and 100 percent (7.2 percent). In all categories of declining numbers of farms, the percentages of declining places was about the same (in the 10 to 49.9 percent rate of decline). This could indicate that the farm number decline categories between the 0 and 59.9 percent rate had about the same impact on the change in size of places. The pattern of percentages in each change rate seemed to support the hypothesis, but not without exception.

When the data was condensed into three categories, a consistent pattern of change in size emerged (see Table 24). But this pattern still showed that the three categories of farm number declines (0 to 39.9 percent, 40 to 49.9 percent, and 50 to 59.9 percent) had about the same percentages of declining or growing places.

Tau c (+.1777) showed a weak relationship, and the Pearson product moment correlation coefficient (-.0050)

Table 24.--Distribution of Michigan Places in Three Categories of the 1930-1970 Change in Size by Change in the Number of Farm in a County, 1930-1970.

Farm Change Category	Decline		Stable		Growth		Total	
	#	%	#	%	#	%	#	%
0 to -39.9	14	22.6	3	4.8	45	72.5	62	100
-40.0 to -49.9	61	19.1	25	7.9	232	73.0	318	100
-50.0 to -59.9	71	21.8	22	6.7	233	71.4	326	100
-60.0 to -69.9	62	25.2	14	5.7	170	69.0	246	100
-70.0 to -79.9	73	52.2	21	15.0	46	32.9	140	100
-80.0 to -100	100	73.0	11	8.0	26	19.1	137	100
Total	381	31.0	96	7.8	752	61.2	1229	100

showed an even weaker relationship between the decrease in the number of farms and the change in size.

However, when change in size was categorized into three broad categories (growth, decline, stable) that correlations become stronger (see Table 24). Change in the number of farms showed a correlation of +.3362 with growth and -.3305 with decline. It could, therefore, be said that change in the number of farms in a county was positively related to change in sizes of places in the county, i.e., decline in the number of farms in a county could induce decline in place size. More clarification emerged with specific rates of decline in the number of farms and in size of places, as Table 24 indicated. The decline rate

at 80 to 100 percent in the farms numbers was associated relatively strongly with growth or decline in size. It was more strongly associated with decline in size at the 50 to 100 percent rate (-.2661). This association held less strongly with other rates of decline in size as shown by lower correlation coefficients. This category of farm number decline (80 to 100 percent) also had the highest correlation value with other rates of decline in size (see Table 25).

These findings would have supported the hypothesis in a reformulated form, reflecting the positive relationship between the two variables. It could therefore be said that the smaller the decline in the number of farms in a given county, the smaller the decrease in size of places in that county. This could be an indication that in counties where the number of farms has reached a stable number, as reflected in a low percentage of decline in the number of farms, the relationship between change in size of a place and decline in the number of farms became weaker.

Change in the Average Farm Size in a County and Change in Size

Hypothesis XI stated that:

> The larger the increase in a county average farm size, the higher the rate of decline in size of places located in that county.

It was difficult to perceive any general pattern reflecting an association between change in size of places

Table 25.--Correlation Between Change in the Farm Number in a County and the Change in Size of Michigan Places, 1930-1970.

				Percent Change in Size 1930-1970									
				% Growth Rates					% Decline Rates				% Stable
	1930 to 1970	1930 to 1950	1950 to 1970	Greater than 0	10.0 to 29.9	30.0 to 49.9	50.0 to 99.9	100 to over	Less than 0	-10.0 to -29.9	-30.0 to -49.9	-50 to -100	-9.9 to +9.9
Percent change in farm number**	-.0050	-.0635	.0320	.3352	.0484	.0131	.2080	.0333	-.3305	-.0942	-.1207	-.2661	-.0394
0 to -39.9*													
-40 to -49.9*													
-50 to -59.9*													
-60 to -69.9	-.0421	-.0305	.0359	.1549	.0399	.1170	.1479	-.0618	-.1618	-.0302	-.0596	-.1423	-.0026
-70 to -79.9	.0907	-.0332	-.0060	.1164	.0130	-.0502	-.0249	.1857	-.1076	-.0507	-.0503	-.0627	-.0261
-80 to -100	-.0700	.0806	-.0352	-.3407	-.0652	-.0741	-.1449	-.1648	.3373	-.1035	-.1385	.2543	.0378

*For some reasons the computer could not calculate correlation coefficients in these rates of farm number decline.

**Correlations for both the 1930 and 1969 number of farms in a county were .0302 and .0033, respectively.

and change in the average farm size (see Table 9, Appendix A).

According to data presented in Table 26, about 32.9 percent of the places were in areas where the average farm size increased between 30 and 49.9 percent; 28.5 percent of places were in areas where the average farm size increased between 50 and 69.9 percent, 23.3 percent in areas with a 70 to 100 percent increase in average farm, about 10.0 percent of places were in areas with a 0 to 29.9 percent average farm increase, and 5.2 percent were in areas where there was a decline in average farm size The pattern of percentages showing growth, for example, suggested that as the average farm size increased, the percentage of

Table 26.--Distribution of Michigan Places in Three Categories of the 1930-1970 Change in Size by Rate of Change in Average Farm Size in Counties.

Percent Change in Average Farm Size Category	Decline		Stable		Growth		Total	
	#	%	#	%	#	%	#	%
-100 to 0	14	21.5	2	3.1	49	75.4	65	100
0.0 to 29.9	19	15.6	8	6.5	95	77.9	122	100
30.0 to 49.9	77	19.0	30	7.4	298	73.6	405	100
50.0 to 69.9	88	25.1	27	7.7	236	67.3	351	100
70.0 to 100	183	64.0	29	10.1	74	25.9	286	100
Total	381	31.0	96	7.8	752	61.2	1229	100

places increasing in size decreased; or the larger the average farm size, the greater was the decline.

The tau c test (-.2972) supported the inverse relationship between the change in the average farm size and change in size of a place. Similarly, the Pearson product moment correlation showed a weak inverse relationship (-.1029). This kind of association was found for the 1930 to 1950 change (-.1066); but it was weaker with the 1950 to 1970 change in size (-.0300).

When the dependent variable was categorized, the value of the correlation coefficient increased (see Table 27). The change in the average farm size in a county (without specific size) had a +.3257 product moment correlation with growth, and -.3362 correlation with decline.

Further expansion of change in the average farm size into rate of change categories (see Table 27) provided further illumination on specific degrees of the relationship with the dependent variable. In counties where the average farm size increased by 0 to 29.9 percent, the correlation between this trend and change in size was almost nil (+.0083). As the change in the average farm size increased from 25 to 49.9 percent, the degree of association increased to -.0452. With the highest increase (70 to 100 percent) in average farm size, the degree of association rose to -.0852, but still remained weak as in other categories of rate-of-change in average farm size.

Table 27.--Correlation Between Change in the Average Size Farm in a County and the Change in Size of Michigan Places, 1930-1970.

				Percent Change in Size 1930-1970									
				% Growth Rates					% Decline Rates				% Stable
	1930 to 1970	1930 to 1950	1950 to 1970	Greater than 0	10.0 to 29.9	30.0 to 49.9	50.0 to 99.9	100 to over	Less than 0	-10.0 to -29.9	-30.0 to -49.9	-50 to -100	-9.9 to +9.9
Change in the Average Size Farm*	-.1039	.1066	-.0300	-.3362	-.0483	-.0517	-.1105	-.2197	.3257	.1214	.1283	.2329	.0496
0 to -100	.1264	-.0174	.0299	.0675	-.0665	-.0389	-.0501	.2045	.0472	-.0452	-.0265	-.0063	-.0412
0 to 29.9	-.0083	-.0145	.0008	.0535	-.0324	-.0551	.0513	.0858	-.0525	.0047	-.0551	-.0308	-.0068
30.0 to 49.9	.0452	-.0080	-.0137	.2190	.0447	.0969	.0613	.0937	-.2202	-.0946	-.0308	-.1907	-.0168
50.0 to 69.9	-.0284	-.0473	.0393	.0750	.0686	.0169	.0750	-.0444	-.0781	.0161	-.0587	-.0703	-.0016
70.0 to 100.0	-.0853	.0761	-.0420	-.3907	-.0752	-.0850	-.1464	-.2057	.3855	.1136	.1358	.3111	.0457

*Correlations for both the 1930 and 1969 average size farm in a county were .0562 and -.1282, respectively.

It was further observed that a change in average farm size had different degrees of correlation with change in size in urban and rural places, but the nature of the correlation was the same. A change of 0 to 29.9 percent in average farm size in a county correlated with the 1930 to 1970 growth (+.1066 in urban and +.0493 in rural places). The degree of association was not significantly different at more than 100 percent growth rate (+.0775 for urban and +.0872 for rural places). When change in the average farm size exceeded 50 percent, correlation with growth became negative in both urban and rural places. For example, at the 70 to 100 percent rate-of-change of the average farm size there was a strong negative correlation with growth in urban and rural places (-.6071 and -.3712, respectively). This meant that there was a large reduction of the number of farms, or the number of farmers, and consequently the decline of the place.

An increase in average farm size below 50 percent could induce growth, and an increase over 50 percent could induce decline. In other words, with a small decline in average farm size, the decrease in size of places in a county would occur, because smaller numbers would serve the remaining farmers. As the average farm increased to medium size, the medium size farmers could have required additional new services which could have caused a place to increase in size. When the average farm size increase was over 75 percent, a reduction in the number of farms became

inevitable, with its consequence of decline in the number of farm-oriented services depending heavily on farm industry. These findings indicated that the smaller the increase in the average farm size in a county, the higher the number of places in the county increased their sizes.

Change in Farm Population and Change in Size

Hypothesis XII stated that:

> The greater the decrease in the number of farm population in a county, the greater the decrease in size of places in the county.

The data was arranged into a detailed distribution of Michigan places in ten categories of 1930 to 1970 change in size, and by categories of farm population change (see Table 12, Appendix A).

The highest number of Michigan places (33.4 percent) were located in counties where the farm population declined between 60.0 and 79.9 percent. The second largest group (21.9 percent) were in counties with a farm population decline in the 40 to 49.9 percent category. Two hundred and fourteen places (or 17.4 percent) were in counties with a decline of 50.0 to 59.9 percent farm population. The lowest number (8 places) were in counties with an increase in the farm population.

The percentage distribution of places in every rate category of decline in size was positively related to decrease in the farm population, with some exceptions. On

the other hand, the distribution of percentages in every rate category of increase in size was inversely related to decline in the farm population of a county. In other words, the higher the percentage of declining places, the higher the percentage of declining farm population (see Table 28).

Table 28.--Distribution of Michigan Places in Three Categories of the 1930-1970 Change in Size by Rates of Farm Population Change in Counties.

Farm Population Change Category	Decline		Stable		Growth		Total	
	#	%	#	%	#	%	#	%
-1.00 to -.80	36	78.3	3	6.5	7	15.2	46	100
-.80 to -.60	200	48.7	42	10.2	169	41.1	411	100
-.60 to -.50	50	23.4	7	3.3	157	73.4	214	100
-.50 to -.40	57	21.2	31	11.5	182	67.6	269	100
-.40 to -.30	20	14.7	3	.2	113	83.1	136	100
-.30 to 0	16	11.0	8	5.5	121	83.4	145	100
0 to 9998	2	25.0	2	25.0	4	50.0	8	100
Total	381	31.0	96	7.8	752	61.2	1229	100

The Pearson product moment correlation coefficients showed a weak relationship between the farm population change and the 1930 to 1970, 1930 to 1950, 1950 to 1970 changes in size (+.0730, -.0437, and +.0514, respectively). As expected, the correlation with growth (or decline) was higher (+.3236 for growth and -.3286 for decline). The

data also indicated that the declining effect in size of places would be more likely to occur when farm population declined in the 70 to 100 percent rate (+.2547). The pattern of correlation in other change-in-size categories and rates of farm population change, in urban and rural places, was similar to those of other independent variables (see Table 29).

Change in Work Force in a County and Change in Size

The fourth set of hypotheses dealt with the work force at the county level. It was hypothesized that the change in the work force characteristics of a county would be related to the change in size of places located in the county. In this section, examination is given first to the relationship between change in extractive work force and change in size; second, change in nonextractive industry work force and change in size will be examined. The relationship between change in size and work force numbers in 1930 and 1969 are reported in Appendix B.

Change in Extractive Industry Work Force and Change in Size

Hypothesis XIII stated that:

> The greater the decrease in the work force in extractive industry in a county, the greater the decrease in size of places in that county. Conversely, the increase in labor force of extractive industry will positively affect the change in size of places in that county.

Table 29.--Correlation Between Change in Farm Population and the Change in Size of Michigan Places, 1930-1970.

				Percent Change in Size 1930-1970									
				% Growth Rates					% Decline Rates				% Stable
	1930 to 1970	1930 to 1950	1950 to 1970	Greater than 0	10.0 to 29.9	30.0 to 49.9	50.0 to 99.9	100 to over	Less than 0	-10.0 to -29.9	-30.0 to -49.9	-50 to -100	-9.9 to +9.9
Percent Change in Farm Population*	.0730	-.0344	.0814	.3236	-.0177	.0471	.1298	.2440	-.3286	-.0903	-.1359	-.2554	-.0216
0 to 99,998	-.0678	-.0161	-.0346	-.3450	-.0764	-.0739	-.1100	-.1913	.3525	.0119	-.0231	-.0052	.0195
0 to -24.9	.0054	.0298	-.0316	-.0155	.0665	.0266	-.0578	-.0409	.0261	-.0213	-.0517	-.0752	-.0169
-25.0 to -49.9	.0278	-.0127	-.0013	.2332	-.0029	.0176	.1276	.1510	-.2392	-.0781	-.0848	-.1942	-.0116
-50.0 to -74.9	.0054	.0298	-.0316	-.0155	.0668	.0266	-.0578	-.0408	.0261	.0181	-.0182	.0333	-.0168
-75.0 to -100	-.0678	-.0161	-.0346	-.3450	-.0764	-.0739	-.1100	-.1913	.3525	.0925	.1616	.2654	.0195

*Correlations for farm population both in 1930 and 1970 were .0489 and .0639, respectively.

The data (see Table 10, Appendix A) showed that there was an indication that: there was no increase in the extractive industry work force between 1930 and 1970 in Michigan; and that places were distributed in counties with different rates of decline in extractive work force. Most places (19.8 percent) were in counties with the 80 to 84.9 percent decline rate. Counties with an extractive work force declining at a rate of 70 to 74.9 and 75 to 79.9 percent had about the same number of places (16.8 percent and 17.1 percent, respectively). The lowest percentage of places were in counties with a declining work force of 90 to 100 percent.

With few exceptions, the distribution pattern of places by categories of percentage change in extractive industry work force, showed that the higher the decline in extractive industry work force, the higher the percentage of declining places. It could be observed from data (see Table 30) that when there was a sharp decline in extractive industry work force (90 to 100 percent), the percentage of declining places was higher than that of growing places in the same category (66.3 percent of declining and 23.1 of growing ones). The number of declining and growing places was about the same (44.5 percent for the former and 48.6 for the latter) in counties where the decline rate was between 85 and 89.9 percent. Counties with extractive industry work force less than 85 percent had more growing places than declining ones. It could also be observed

Table 30.--Distribution of Michigan Places in Three Categories of 1930-1970 Change in Size by Rates of Decline in Extractive Industry Work Force in Counties.

Percent Work Force Decline Category	Decline		Stable		Growth		Total	
	#	%	#	%	#	%	#	%
0.0 to -59.9	40	25.6	5	3.2	111	71.1	156	100
-60.0 to -69.9	29	16.6	9	5.2	136	78.2	174	100
-70.0 to -74.9	34	16.2	15	7.1	161	76.6	210	100
-75.0 to -79.9	61	29.4	15	7.2	131	63.3	207	100
-80.0 to -84.9	90	37.0	32	13.2	121	49.8	243	100
-85.0 to -89.9	64	44.5	10	6.9	70	48.6	144	100
-90.0 to -100	63	66.3	10	10.6	22	23.1	95	100
0.0 to 9998	0		0		0		0	
Total	381	31.0	96	7.8	752	61.2	1229	100

that a decline in work force between 0 and 60 percent had 9 percent more declining places than the declining work force category of 60 to 75 percent.

The association between change in extractive industry work force and change in size was weak, as indicated by the tau c test (+.2927) and by the Pearson product moment correlation (+.1996). This was the strongest association of all variables (independent variables without specific definition in operational terms) discussed up to this point. The degree of this association did not greatly change when 1930 to 1970 change-in-size was categorized in terms of growth and decline (+.2363 for growth and -.2027 for decline).

Furthermore, the Pearson correlation coefficients showed that an increase in extractive work force would, in general, be more likely to correlate with growth at the rate of 100 percent or more (+.3367). More specifically, this high degree of correlation existed especially between extractive industry work force decline (at 90 to 100 percent) and the 50 to 100 percent rate of decline in place size. The two variables were positively correlated, i.e., the greater the decline in the extractive industry, the greater the decline in size of places (see Table 31).

In urban places the degree of association between percent of change in the extractive industry work force and the 1930 to 1970 change in size, showed a higher correlation (+.3728) than that of all places combined (+.1996),

Table 31.--Correlation Between Change in Extractive Industry Work Force in a County and the Change in Size of Michigan Places, 1930-1970.

	1930 to 1970	1930 to 1950	1950 to 1970	Percent Change in Size 1930-1970									
				% Growth Rates					% Decline Rates				% Stable
				Greater than 0	10.0 to 29.9	30.0 to 49.9	50.0 to 99.9	100 to over	Less than 0	-10.0 to -29.9	-30.0 to -49.9	-50 to -100	-9.9 to +9.9
Change in Extractive Work Force**	.1996	.0729	.0412	.2363	-.0713	.0317	-.0327	.3367	-.2027	-.0501	-.0832	-.1623	-.0801
Greater than 0*													
0 to -24.9*													
-25.0 to -49.9	.1354	-.0175	.0092	.0281	-.0357	.0041	-.1019	.1463	-.0204	.0047	-.0417	.0009	-.0180
-50.0 to -74.9	.0825	.0700	.0632	.2547	-.0416	.0700	.0664	.2197	-.2248	-.0495	-.0651	-.2050	-.0755
-75.0 to -100	-.1428	-.0607	-.0662	-.2627	.0570	-.0705	-.0187	-.2822	.2298	.0464	.0829	.2007	.0814

*Could not be computed.

**Correlations for extractive industrial work force in both 1930 and 1970 were .0797 and .2070, respectively.

and than that in rural places (+.2085). At every rate-of-change category, coefficients of correlation for urban places remained higher than for rural places. The generally higher degrees of association in urban places could be explained by the fact that rural places might not have had extensive extractive industries, as they were mostly dependent upon farm industry. Furthermore, the extractive industry work force of a county as a whole reflected mostly the work force present in places larger than 2,500 people, or urban places.

The data also showed that places in counties with a decline of the work force up to 70 percent could still grow; but if the work force declined more than 70 percent, the majority of places would decline. This decline "threshold" could be different at the individual level; i.e., at a lower level of work force decline (15 or 20 percent decline, for example), most places could be adversely affected. The threshold indicated in general that there had to be a certain degree of change in the larger environment of a place, in order that an individual place be either adversely or positively affected.

The positive association between decline in size and decline in extractive industry work force could reflect the process in which counties lost other supporting services as a consequence of sharp decline in the work force. As the degree of declining work force became lower, a gradual adaptation could have taken place in a county as other

industries emerged, thus slowing down the exodus of people. Some new services could have been created in the county to absorb the displaced work force from extractive industry.

Change in Nonextractive Industry Work Force and Change in Size

Hypothesis XIV stated that:

> The greater the increase in nonextractive industry work force in a county, the greater the increase in the size of places in that county.

The pattern of percentages in the distribution of growing or declining places by categories of change rate in the nonextractive industry work force was similar to that of the change in extractive industry work force (see Table 11, Appendix A). The highest percentage of places (18.5 percent) was in counties with the highest rate of increase in nonextractive work force (250 percent or more). The next largest number of places (not very different from the largest number) was in counties with an increase in the 100 to 149.9 percent rate (210 places, or 17.1 percent). Other rate of increase categories in the nonextractive work force had about the same number of places (see Table 11, Appendix A).

In the 10 to 49.9 percent and the 50 to 100 percent rate-of-decline categories, the percentages of declining places decreased as the percentage of nonextractive industry work force increased up to the 35 to 69.9 percent rate category. The percentages stayed nearly the same, or

increased slightly, as percentages of the nonextractive work force continued to increase. The percentage of stable places remained about the same in all rates of change in nonextractive work force between 0 and 149.9 percent, and then it declined. Percentages increased, with some exceptions, in all rates-of-growth in size categories as the work force increased.

When rates-of-change in size categories were condensed (see Table 32), exceptions to the relationship were more visible. The trend of declining places, for example, was inversely related to the trend of growth in the nonextractive industry work force. The slight decline in

Table 32.--Distribution of Michigan Places in Three Categories of 1930-1970 Change in Size by Rates of Increase in Nonextractive Work Force in Counties.

Percent Work Force Change Category	Decline		Stable		Growth		Total	
	#	%	#	%	#	%	#	%
-100 to 0	59	75.6	6	7.7	13	16.7	78	100
0 to 34.9	76	66.0	13	11.4	26	22.6	115	100
35.0 to 69.9	60	42.2	13	9.2	69	48.6	142	100
70.0 to 99.9	25	19.4	11	8.5	93	72.1	129	100
100.0 to 149.9	51	24.3	27	12.8	132	62.9	210	100
150.0 to 199.9	40	25.5	9	5.7	108	68.8	157	100
200.0 to 249.9	43	25.1	10	5.8	118	69.0	171	100
250.0 to 999.9	27	11.9	7	3.1	193	85.0	227	100
Total	381	31.0	96	7.8	752	61.2	1229	100

growth trend in the 100 to 249.9 percent rates of increase in work force suggested that the nonextractive work force in these counties could be commuting from adjacent counties. Hence, they probably did not reside in counties where the increase in work force was reported.

The tau c test (+.3070) and the Pearson product moment correlation coefficient (+.1917) showed that the association of change in nonextractive work force and change in size was the second strongest (but about the same as that between change in extractive work force and change in size) association of the variables considered up to this point. As with the extractive work force, the association was stronger with the 1930 to 1970 growth or decline (+.2952 and -.2692, respectively), and especially with the growth rate at 100 percent or more (+.3531).

It could also be observed (see Table 33) that a nonextractive work force decline in the 0 to 100 percent rate, or an increase in the 0 to 50 percent rate had the same nature (negative) and about the same strength of relationship with the 1930 to 1970 growth or decline of a place. Nonextractive work force increased over 50 percent correlated positively with growth. The two categories (0 to 100 percent decline and 0 to 49.9 percent growth) continued to show the same nature and degree of associations with other rates of growth or decline in size of a place. This meant that counties with a 0 to 49.9 percent increase in nonextractive work force did not do any better to

Table 33.--Correlation Between Change in Nonextractive Industry Work Force in a County and the Change in Size of Michigan Places, 1930-1970.

				Percent Change in Size 1930-1970									
				% Growth Rates					% Decline Rates				% Stable
	1930 to 1970	1930 to 1950	1950 to 1970	Greater than 0	10.0 to 29.9	30.0 to 49.9	50.0 to 99.9	100 to over	Less than 0	-10.0 to -29.9	-30.0 to -49.9	-50 to -100	-9.9 to +9.9
Change in Nonextractive Work Force*	.1917	-.0437	.0486	.2952	-.0360	.0183	.0076	.3531	-.2692	-.1035	-.0942	-.1988	-.0727
0 to -100	-.0443	-.0015	-.0225	-.2346	-.0479	-.0417	-.0929	-.1241	.2485	.0996	.0748	.1892	-.0016
0 to 49.9	-.0685	.0743	-.0357	-.2504	-.0409	-.0535	-.0845	-.1471	.2345	.0520	.0698	.2122	.0510
50.0 to 99.9	.0137	.0269	-.0039	.0701	-.0062	-.0033	.0662	.0840	-.0729	-.1010	-.0185	-.0502	-.0017
100.0 to 199.9	-.0453	-.0489	-.0321	.0528	.0389	.0288	.0963	-.1100	-.0845	-.0118	-.0260	-.0812	.0492
200.0 to over	.1164	-.0350	.0764	.2375	-.0176	.0409	.0226	.2408	-.1981	-.0844	-.0608	-.1463	-.0903

*Correlation for nonextractive industrial work force for both 1930 and 1970 were .2235 and .2600, respectively.

stimulate the increase in size of places than did counties in which nonextractive industry work force declined at a rate of 0 to 100 percent.

The findings also showed that correlation coefficients between the two variables were higher in urban than in rural places (+.4976 and +.2021). The explanation could lie in the degrees of dependency of the places upon the nonextractive industry.

The data supported the hypothesis that the greater the increase in nonextractive industry work force in a county, the greater the increase in size of places located in the same county.

The Combined Effects of Factors on Place Growth and Decline

At this point it could be observed that statistical methods utilized so far have permitted the attainment of one of the main purposes of this study, i.e., the determination of varying degrees of influence of each selected factor on different rates of change in size of a place. Through the analysis it was possible to determine the relationship between each independent variable and the change in size of places.

By contingency analysis, it was shown that all independent variables demonstrated some association with the 1930 to 1970 change-in-size of places. It could be observed that if a conclusion was drawn just on the basis of percentages and the way they were distributed in change

categories, an impression would be left that each independent variable could be used as an important factor to explain the change in size. However, when the strength of association was measured by the tau c test and the Pearson product moment correlation coefficients, the degree of association between each independent variable and the dependent variable was quite low, by normal standards. The tau c usually yielded relatively higher coefficients than did the Pearson correlation test. Therefore, a conclusion on the strength of association could be drawn relative to the test used.

This level of analysis has been able to show, in detail, the strongest association between specific levels of both independent and dependent variables. It was observed that continuous forms of variables (without being condensed) obscured the strength of the relationship that might have existed between two variables. Categorization of variables did improve the strength of relationship, especially the categorization of the dependent variables. It was also demonstrated that categories of independent variables could specifically indicate a threshold of positive or negative correlation with the dependent variable, i.e., at a given level, the independent variable could induce growth, and at another level it could induce decline.

Up to this point the goal of the research has not been to explain the variation in the dependent variable caused by any given independent variable. If causal

Table 34.--Coefficients of Determination of Continuous Independent Variables and Condensed Dependent Variables.

Independent Variables	Size Change p^2	Growth p^2	Decline p^2
Initial Size	.00016	.0026	.0129
Region	.0112	.1951	.1866
Change of Average Farm Size in a County	.0106	.1208	.1122
Change in Extractive Industry Work Force 1930-1970	.0398	.0542	.0400
Change in Nonextractive Industry Work Force 1930-1970	.03677	.0894	.0739
Change in Farm Population in a County 1930-1970	.0053	.1069	.1095
Type of Road	.0114	.0370	.0488
Type of Intersection	.0001	.0176	.0146
Proximity to Freeway	.0228	.1169	.0998
Largest Place in County by Categories	.0251	.0445	.0384
Proximity to Largest Place in County	.0080	.0259	.0388
Proximity to Metropolitan Place	.0147	.1466	.1211
County Seat Status	.0008	.0047	.0118
Farm Number Change in a County 1930-1970	.0000	.1162	.1129

relationship was assumed, the Pearson product moment coefficient reported for each independent variable could give a basis to produce coefficients of determination (p^2) which would specify what percentage of variation in the change in size (dependent variable) was explained by variation in a given independent variable (see Table 34).

Very modest amounts of variation in the continuous dependent variable (1930 to 1970 change in size) were explained by continuous independent variables (as shown in Table 21). Some variables explained almost no variation in the change in size, as for example, initial size, change in the largest place in a county, type of intersection, county seat status, and change in the number of farms in a county. Coefficients of determination in these cases ranged from .0000 to .0008. Change in extractive industry work force yielded the largest explanation of variation, +.0398. This meant that only 4 percent of the variation in change in size of a place could be explained by variation in extractive industry work force in a county.

The second highest coefficient of determination was found for the change in nonextractive industry work force between 1930 and 1970. It explained 3.5 percent of the variation in the change in size of a place. The third highest coefficient of determination was found for the largest place in a county, 2.5 percent. Proximity to a freeway also explained 2 percent of the variation in the dependent variable.

Proximity to a metropolitan center explained only 1.5 percent. Type of road and change in average size of farm accounted for 1 percent of the variation.

The rest of the independent variables accounted each for less than 1 percent of the variation. This meant that not much could be explained in the change in size of a place based on the continuous form of both variables. However, these coefficients of determination suggested areas where more attention should be focused and probed further.

The percentage of explanation of the variation in the dependent variable improved when change in size was categorized into growth or decline. The largest explanation of variation was found for region, 19 percent. The next highest was proximity to a metropolitan place, 14 percent. The third, by the change in the average farm size in a county (12 percent) followed by proximity to freeway and change in the number of farms (each explained 11 percent of the variation). Change in farm population accounted for 10 percent of the variation. Both change in extractive industry and nonextractive industry work force explained 5 and 9 percent, respectively.

A 75 percent or greater decline in the average size of farm in a county specified that 15 percent of the variation in increase in size could be explained; 3 percent higher than the explanation offered by continuous change in the average farm size. The percentage explanation

also became higher with proximity more than 50 miles to a metropolitan place, 14 percent. The percentage explanation in the variation of growth or decline did not become higher with other independent variables condensed. Again, this meant that the highest percentage explanation of the variation in the dependent variable was obtained by the continuous form of most independent variables with change in size categorized into growth or decline categories.

At this stage, it was possible to identify the more important or strongest independent variables affecting change in the size of places. Speaking of change in general, it was shown that industrial work force would affect change more than any other variable dealt with. But with categories of growth or decline, the test showed that region, proximity to a metropolitan place, change in the average farm size, change in the number of farms, proximity to freeway, change in farm population were more important in explaining variation than industrial work force.

This study has been able to establish the proposition that independent variables measured at the county level would affect the change in individual places found in the county. The relationship between independent variables at the county level and change in size at the place level could prove to be independent, to a certain degree, of the relationship between the same independent variables at the place level and the change in size of the place.

Further studies will, in all probability, show that the relationship at the place level would be stronger than that at the county level.

Multiple Regression.--Attention was focused largely on: (1) the most important independent variables influencing the dependent variable as determined by standardized regression coefficients; and (2) the multiple R of each model dealing with a particular definition of either independent or dependent variable.

The partial unstandardized regression coefficient for each independent variable reflected the degree of change in the dependent variable as a result of one unit change (number of people per thousand or more; one unit score representing region, percent change in acres of average farm, mile, etc.) in the independent variable.

In the multiple regression model dealing with change in size (see Table 35) nonextractive industry work force change had the highest positive standardized regression coefficient, +.1741.[6] Nonextractive industry work force change in a county played an important positive role in the change in size of places in the county. This gave

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[1]With more than one independent variable measured on different units, standardized regression coefficients provided the only sensible way to compare the relative effect on the dependent variable of each independent variable (H. E. Norman et al., Statistical Package for the Social Science, 2nd ed., McGraw Hill, Inc., 1975, p. 325).

Table 35.--Multiple Regression Coefficients of Variables Related to the 1930-1970 Change in Size of Non-metropolitan Places in Michigan.

Independent Variables	Unstandardized Regression Coefficients	Standardized Regression Coefficients
	Change in Size	Change in Size
Intercept	5.2989	
Initial Size	-0.3849	-0.0934
Region	-0.2064	-0.0321
Change in Average Size Farm	-0.9900	-0.0378
Change in Extractive Industry Work Force 1930-1970	6.5554	.0628
Change in Nonextractive Industry Work Force	1.2473	.1741
Change in Farm Population	.8390	.0117
Type of Road	-2.0270	.1105
Type of Intersection	-.3085	-.0316
Proximity to Freeway	-.5071	-.0480
Class of the Largest Place in a County	.9478	.1072
Proximity to Largest Place in a County	-.6706	-.0443
Proximity to Metropolitan	.7555	.0482
County Seat Status	-.6751	-.0128
Change in Farm Numbers in a County	-4.7635	-.0484

further confirmation of the nonextractive industry work force hypothesis.

The second most important variable affecting change in size was the class of road present in a place, with a coefficient of +.1105. The class of intersection did not show a high coefficient (+.0316), possibly because of its high correlation with class of road.

The third important variable was the class of the largest place in a county (+.1072). These values reflected the competitive/complementary relationship that was mentioned earlier; to the effect that certain sizes of largest places would stimulate growth of smaller places (conplementary), while others will induce decline (competitive).

The fourth important variable affecting change in size was initial size of a place (-.0934). Its unstandardized regression coefficient or its product moment coefficient (p) did not show this importance. But its importance as shown in a standardized coefficient confirmed the importance that has been attached to initial size in a number of other studies. The direction of the coefficient was consistent with the findings of the previous section where it was shown that change in size would be felt more readily in smaller places than in larger places. This would be true with any index of change: population size change, business establishments change, change in number of industry, etc. The small place sensitivity to change was illustrated in

the standardized regression coefficients of the two smallest size class categories: -.1301 for the 75 to 149 class, and -.1043 for the 150 to 299 size class. But the 1500 to 2499 class, for example, had a standardized regression coefficient of +.0333.

The fifth most important variable was place variable, but the difference was that the influence of the class of largest place was general, all encompassing, i.e., its influence could originate from several sources. But change in size of the largest place measured specifically the influence of change in size of the largest place upon the smallest places in the county. The association reflected mostly the relationship of competition.

The sixth most important variable was the change in extractive industry work force in a county, with a value of +.0628. Ranked seventh were proximity to metropolitan place (-.0482), proximity to freeway (-.0480), and change in the number of farms (-.0478), followed by proximity to the largest place in a county (-.0443). The rest of the independent variables had standardized regression coefficients of less than +.0400. All the independent variables explained only 8 percent of the variation in the 1930 to 1970 change in size.

Tables 36 and 37 show the unstandardized and standardized regression coefficients of the relationship between growth, decline, and all the independent variables in continuous cases. When this data was considered, the

Table 36.--Multiple Regression Coefficients of Variables Related to the 1930-1970 Growth of Nonmetropolitan Places in Michigan.

Independent Variables	Unstandardized Regression Coefficients	Standardized Regression Coefficients
	Change in Size	Change in Size
Intercept	1.3866	
Initial Size	-.00001	-.0790
Region	.2256	.1026
Change in Average Size Farm	-.05316	-.0593
Change in Extractive Industry Work Force	.2477	.0682
Change in Nonextractive Industry Work Force	.1674	.0682
Change in Farm Population	.09982	.0408
Change in Farm Numbers in a County	.4144	.0229
Type of Road	-.08933	.1421
Type of Intersection	.03227	.0965
Proximity to Freeway	-.03919	-.1083
Class of the Largest Place in a County	.0077	.0254
Proximity to Largest Place in a County	-.0019	-.0036
Proximity to Metropolitan	-.0398	-.0742
County Seat Status	.1602	.0886

Table 37.--Multiple Regression Coefficients of Variables Related to the 1930-1970 Decline of Nonmetropolitan Places in Michigan.

Independent Variables	Unstandardized Regression Coefficients	Standardized Regression Coefficients
	Change in Size	Change in Size
Intercept	1.3866	
Initial Size	.00003	-.0890
Region	-.3528	.1690
Change in Average Size Farm	.0341	.0400
Change in Extractive Industry Work Force	-.1168	-.0344
Change in Nonextractive Industry Work Force	-.0126	-.0542
Change in Farm Population	-.1855	-.0800
Change in Farm Numbers in a County	-.2855	-.0892
Type of Road	.0897	.1504
Type of Intersection	-.0287	-.0905
Proximity to Freeway	.0258	.0754
Class of the Largest Place in a County	-.0071	-.0248
Proximity to Largest Place in a County	.0166	.0338
Proximity to Metropolitan	.0172	.0339
County Seat Status	-.1530	-.0892

rank of importance became different from that of the previous model, because these two models dealt with more specificities with a given operationalized dependent variable.

In decreasing order of importance they were: class of road (+.1421); proximity to freeway (-.1083); the region in which a place was located (+.1026); the class of intersection (+.0965); the county seat status (+.0886); the initial size (-.0790); proximity to a metropolitan place (-.0742); followed by change in both extractive and non-extractive industrial work force (+.0682). Farm characteristics almost maintained the same degree of importance. All the variables explained 27 percent of the variation in growth (R^2 .2714).

The order of importance of variables relating to decline was almost the same as that of growth, with class of road and region being the most important determinants of decline. Class of intersection, change in farm numbers, county seat status, and change in farm population all had significant roles. Again, change in industrial work force in a county retained the same degree of influence. The percentage of variation in decline was explained almost the same, or 26 percent (R^2 .2643). This model reflected the other side of the same phenomenon, i.e., change in size. The explanation of the variation in the dependent variable improved significantly from 8 percent to 27 percent as the dependent variable was more specified.

Operationalizing the independent variables increased the value of R slightly and thus the degree of explanation (30 percent). The ranked importance of operationalized independent variables reflected the ranked importance of continuous independent variables dealing with operationalized change in size.

The two important additional findings of the regression analysis were the ranked importance of independent variables and the actual coefficients of prediction (unstandardized coefficients in the models[1]).

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[1]The hierarchy of independent variables found in these models was also observed in the stepwise method. The path method did not yield regression coefficients different from simple product moment p's.

CHAPTER V

SUMMARY, CONCLUSION, IMPLICATIONS, LIMITATIONS AND RECOMMENDATIONS

Summary

Introductory Remarks

This research was evolved upon the basic proposition that the change in size of places in Michigan was a result of internal and external factors. To achieve a better and more precise comprehensive explanation of these changes in community (place) size, both factors associated with change in size had to be taken into account and a more refined method of analysis designed. Whether internal or external factors, most of these are related to the twentieth century major changes in industrial technology, transportation, communication, urbanization, and other technological developments. The task for students of communities is to identify these forces of change, and to explain the processes of change in size of places for obtaining a better illumination of the life cycle of places. This is very important for both theoretical and empirical reasons. Students of communities would have a

base for improving theoretical formulations concerning communities. Agencies interested in economic or social development of communities would have specific insights into the "behavior" of change in size of places so that development programs could become more effective.

The Problem

A number of studies have attempted to explain the increase or decrease in size of places. Their contributions have been helpful in pointing out some factors of change in size of places. However, there were still a number of problems to be solved in order to attain a superior explanation of how and why places change their sizes, what the factors of change were, and what their relative effects upon change in size would be.

A more precise understanding of the relationships between causal forces and change in size of places was still needed. Physical sciences and some fields in the social sciences such as production economics and land economics have achieved high precision in determining relationships between variables. For example, it has been established that a given amount of input would produce a given amount of output. It has not been possible to attain this kind of precision in studies of factors influencing places' growth or decline so far.

There have been several specific problems that have hindered this kind of precise understanding. First only a

limited number of independent variables have been considered in the past to explain growth or decline of places. In view of the complexities of interplay of internal and external forces of change, it is unlikely that higher degrees of explanation of change in size could be achieved by examining a limited number of factors. Second factors of change in size of places have often been studied in "static" form while they should have been observed, where possible, in "changed" or "marginal" form to obtain the kind of understanding needed. Third, the period of observation of change in size of places has originally been too short (one decade) in most previous studies. A short period, as was pointed out earlier, might not identify the long term influence of an independent variable upon changing size of places. Fourth, the assessment of the degree of relationship (Pearson product moment p, for example) has often been based upon continuous (not categorized) formed of variables, thus preventing a clearer understanding of the rate of change in size of a place as a result of the "marginal" change in independent variables.

The Purpose

The present study, therefore, was designed to use some methodological alternatives in order to achieve a hierarchical classification among the selected factors of change, i.e., to obtain greater precision in the explanatory strength each factor had on change in size of places.

Method

First, all nonmetropolitan places in Michigan greater than 74 inhabitants in 1930 were selected to comprise the population studied. Second, a large number of independent variables were selected. Fourteen causal forces related to industrialization were selected as factors of change in size of places in Michigan. An attempt was made to measure the effect of the independent variables upon the change in size of places. Third, a period of four decades was considered for long term inquiry of the forces of change.

The measurement was applied to continuous and categorized (or condensed) forms of variables to focus on the "genuine" impact of each force on change in size of places, and to locate the strongest correlations and the highest degree of predictability.

Two general assertions served as bases for operational hypotheses. The first contended that in Michigan, the rate of change in size of a place was a function of the level of its urbanization. The second asserted that the change in size of a place was partly a function of the characteristics of its immediate and distant hinterlands.

Fourteen independent variables were formulated as operational hypotheses. These hypotheses were measured using three tests: contingency tests to establish simple patterns of change; correlations to measure the strength of specific relationships; and multiple regression to

establish the relative influence of each causal factor and the total effect of all selected independent variables.

Summary of the Findings

The relationship of single factors on place size.--Hypotheses about: the initial size of a place; the presence of a county seat; the quality of roads and intersections in a place; the proximity of a place to a freeway, to the largest place in a county, and to a metropolitan center; the class of the largest place in a county; the region of the state in which a place was located; the change in the number of farms in a county; the change in the average size of farms in a county; the change in the farm population in a county; and the change in the industrial work force in a county were all supported with varying degrees of strength.

The percentages in the contingency tables showed a consistent relationship pattern, with few exceptions, between each causal factor and change in size of places. Though correlation tests showed a weak relationship between each independent variable and the 1930-1970 change in size, they indicated some strong relationships between specific levels or categories of forces of change and specific rates of 1930-1970 growth or decline of places.

It was shown that:

(1) Larger sized places were more likely to grow than smaller sized places, but at a slower rate. Relative

growth of larger places was less than that of smaller places. Smaller places were more sensitive to change in size than were larger places; due in part to the index used in measuring change.

It was also revealed that the correlation between size of a place and change in size was stronger when change in size was grouped into growth or decline categories.

(2) County seats were more likely to grow than non-county seats. This was true at a low level of growth (10 to 50 percent rate), but not at a high level of growth (100 percent growth rate or over). The findings showed that county seat status was a significant explanatory variable of change in size. It was also observed that most county seats were often the largest place in a county, a fact most applicable to the northern part of the state. Most noncounty seat places were most likely to decline at a moderate rate (50 to 100 percent).

(3) Hypotheses about quality of roads and intersections of roads present at a place were supported. The majority of places in Michigan were located on multilane and two lane highways. Though the findings showed that the expressways and their intersections were more likely to stimulate the highest rate of increase in size, the four lane and improved two lane highways also stimulated the increase in size of places but at a lower rate of growth (between 10 and 100 percent), and rarely at higher rates of growth (over 100 percent). These findings pointed out

that most places in southern part of the state have experienced growth and likely would continue to do so, considering the long term effect on their improved quality of transportation. The road system in southern Michigan has been more developed than that of the northern sections of the state.

4. Characteristics of the immediate and the distant hinterlands were confirmed in regard to affecting change in size of places. For example, the results showed that the increase in size of a smaller place was negatively related to its closeness to a larger place under 10,000 inhabitants, but positively related to a larger place over 10,000 inhabitants, and more strongly with metropolitan centers. This suggested that growth of smaller places was dependent on the degree of industrialization of the largest place in the environment. Two new specific hypotheses were suggested instead of the one originally formulated about distance to the largest place in the county or larger environment. One was that the increase in size of a smaller place was positively related to greater distance from a larger place under 10,000 inhabitants. The other stipulated that increase in size of a smaller place was negatively related to greater distances from a larger place over 10,000 inhabitants. For example, metropolitan centers appeared to be complementary to the growth of smaller places located within a twenty-five mile zone. As distance increased from metropolitan places, the

decline of smaller places increased, or growth declined. On the other hand, larger places under 5,000 inhabitants appeared to be more competitive with the growth of smaller places within shorter distances. Smaller places whose sizes were near that of the largest place were more negatively affected by the largest nonmetropolitan places than were places much smaller. This kind of relationship was most likely to be found in the rural, northern parts of the state.

5. The rate of increase in size of a place was seen to be a function of the level of development of the region in which a place was located. For example, in the southwest region of the lower peninsula, which was industrialized, but less so than the southeast region of the lower peninsula, growth in places was less rapid in degree than places in the southeast region.

6. It took a substantial change in farm characteristics in a county to significantly affect the change in size of places in a county. Both the percentages and the correlations showed the threshold of decline in the number of farms in a county which began to negatively influence the size of a place to be at a high degree of decline (70 percent). The threshold for the increase in the average farm size in a county affecting negatively the size change of a place was at a moderate level of increase (60 or 70 percent); that of the farm population change was at a moderate decline of 60 percent. In other words, the

findings indicated that when these three independent variables changed at the indicated high to moderate rates, the effect on size change was felt in a place within the county.

7. Hypotheses about work force change in a county were supported. A decline of the work force in extractive industry adversely affected the size of places which heavily depended upon these industries. Nevertheless, this adverse effect occurred only when the decline became drastic, i.e., by more than 75 percent. The data suggested that with a smaller decline (less than 75 percent), places could absorb the displaced labor force from extractive industry, by generating jobs in other nonextractive industries. Absorption, of course, would depend upon the size of the displaced labor force. On the other hand, there has been a steady increase in the nonextractive industrial work force. Places located in counties with an increased nonextractive work force, showed a tendency to increase in size. The effect of the "threshold" for the nonextractive industrial work force was a moderate increase of 50 percent. Further, the findings indicated that small increases in the nonextractive work force in a county would not noticeably increase the size of places in the county.

Long term versus short term effects.--The long term effects of most causal forces examined was different, in nature and degree, from that of short term effects. The

strength of the relationship of different factors was often variable in the different periods considered: 1930-1970, 1930-1950, and 1950-1970. An example of consistent relationship over time was the negative relationship between initial size of a place and its future growth throughout the 1930-1970 period. On the other hand, an example of inconsistent relationship over time was that higher quality of roads was inversely related to growth in the 1930-1950 period, but positively related in the 1930-1970 and 1950-1970 periods.

The Hierarchical Importance of Factors.--Based on the standardized regression coefficients (see Table 38), a hierarchical importance of factors of change in size of places was established. Independent variables showing a correlation over .10 were considered the most important; those with correlation between .05 and .09 were next in importance; and those with correlation below .05 were the least important.

According to this scale, the most important factors in determining growth of places were:

1. the type of roads present in a place,
2. the region in which a place was located,
3. proximity to a freeway.

The most important factors explaining decline of places were:

Table 38.--Hierarchical Importance of Factors Associated with Change in Size of Places in Michigan, 1930-1970.

Model I* 1930-1970 change in size	Model II** 1930-1970 growth	Model III*** 1930-1970 decline
1. Change in Non-extractive Industry Work Force	1. Type of Roads	1. Region
2. Type of Roads	2. Proximity to Freeway	2. Type of Roads
3. Class of Largest Place	3. Region	3. Type of Road Intersection
4. Initial Size	4. Road Inter-section	4. Initial Size
5. Change in Extractive Industry Work Force	5. County Seat Status	5. County Seat Status
6. Change in Numbers of Farms	6. Initial Size	6. Change in Numbers of Farms
7. Proximity to Metro	7. Proximity to Metro	7. Change in Farm Population
8. Proximity to Freeway	8. Change in Non-extractive Work Force	8. Proximity to Freeway
9. Proximity to the Largest Place	9. Change in Extractive Work Force	9. Change in Non-extractive Work Force
10. Change in Average Size Farm	10. Change in Farm Popu-lation	10. Change in Average Size Farm
11. Region	11. Class of Largest Place	11. Change in Extractive Work Force

Table 38.--Continued.

Model I* 1930-1970 change in size	Model II** 1930-1970 growth	Model III*** 1930-1970 decline
12. Road Intersection	12. Change in Number of Farms	12. Proximity to Metro.
13. Change in Farm Population	13. Proximity to Largest Place	13. Class of Largest Place
14. County Seat Status	14. Change in Average Size Farm	14. Proximity to Largest Place

*Model I indicates correlation between change in size (growth and decline, no distinction) of all places (1930 to 1970) and each factor.

**Model II represents correlation between increase in size of places (1930 to 1970) and each factor.

*** Model III represents correlation between decrease in size of places (1930 to 1970) and each factor.

1. the region in which a place was located,
2. the type of roads present in a place.

Next in importance for growth or decline were the following factors:

1. the type of intersection present in a place,
2. the initial size of a place,
3. county seat status,
4. proximity to a metropolitan center,
5. change in farm population in the hinterlands,
6. change in the number of farms in the hinterlands,
7. change in the size of industrial work force in the hinterlands.

Factors having the least impact on the change in size of places were:

1. proximity to the largest place (when largest place was considered as a continuous variable),
2. change in average farm size in a county,
3. class of the largest places in a county.

The regression analysis showed that the combined effect of all these factors explained 27 percent of the variation in growth, 26 percent of the variation in decline, and only 8 percent of change in size (with no specification of either growth or decline) during the 1930-1970 period.

Conclusions

This study yielded a great amount of data and it was possible to reach several conclusions from the findings.

The first was that a system's approach to the study of a place (or community) was useful for systematic research. It permitted us to view a place as a dynamic entity within a larger system composed of other places. It permitted us to present a rather comprehensive view of the processes of growth or decline of places within the system framework.

Though a formulation of a theory was not made,[1] the study provided: (1) concepts or "units"--to use Dubin's term--that might enter into community theory building; and (2) empirical evidence to support theories of communities by pointing out cause-effect relationship of "units" or variables within the system framework. This evidence has raised our understanding of the law of interaction of the characteristics of places, their hinterlands and their change in size.

It was pointed out earlier that most previous theories of communities have failed to accommodate aspects and dimensions of modern communities.[2] The system framework established, and the results thereof indicated that theories of modern community could be more accommodating

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[1]Theory in the sense of law.

[2]Roland L. Warren, "Toward a Reformulation of Community Theory," Human Organization 15 (Summer, 1956), pp. 99-106.

if they were formulated in the system framework or within an ecosystem of communities--to use the ecological or biological terms. Such theories would include characteristics of a place itself, as well as its hinterland.

A second conclusion was that measuring the impact of certain factors in "changed" form did not significantly show any difference between the impact of their "static" form at the beginning of the period and the impact of their "marginality" at the end of the observed period.

Third, the study demonstrated that statistical methods would be used to determine: (1) important factors of growth or decline of places, (2) higher precision in the relationship between causal forces of change and change in size of places by study design and statistical methods. That is, by categorizing and condensing independent and dependent variables, higher degrees of precision of relationships could be achieved. It was shown that some factors revealed a "turning point" in the rate of change "continuum," i.e., at a given rate of increase the effect on the change in size would begin to show, either positive or negative.

It could also be pointed out that the reliability of the findings was improved because all nonmetropolitan places greater than 74 inhabitants were included in the study. This eliminated the problem of estimating population parameters. The results thus obtained reflected the actual relationships between the variables considered.

Fourth, the order of importance of the factors considered was at first surprising, in that roads were more important than size and the proximity in relation to the largest place in a county. This is contrary to the findings of previous studies which have shown size proximity as most important. All factors related to transportation showed some meaningful relationships with change in size of place--proximity to freeway, position on intersection, etc. This was probably due to the fact that roads gained their importance from the interdependence of places which so markedly characterize a modern society. The results suggested that the viability of a modern place depended greatly upon the degree of communication with other places embracing a larger environment. With greater accessibility, a place could be expected to increase its size, and the converse was equally true. Many smaller places today have survived and grown because improved roads have permitted the exchange of resources with the larger environment. With improved transportation, commuting from small to larger places has become commonplace, permitting populations of small places (in regions with high quality roads) to stabilize and allowing residents of small places to earn an income in larger centers without moving from their residences. Improved roads probably allowed places with decline problems to link with outside centers which could offer resources for growth or stability. These kinds of relationships were particularly evident in the developed

regions of the southern part of the state where the transportation infrastructure was extensive.

Fifth, regional characteristics were also shown to be important factors for the growth of places. Places were more likely to grow if the region as a whole was developed and growing. In other words, it was unlikely that a place would experience growth in a region where other places in the region were not growing; it meant that places would not grow in isolation. A developed region stimulates growth in places of all sizes.

The study results showed that a given size "range" of a place would generate growth confirming earlier studies. But due to the interdependence of modern places and the role of communication, it seemed that other factors have compensated for the lack of what had been considered "viable size" in a place.

Sixth, this study has shown that there was no ground to argue that nonmetropolitan places, especially smaller ones (75 to 300 inhabitants in size), would disappear in the near future. During the 1930 to 1970 period, only thirteen places out of the 1229 considered, or 1 percent, disappeared. Two trends, among others, would make the existence of nonmetropolitan places more certain: (1) the preference for small places as a residence by people will probably continue into the future, as recent opinion surveys have shown; (2) the desire for more industrial decentralization will also probably continue as the

modern economy becomes more service oriented. With this desired decentralization, nonmetropolitan places will probably be points for the location and relocation of old and new industries. Nonmetropolitan places will probably become centers for new development in the future, particularly places with high quality transportation systems and higher actual or potential industrial development.

It could be concluded that the decline in farm population had less impact on size of community than some people had thought previously. The impact of change in farm characteristics--the decline in the number of farms in a county, the change in the average farm size in a county, and the decline in farm population--showed effect on change in size of places only when they had a high rate of change. Places were somewhat more sensitive to decline in farm population than to decline in the other farm characteristics. The impact of the decline in farm population on the size of places will stabilize in the future as the number of farm population becomes stable itself. If the nonfarm population replaces farm population, many smaller places will experience growth as a result.

Changes in the economic base of the larger area, the county, were found to affect the change in size of places found in the area. As the American economy continues to depend less on natural resources, extractive industry will become less influential at the level of the larger unit. On the other hand, nonextractive industry in a

county will probably become more significant for the growth of individual places in the county.

Again, it is emphasized that the size of nonextractive industrial work force in a county must be substantial, i.e., large, to affect individual places' growth in the county. The size of the nonextractive industrial work force of a county is most likely to be that of the larger places. This may be an explanation why the largest place in a county had some influence on smaller places in the same county.

Implications

The results and conclusions reached in this study raised important implications applicable to different areas. There were implications to policy and decision makers involved in development programs here in the United States and abroad; there were implications to those who practice community development, attempting to help local communities increase the quality of life for their residents; and finally to the theory of community, of interest to those who research and study communities.

The remarks in this section will develop each of the above categories of implications. In all categories, particularly the first one (dealing with implications for policy makers involved in development programs), an attempt was made to discuss first, the implications that applied to Michigan and the United States; and second, the

implications that applied to developing countries especially those located in Africa. This attempt reflects the deep interest the writer has for the orderly and effective development of these countries.

Implications to Development Policy

It was pointed out that the future of nonmetropolitan places in Michigan, even the smaller ones, was not necessarily gloomy. The period studied (1930 to 1970) could be described as a period of relatively rapid growth in the United States (particularly in the 1940s and the 1950s, a period of general shifting population from rural to urban areas, especially from the South to the North) due to a high rate of natural increase as well as migratory movements. This period was characterized by increases in size of many places. However, in the mid 1970s the United States was close to achieving a zero rate of population growth and large scale shifts of population had abated.

Despite the expected low birth rates, growth of most nonmetropolitan places might still result from migratory shifts of population--between regions and between urban and rural areas. This would mean growth of some places at the expense of others. It is possible, however, that attitudes favoring higher birth rates would at some future time become the source of growth. With a zero rate of population growth, it is likely that metropolitan centers (50,000 population or more) and some large

nonmetropolitan places (less than 50,000 inhabitants) would provide for the growth of smaller nonmetropolitan places.

The findings of this study suggested that migrants from larger places to smaller ones might still want to settle in places where factors of growth are present: easy accessibility by good roads, closeness to market and service centers, and others. On the other hand, the decentralization of population, from larger metropolitan centers to smaller places, might be hindered because of the lack of these factors. Thus governments, federal and state, might want to adopt a policy of improving the attractiveness of nonmetropolitan places in order to achieve a more "balanced" resettlement of people and a more "balanced" relocation of industries. This would necessitate the introduction of factors of growth in places where new residents were needed or where it was desired that places stay stable. The emphasis in the policy of assisting the growth of nonmetropolitan places should be placed upon transportation.

Given its relatively great importance in explaining growth and decline of places, road or transportation systems would have to be considered a crucial element in the development policy of nonmetropolitan places in Michigan, and probably in most other states of the United States. This would not mean that every road in Michigan should be turned into high quality expressways (which was among the

road types that appeared to stimulate the greatest rate of growth in places). Resources would be limited and it would not be feasible, for environmental and ecological reasons. Therefore, emphasis would have to be placed on improving the two lane or four lane highway systems.

Construction of new or the improvement of existing roads, for developmental purposes, should be considered an integral part of a general development program for a place or a region. The findings of a recent public opinion survey conducted by Kimball and Thullen (1977) supported the empirical findings in this study that road transportation was an important factor for growth. The findings of this survey indicated that transportation was one of the major concerns of the residents in less developed areas of Michigan, especially in the northern rural parts of the state.

It could be noted, at this point, that during the 1930 to 1970 period, petroleum fuel for transportation was abundant and cheap. The cheap fuel permitted long distance commuting, as well as shorter distance daily travel, mostly by private automobile, to centers of work.

The preceding observations about transportation were made under the assumption that energy or fuel for transportation would continue to be cheap. Such an assumption is unrealistic in view of the current energy situation and in view of the fact that fossil fuel cannot remain indefinitely as the sole source of power for

automobile transportation. Predictions are that petroleum fuel will last a few more decades at current consumption levels. It will become very expensive and will have an impact on the pattern of settlements in the long run. If alternative fuel sources are not developed, people will probably tend to settle closer to their places of work (which will likely be in large centers). This will probably mean a decline of small places located far from larger centers. And, because automobile transportation will necessarily decline as the main mode of transportation, the population might once again tend to concentrate in larger places. Transportation by buses and train may become the main mode for transportation. It could be speculated that under these new transportation conditions, railroad quality and location as well as water transportation networks, could be just as important in determining growth and decline of places as roads were in the time period this study covered. Even if alternative sources of energy were discovered in the future, they would probably not be available for individual means of transportation (such as automobiles) to the extent gasoline is presently.

The point is that improved transportation, especially road improvement, must be high in the development package for nonmetropolitan areas.

Another important implication for development policy was the nature of the development area. The qualities of a region, as a strong factor for growth, implied

that an area larger than a place needed to be stressed in development programs of places. A regional approach to development programs has distinct advantages over a "single place" development approach, in that the region concerned includes many places. When a region as a whole is growing, the individual places in that region have a higher probability of growing. The regional approach also would deal with a larger area, in which different industries could be located in different parts of the region, thus making the region as independent (to some degrees) unit that might be expected to attract more residents. Industrialization and business specialization of these parts would make them mutually complementary.

It was indicated that more places in the Upper Peninsula, and the northern Lower Peninsula experienced decline than did those in the southern Lower Peninsula in Michigan. If a "single place" or even a "single county" approach for development of places in these regions were adopted as a policy, it would be likely that growth of many individual places would be slower than what it would be if a regional approach were adopted. Resources might be wasted by duplication, as it has often been the case, and uncoordination of resources and activities would occur. Each individual unit might not be able to independently support the services or factors introduced.

The relatively strong influence of a region on the change in size of individual places, therefore, suggested

an approach that embraced a unit larger than a place, in some cases larger than a county. This approach would transcend political and other barriers between places or between counties if the common interest were the growth of the designated unit.

Another important implication, which reinforced the adoption of a policy for a larger development unit, was the importance of the size of a place. This characteristic still affects the change in size of a given place. However, to insure the development of each individual place, no development agency could make every place in Michigan (and particularly in the northern part of the state) large enough to guarantee future growth. However, the survival and/or growth would need to be maintained, however. This would be achieved in a larger unit in which smaller individual places can be connected with others through improved transportation.

With this kind of interconnection and interdependence in a larger unit, most small nonmetropolitan places need not face decline or extinction. They would benefit from the growth trend of the entire area or network of places.

Another advantage of a larger unit of development would be that specific places could be developed that would help maintain growth or stability of nearby smaller places. This kind of influence was observed with metropolitan centers and with larger nonmetropolitan places. In the

adoption of a regional approach to development, the development of a specific place (perhaps the largest place in the area) as a "pole" or "central place" for development should be a part of the "growth package." In the northern part of Michigan and the Upper Peninsula, places such as Marquette, Menominee, Alpena, and others with more than 10,000 inhabitants and other existing features of potential growth, would serve as "poles." They could provide industrial, cultural, and social development, creating opportunities for the residents of smaller places in the larger unit. These "poles" would diffuse their growth influence by "trickle down" or "filtering" processes. Significant industrial development, especially nonextractive industries, would be located in such places. The emphasis on the "central place" does not necessarily represent advocacy for centralization of all services and functions in the largest place.

The last implication for development policy that can be deduced is the maintenance or the encouragement of farm population and nonfarm population in the hinterlands of places. Farm population in the hinterland may be related to the general concept of hinterland density of a place. The positive relationship between the change in density in the hinterland and the change in size of a place suggests a balanced emphasis in the development of both a place and its hinterland. Maintenance of adequate density in the immediate hinterland of a place, for growth purposes,

could also be part of a policy "package" for development, especially for rural development.

In summary, in the process of planning for development of places or region, a series of questions should be addressed to the quality of transportation systems existing in these places or the area, the degree of development in the larger area, the size of the "central" place, the density of the hinterlands, and the existing types of industries. The answers to these questions would help determine a set of strategies of action. The awareness of the presence of certain factors would help decision makers move to the next relevant factors deemed important for the growth of a given place.

However, the fact that one given factor did not assert itself as the one factor of growth of a place, but rather there are many at one time, reinforces the view that development of a place or a region must be comprehensive, both at the policy-making level and the implementation level. This will necessitate compilation of various sources of information and consultation with various experts in different fields to coordinate and formulate a comprehensive policy of development. The input for such a comprehensive policy for the growth of place can come from economists, sociologists, civil engineers, regional and urban planners, and others. Such input is very important because factors that have been pointed out as

affecting change are not analyzed or studied in a single discipline.

The findings must be considered as a package. The application of road alone, for example, would not stimulate the growth of places without other developments in the region, or without the presence of actual or potential "pole" of development. It must be constantly remembered that a place is a system within the "ecosystem" of other places. Alteration of one aspect of the system would require adjustment of other aspects of the system.

Implications for International Development, Particularly Africa

The conditions in all African countries are different from those found in Michigan and the rest of the United States. The levels of economic development are different; the degrees of industrialization and urbanization are different; the pattern of spatial settlements is different. But the implications for development policy may be generally the same with some modifications.

The importance of road transportation found in this study has significant implications for the growth of towns and cities in developing countries of Africa. First it has laid emphasis where it has not been often laid in most development schemes. In most suggested theories of development for developing countries, emphasis is often placed on industrial development, agricultural

development, the development of the "primary sector," the development of the "secondary sector," the "international connections," and the importation of capital and technology. These are important for the economic development of a country, and especially the growth of cities, which are centers of development in these countries. The findings concerning roads, in this study, strongly suggest that serious consideration be given to transportation in these countries for the growth of places. Second, improved roads would facilitate the flow of resources into and out of the community. This includes, for example, the flow of the labor force from rural areas to towns.

The absence of improved roads often results in an influx of unskilled inexperienced labor force into town from the country. This unemployed labor force often becomes "stranded" in town. The main reason for staying in town is that jobs must be sought regularly almost on a daily basis. Returning to the village would make a "job hunter" lose the time that he or she should be devoting to looking for a job. Besides, the cost of trips by bus to the village is proportionally higher than the annual per capita income in the country, therefore, a "job hunter" would rather stay in the city. This kind of growth is detrimental to the town, because it creates social problems such as crime, housing, sanitation, unemployment and others. Third, the easy flow of people between villages and towns through improved transportation would also mean

that markets in both sectors would expand. The farmers would be able to increase the volume of sales in the city by moving products immediately after harvest without sustaining loss of perishable agricultural products. And if there is encouragement to save in city banks, these savings can be invested in the city to provide more jobs for the unemployed. Thus rural areas would serve as a source of labor, materials, and savings. On the other hand, the market in rural areas would be opened for urban goods and services. The incentive for greater production in city would be stimulated. Not only the immediate hinterland would be opened to the city, but other cities as well. Thus to achieve "healthy" growth in developing countries, it would seem that the transportation system must be an integral part of a development "package."

More than developed countries, developing countries face the problem of both energy and transportation equipment. Most of the developing countries do not have oil deposits, and those having some deposits lack the technology for energy development. Unlike developed countries, the developing countries lack the technology to develop alternative sources of energy and they lack the technology to produce equipment and vehicles for transportation. These compounded problems become awesome when a certain degree of growth is to be achieved. Nevertheless, the problem of energy and equipment does not mean abandonment of the transportation aspect as a part of the growth of

places. It is reasonable to believe that the discovery of alternative sources of energy in developed countries will be transmitted to less developed countries. Furthermore, these countries might meet the transportation requirement by developing mass transportation systems such as buses, trains, and water transportation.

Findings related to the importance of a region on the growth of places is significant for the development of places in developing countries. Most of the policies for development are particularly directed to the economic development of cities, and not villages. The purpose of these policies is not primarily for growth in size of places, but economic and social growth. Growth in size in most cases is being controlled by the government. Development, emphasizing towns, rather than cities, would not present any weakness, if the town or the city is considered as "the central place" in a given region. It is often the case that towns would have a hinterland of a 50 mile radius or more. These places are in a location where industrial development is often intensified for growth diffusion in villages. The policy would be concerned mostly with village stability, the retention of most rural population in villages for increased agricultural production; it would be concerned with "controlled" growth of towns and cities. It has been pointed out that these two sectors--urban and rural or place and its hinterland--are interdependent.

Development programs that view the place and its hinterlands as two independent sectors are often found in developing countries. These may be looked upon as defective. For the neglect in developing the hinterland results in an "unhealthy" growth, breeding crime, unemployment, housing, and other social problems.

A further implication for developing countries may be deduced from the findings. It was shown that the presence of government services (the county seat) in a place stimulated growth. In regions where new settlements are being designed, government services may be established to stimulate growth in the new area. This means some degree of decentralization in the existing services in the district headquarters.

Implication for Community Development

The most useful implication for community development does not come so much from the results of the study as much as it did from the methodology employed.

The method employed in this study could be helpful in designing and implementing community development programs. The method provided an example of a logical and systematic approach to the study of community problems. It showed that to deal with a given community problem, research had to be carried out, that analyzed factors that caused the problem, then ranking them in terms of their degree of impact in order to establish priorities or a

hierarchy of factors. A demonstration of a logical relationship between factors could help determine which one needed to be treated first, which one second, and so on. This approach could have a higher probability of offering a long term "solution" to the problems of communities. A method of establishing a hierarchy among factors of the problem, their relationship, and their degrees of influence would provide a good basis for designing an effective action program in community development, with an efficient allocation of resources. This approach would minimize the possibility of a major alteration of the program in the course of implementation.

When community development is viewed as a "form of guided or planned progress," the findings of this study would give a better understanding of the outcome in a place (or community) when factors, such as those indicated in this study, were present or absent in a place. Furthermore, the fact that specific levels or categories of factors caused significant alterations, observed in the dependent variable, would enable a change agent for example, to make specific efforts in order to obtain the necessary "amount" of the factor for the intended change.

Furthermore, the study suggested that there was not a hard line of demarcation between community development programs and regional development programs. This assertion is not based upon the way "community" is defined (a locality such as a village or a town or a region), but

the assertion is based on the operation and influence of the characteristics of both units (the place and the region) upon the change in size of a given place. It may be said that the higher the development of a society (economic, social, cultural), the greater the interdependence of its communities. Therefore, phases of community programs (problem identification planning, implementation evaluation) would not be complete if a place and its hinterland (immediate and distant hinterland) were not considered.

It has become very hard to identify community problems that would involve only the place or only the hinterland. In most problems, the place and its hinterland are both involved, as it has been demonstrated in this study. Very often many solutions of community problems have been proposed on the basis of a place alone. The interdependence of modern American places leaves little room for isolated solutions to community problems, but has forced us to consider cooperation and coordination of efforts and resources, of communities or countries, toward problem solving.

It could briefly be observed that a comprehensive analytical approach has often been lacking in a significant number of community development programs in African countries. In many cases, a number of community development programs have been based on political grounds, becoming show cases. Those in power may have wanted to show some accomplishments in order to assure their reelection or their appointment to power positions. Other programs may have

been based on the "wishes" of the financial and technical donor countries. These kind of programs have not often been based on empirical findings, so that priorities could systematically be established and an effective program action planned for the optimum satisfaction of those to be helped. Although it would have required more resources in developing countries to conduct such analyses, it seems worth undertaking, because reliable information would result from such a study, and it is only on reliable information that sound community programs would be executed.

Implication to Theories of Community Change

One of the purposes of the study was to provide a basis for better understanding community growth and decline, or community change in size. This understanding was provided, in the sense that specific relationships between change in size of a place and given factors influencing change were established. Thus more light was shed to the process of change in size, and consequently, to the general concept of community change.

These findings serve to caution those concerned with community "life" against oversimplification of the factors and processes of change.

It has always been a temptation to explain community growth change by using one factor theories: economic determinism (many economists fall in this trap); technological determinism; natural resource determinism; and

geographic determinism. Each of these have emphasized a primary factor explaining the growth of a community. These kind of theories have not explained changes of communities adequately. This is not to say that these theories were not important tools explaining change. Each reflected an aspect of the process of change. It is when they were taken together that a greater power of explanation of change in size of places could occur.

This means that students interested in community change, from different disciplines, would do better if they attempted to explain change by considering a variety of variables from a diversity of disciplines. This does not mean that all factors would be of equal importance in explaining variation in the change in size. It had already been demonstrated in this study that some factors were more important than others. The fact of "multiple factor explanation" suggested that any overall theory of change in size of places would need to consider and recognize the complexity of communities and the great variety of interrelated factors that influence their growth or decline in size.

Limitations

The study was concerned with an area that was both highly urban (the southern Lower Peninsula) as well as rural (the northern Lower Peninsula and the Upper Peninsula). These two characteristics made the state a suitable

area to assess the influence of several factors upon the increase or decrease in size of places in both urban and rural settings. The results generally had wide applicability, in terms of the theoretical and practical knowledge. However, there were several limitations to this study.

First, although the model of this study was applicable to all human habitations, some specific observations and the degree and pattern of influence of certain causal forces of change in size applied only to Michigan. Care would need to be exercised when applying the results to other states in the United States. More reservations about the applicability of the results become apparent if these findings were to be applied to foreign countries. The definition of "place" adopted in this study applies to settlements in Michigan and similar states in the United States. This definition could not refer to a "place" in most, if not all, countries in Africa, for example. In areas such as Africa, it would rather refer to a town of over 10,000 inhabitants. Here commercial, health, educational, and other services are provided. There are exceptions: most educational services are provided at the village level. These kind of "places" in Africa are located at intervals of at least 60 miles or more.

Second, the study failed to include the human factor in the process of place's change in size. The organization, participation, and management skills of people living in a place are important in the process of

change in size. This failure to include the human element prevented this study from helping gain insight into the processes of growth as they relate to the quality of inhabitants of a given place.

This limitation will probably draw criticisms from students of community studies. There have been many documented cases where communities, which lacked man-made and natural resources, had been able to survive and grow because of the "fine" and "dynamic" leadership of its people, and the resourcefulness and the creativity of the inhabitants. These are always important ingredients for the growth of a place.

However, attempts to include and to secure data related to the above attributes would have presented several problems. (1) The number of places in this study was so large that it would have taken considerable resource to secure the necessary data for the 1229 places. (2) It would have been impossible to measure longitudinally variables such as the inhabitants' participation in the affairs of their community, the resourcefulness, the creativity, and the leadership ability in the community from 1930 to 1970. (3) The accuracy of the data, if collected, would have been very low and unreliable.

Third, some of the independent variables of the larger environment (the county) could also have been those of a place; e.g., work force and farm characteristics could have been measured at the place level. This step could

have enhanced the degree of explanation of variation in the dependent variable. However, the measurement of these variables was dictated by the model designed for this analysis of change in place size. Data for these variables at the place level just was not available from secondary sources for all places included in the study.

The study failed to delineate the demarcation line between the immediate hinterland and the place. This distinction could have permitted the measurement of hinterland characteristics such as farm characteristics and industrial work force. However this kind of demarcation was another difficult problem, which would have required enormous resources to obtain the desired data.

Fourth, the degree of correlation between certain independent variables might not have reflected the "genuine" effect of each separate independent variable upon the dependent variable (change in place size). Certain independent variables were highly correlated with one another. For example, a high correlation (+50 or more) existed between: region and change in the number of farms in a county (+.7961); region and farm population change (+.6203); change in the farm number in a county and change in farm population (+.5534); proximity to a metropolitan place and change in the average farm size (+.5239); change in the extractive industrial work force and change in the non-extractive industrial work force in a county (+.5373), etc.

This meant that the apparent influence of some independent variables on change of place size would have been caused by their close relationship to other independent variables, which had a more genuine influence on place size. It was not possible to determine spurious relationships, due to this phenomenon, with the statistical techniques used.

Recommendations

Recommendations resulting from the present study are of a methodological and practical nature.

1. Efforts to apply the findings of this study in other countries must be limited unless the application is more or less general and broad. Application of specific findings may prove to be irrelevant in these countries because of the differences in economic, social, and institutional organizations. This suggests that this study would have to be replicated to find out if the results also apply elsewhere, particularly in developing countries.
2. The important factor of human attributes must be included in future studies. Indirect measurement of such attributes as participation of the people in community affairs, and community leadership, may be achieved by looking at the number and nature of organizations that have existed in a community.

3. Data related to variables which can be measured at both place level and county level needs to be included in future similar studies. A field survey would need to be conducted to see if it were feasible to secure information for all places during past and recent decades. Perhaps information for an individual place would have to be obtained from respondents over 65 years of age who have lived in the place for more than forty years, who know the history of the place.
4. To overcome the difficulty of establishing the limits between the place, its immediate hinterland, and its distant hinterland, some method of delineation of a community will have to be used. This would entail the expenditure of a considerable amount of resources.
5. Partial correlation could be used to locate spurious correlations between certain independent variables and the change in size of places. This would determine which specific factors acted as intervening variables. Since this procedure was not carried out in the present study, due to limitations in time and resources, it becomes an important aspect to consider in future studies. The results of such a procedure could shift the relative importance of the preceding factors, in

terms of their power of explanation of the variation in change in the size of a place.

6. Knowledge about growth or decline of places has to be cumulative, i.e., previous as well as present findings must serve as a fourication for future research. This can be best achieved by using in one area the same population such as the one used in this study. This study, therefore, can serve as the first in possible future series of studies on growth or decline of places in Michigan. Such a series of studies would be a means of empirically monitoring growth or decline. The series of studies would also serve as a data base about small places that would provide information rarely found anywhere else. Improvement and enrichment of data would take place by including other characteristics of places and hinterlands such as the level of education of residents, the number of organizations, the income of residents, the number of business and industrial establishments in a place, and the number and quality of other service establishments.
7. An attempt to assess the combined percentage level of explanation in change in size of places by all factors was made. However, factors failed to explain even half of the variation of change in size of places. They explained 27 percent. This low percentage might be attributed to the measurement

of the variation, or the method used to assess the influence of factor, and to the absence of some factors not considered. This low degree of explanation makes further research imperative, if an understanding of change in size of places is to improve. Additional factors should be analyzed, together with those of the present study. This will permit a direct comparison between the findings of such a research and those of the present one. If another statistical method is used, it will apply to the same population. Path analysis could be considered for more "filtering" of the "genuine" effect of each factor associated with growth or decline.

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APPENDIX

TABLE 1

Distribution of Michigan Places in Rate Categories of Change in Size by 1930 Initial Size Categories

Initial Size Categories		Percent Rate Categories of Change in Size of Places										
		-50 to -100	-10 to -49.9	-9.9 to 9.9	10 to 49.9	50 to 99.9	100 to 199.9	200 to 299.9	300 to 399.9	400 to 499.9	500 to over	Total
75-149	#	68	56	24	46	23	21	14	10	2	21	285
	%	23.9	19.6	8.4	16.1	8.1	7.4	4.9	3.5	.7	7.4	23.2
150-299	#	80	72	23	74	38	16	11	4	4	24	326
	%	18.4	22.1	7.1	22.7	11.7	4.9	3.4	1.2	1.2	27.9	26.5
300-499	#	28	26	18	64	33	15	8	1	3	9	205
	%	13.7	12.7	8.8	31.2	16.1	7.3	3.9	.5	1.5	4.4	16.7
500-749	#	13	15	6	18	29	6	2	2	1	7	99
	%	13.1	15.2	6.1	18.2	29.3	6.1	2.0	2,0	1.0	7.1	8.1
750-999	#	5	5	1	15	15	6	4	1	1	5	58
	%	8.6	8.6	1.7	25.9	25.9	10.3	6.9	1.7	1.7	8.6	4.7
1,000 1,499	#	3	4	5	22	21	10	5	4	0	3	77
	%	3.9	5.2	6.5	28.6	27.3	13.0	6.5	5.2	0	3.9	6.3
1,500 2,499	#	7	5	5	17	17	5	1	1	0	5	63
	%	11.1	7.9	7.9	27.0	27.0	7.9	1.6	1.6	0	7.9	5.1
2,500 4,999	#	1	6	1	15	7	4	4	1	2	8	49
	%	2.0	12.2	2.0	30.6	14.3	8.2	8.2	2.0	4.1	16.3	4.0
5,000 9,999	#	0	4	7	13	1	2	3	2	0	4	36
	%	0	11.1	19.4	36.1	2.8	5.6	8.3	5.6	0	11.1	2.9
10,000 49,999	#	0	3	6	13	3	2	2	2	0	0	31
	%	0	9.7	19.4	41.9	9.7	6.5	6.5	6.5	0	0	2.5
Total	#	183	196	96	297	187	87	54	28	13	86	1229
	%	15.1	15.9	7.8	24.2	15.2	7.1	4.4	2.3	1.1	7.0	100.0

TABLE 2

Distribution of Michigan Places in Percent Rate Categories of Change in Size by County Seat Status, 1930

County Seat Status		Percent Rate Categories of Change in Size of Places										
		-50 to -100	-10 to -49.9	-9.9 to 9.9	10 to 49.9	50 to 99.9	100 to 199.9	200 to 299.9	300 to 399.9	400 to 499.9	500 to over	Total
Presence	#	0	6	12	35	17	3	3	1	0	0	77
	%	0	7.8	15.6	45.5	22.7	3.9	3.9	1.3	0	0	6.3
Absence	#	185	189	84	262	169	84	51	27	13	86	1150
	%	16.1	16.4	7.7	22.8	14.7	7.3	4.4	2.3	1.1	7.5	93.7
Total	#	185	195	96	297	186	87	54	28	13	86	1227
	%	15.1	15.9	7.8	24.2	15.2	7.1	4.4	2.3	1.1	7.0	100.0

TABLE 3

Distribution of Michigan Places in Percent Rate Categories of Change in Size by Class of Road Qualities, 1970

Class of Road Quality		Rate Categories of Change in Size of Places										
		-50 to -100	-10 to -49.9	-9.9 to 9.9	10 to 49.9	50 to 99.9	100 to 199.9	200 to 299.9	300 to 399.9	400 to 499.9	500 to over	Total
Express-way	#	0	4	7	15	8	5	9	1	1	23	73
	%	0	5.5	9.6	20.5	11.0	5	9	1	1	31.5	5.9
Multi-lane State Highway	#	68	88	44	163	97	44	16	16	7	31	574
	%	11.8	15.3	7.7	28.4	16.9	7.7	2.8	2.8	1.2	5.4	46.7
Improved Two Lane Highway	#	83	79	43	102	75	32	27	10	5	27	483
	%	17.2	16.4	8.9	21.1	15.5	6.6	5.6	2.1	1.0	5.6	39.3
Designated County Roads	#	20	22	1	15	6	6	1	1	0	5	77
	%	26.0	28.6	1.3	19.5	7.8	7.8	1.3	1.3	0	6.5	6.3
Gravel Roads	#	14	3	1	2	1	0	1	0	0	0	22
	%	63.6	13.6	4.5	9.1	4.5	0	4.5	0	0	0	1.8
Total	#	185	196	96	297	187	87	54	28	13	85	1228
	%	15.1	16.0	7.8	24.2	15.2	7.1	4.4	2.3	1.1	6.9	100.0

TABLE 4

Distribution of Michigan Places in Percent Rate Categories of Change in Size by Class of Road Intersections, 1970

Class of Road Intersections		Rate Categories of Change in Size of Places										
		-50 to -100	-10 to -49.9	-9.9 to 9.9	10 to 49.9	50 to 99.9	100 to 199.9	200 to 299.9	300 to 399.9	400 to 499.9	500 to over	Total
Expressway Intersection	#	1	1	4	9	3	0	2	1	0	14	35
	%	2.9	2.9	11.4	25.7	8.6	0	5.7	2.9	0	40.0	2.9
Multlane Improved Intersections	#	5	21	20	60	32	15	12	7	2	23	197
	%	2.5	10.7	10.2	30.5	16.2	7.6	6.1	3.7	1.0	11.7	16.0
Improved Two Lane Intersection	#	51	76	35	148	100	45	27	11	9	25	527
	%	9.7	14.4	6.6	28.1	19.0	8.5	5.1	2.1	1.7		
Designated Roads Intersect.	#	16	16	4	15	9	3	3	0	1	2	69
	%	23.2	23.2	5.8	21.7	13.0	4.3	4.3	0	1.4	2.9	5.6
Gravel Inters.	#	16	3	2	2	2	2	1	2	0	1	31
	%	51.6	9.7	6.5	6.5	6.5	6.5	3.2	6.5	0	3.2	2.5
Total	#	185	196	96	297	187	87	54	28	13	85	1228
	%	15.1	16.0	7.8	24.2	15.2	7.1	4.4	2.3	1.1	6.9	100.0

TABLE 5

Distribution of Michigan Places in Percent Rate Categories of Change in Size by Proximity to Expressway, 1970

Distance to Expressway		Rate Categories of Change in Size of Places										
		-50 to -100	-10 to -49.9	-9.9 to 9.9	10 to 49.9	50 to 99.9	100 to 199.9	200 to 299.9	300 to 399.9	400 to 499.9	500 to over	Total
Five Mile Zone	#	15	25	19	78	65	47	31	18	6	65	369
	%	4.1	6.8	5.1	21.1	17.6	12.7	8.4	4.9	1.6	17.6	30.1
Ten Mile Zone	#	19	27	9	41	28	12	10	5	3	7	157
	%	9.6	17.2	5.7	26.1	17.8	7.6	6.4	3.2	1.9	4.5	12.8
Fifteen Mile Zone	#	6	15	10	28	13	11	3	0	1	3	90
	%	6.7	16.7	11.1	31.1	14.4	12.2	3.3	0	1.1	3.3	7.4
Over fifteen Mile Zone	#	147	127	58	150	80	17	10	5	3	11	608
	%	24.2	20.9	9.5	24.7	13.2	2.8	1.6	.8	.5	1.8	49.7
Totsl	#	183	194	96	297	186	87	54	28	13	86	1224
	%	15.0	15.8	7.8	24.3	15.2	7.1	4.4	2.3	1.1	7.0	100.0

TABLE 6

Distribution of Michigan Places by Class of Largest Place in a County in Ten Rates of Change Categories Between 1930-1970

Size of Largest Place in a County		Rate Categories of Change in Size of Places										
		-50 to -100	-10 to -49.9	-9.9 to 9.9	10 to 49.9	50 to 99.9	100 to 199.9	200 to 299.9	300 to 399.9	400 to 499.9	500 to over	Total
Less than 1,999	#	30	28	15	44	22	13	2	4	0	5	163
	%	18.0	17.2	9.2	27.0	13.5	8.0	1.2	2.5	0	3.1	13.3
2,000 - 4,999	#	44	48	19	58	37	6	1	1	2	2	218
	%	20.2	22.0	8.7	26.6	17.0	2.8	.5	.5	.9	.9	17.7
5,000 - 9,999	#	41	53	23	88	39	16	10	1	0	5	275
	%	14.5	19.3	8.4	32.0	14.2	5.8	3.6	.4	0	1.8	22.4
10,000 - 24,999	#	55	48	22	58	42	21	7	7	4	20	284
	%	19.4	16.9	7.7	20.4	14.8	7.4	2.5	2.5	1.4	7.0	23.1
25,000 - 49,999	#	5	7	6	17	10	7	8	1	1	5	67
	%	7.5	10.4	9.0	25.4	14.9	10.4	11.9	1.5	1.5	7.5	5.5
50,000 over	#	11	12	11	32	37	24	26	14	6	49	222
	%	5.0	5.4	5.0	14.4	16.7	10.8	11.7	6.3	2.7	22.1	18.1
Total	#	185	196	96	297	187	87	54	28	13	86	1229
	%	15.1	15.9	7.8	24.2	15.2	7.1	4.4	2.3	1.1	7.0	100.0

TABLE 7

Distribution of Michigan Places by Regions of the State in Ten Rates of Change Categories Between 1930 and 1970

Region		Rate Categories of Change in Size of Places										
		-50 to -100	-10 to -49.9	-9.9 to 9.9	10 to 49.9	50 to 99.9	100 to 199.9	200 to 299.9	300 to 399.9	400 to 499.9	500 to over	Total
UPNE	#	41	27	7	8	3	2	0	1	0	0	89
	%	46.1	30.3	7.9	9.0	3.4	2.2	0	1.1	0	0	7.2
UPNW	#	13	9	3	7	4	1	1	0	0	0	38
	%	34.2	23.7	7.9	18.4	10.5	2.6	2.6	0	0	0	3.1
UPSE	#	34	27	6	11	3	1	0	1	0	2	85
	%	40.1	31.8	7.1	12.9	3.5	1.2	0	1.2	0	2.4	6.9
UPSW	#	13	11	9	8	4	0	1	0	1	0	47
	%	27.7	23.4	19.1	17.0	8.5	0	2.1	0	2.1	0	3.8
LPNW	#	22	25	16	32	9	8	6	1	0	3	122
	%	18.0	20.5	13.1	26.2	7.4	6.6	4.9	.8	0	2.5	9.9
PLNE	#	8	13	8	16	14	5	0	1	0	4	69
	%	11.6	18.8	11.6	23.2	20.3	7.2	0	1.4	0	5.8	5.6
LPSW	#	20	43	23	11	54	30	13	4	2	22	321
		6.2	13.4	7.2	34.3	16.8	9.3	4.0	1.2	.6	6.9	26.1
LPSE	#	34	41	24	1 5	96	40	33	20	10	55	458
	%	7.4	9.3	5.2	22.9	21.0	8.7	7.2	4.4	2.2	12.0	37.3
Total	#	185	196	96	297	187	87	54	28	13	86	1229
	%	15.1	15.9	7.8	24.2	15.2	7.1	4.4	2.3	1.1	7.0	100.0

TABLE 8

Distribution of Michigan Places by Categories of Change in the Number of Farms in Ten Rates of Change Categories in Size Categories Between 1930 and 1970

Percent Rate of Change in Number of Farms		Rate Categories of Change in Size of Places										
		-50 to -100	-10 to -49.9	-9.9 to 9.9	10 to 49.9	50 to 99.9	100 to 199.9	200 to 299.9	300 to 399.9	400 to 499.9	500 to over	Total
0 to -39.9	#	7	7	3	26	14	2	3	0	0	0	62
	%	11.3	11.3	4.8	41.9	22.6	3.2	4.8	0	0	0	5.0
-40.0 to -49.9	#	23	38	25	98	74	25	11	6	3	15	318
	%	7.2	11.9	7.9	30.8	23.3	7.9	3.5	1.9	.9	4.7	25.9
-50.0 to -59.9	#	29	42	22	87	62	35	15	8	4	22	326
	%	8.9	12.9	6.7	26.7	19.0	10.7	4.6	2.5	1.2	6.7	26.5
-60.0 to -69.9	#	33	29	14	45	23	18	21	11	5	47	246
	%	13.4	11.8	5.7	18.3	9.3	7.3	8.5	4.5	2.0	19.1	20.0
-70.0 to -79.9	#	41	32	21	24	12	4	4	1	1	0	140
	%	29.3	22.9	15.0	17.1	8.6	2.9	2.9	.7	.7	0	11.4
-80.0 to -100.0	#	52	48	11	17	2	3	0	2	0	2	137
	%	38.0	35.0	8.0	12.4	1.5	2.2	0	1.5	0	1.5	11.1
Total	#	185	196	96	297	187	87	54	28	13	86	1229
	%	15.1	15.9	7.8	24.2	15.2	7.1	4.4	2.3	1.1	7.0	100.0

TABLE 9

Distribution of Michigan Places by Rate of Change in Average Farm Size in a County in Ten Rates of Change in Size Categories, 1930-1970

Percent Change in Average Size Farm		Rate Categories of Change in Size of Places										
		-50 to -100	-10 to -49.9	-9.9 to 9.9	10 to 49.9	50 to 99.9	100 to 199.9	200 to 299.9	300 to 399.9	400 to 499.9	50C to over	Total
0 to -100	#	9	5	2	6	5	5	9	2	2	20	65
	%	13.8	7.7	3.1	9.2	7.7	7.7	13.8	3.1	3.1	30.8	5.3
0.0 to 29.9	#	9	9	8	28	15	12	10	10	4	16	122
	%	7.4	7.4	6.5	23.0	12.3	10.0	8.2	8.2	3.3	13.1	10.0
30.0 to 49.9	#	26	51	30	122	81	38	18	8	4	27	405
	%	6.4	12.6	7.4	30.1	20.0	9.4	4.4	2.0	1.0	6.7	33.0
50.0 to 69.9	#	39	49	27	99	69	25	14	6	2	21	351
	%	11.1	14.0	7.7	28.2	19.6	7.1	4.0	1.7	.6	6.0	28.5
70.0 to 100	#	102	81	29	42	17	7	3	2	1	2	286
	%	35.7	28.3	10.1	14.7	5.9	2.4	1.0	.7	.3	.7	23.3
Total	#	185	196	96	297	187	87	54	28	13	86	1229
	%	15.1	15.9	7.8	24.2	15.2	7.1	4.4	2.3	1.1	7.0	100.0

TABLE 10

Distribution of Michigan Places in Ten Rate Categories of 1930-1970 Change in Size by Rates of Change in Extractive Industrial Work Force in Counties

Percent Change in Extractive Work Force		Rate Categories of Change in Size of Places										
		-50 to -100	-10 to -49.9	-9.9 to 9.9	10 to 49.9	50 to 99.9	100 to 199.9	200 to 299.9	300 to 399.9	400 to 499.9	500 to over	Total
0 to -59.9	#	20	20	5	22	11	11	15	9	4	39	156
	%	12.8	12.8	3.2	14.1	7.1	7.1	9.6	5.8	2.6	25.0	12.7
-60.0 to -69.9	#	9	20	9	37	34	20	9	9	4	23	174
	%	5.2	11.5	5.2	21.3	19.5	11.5	5.2	5.2	2.3	13.2	14.2
-70.0 to -74.9	#	8	26	15	75	41	20	7	3	1	14	210
	%	3.8	12.4	7.1	35.7	19.5	9.5	3.3	1.4	.5	6.7	17.1
-75.0 to -79.9	#	31	30	15	48	49	17	7	4	1	5	207
	%	15.0	14.5	7.2	23.2	23.7	8.2	3.4	1.9	.5	2.4	16.8
-80.0 to -84.9	#	48	42	32	69	27	9	9	2	2	3	243
	%	19.6	17.3	13.2	28.4	11.1	3.7	3.7	.8	.8	1.2	19.8
-85.0 to -89.9	#	31	33	16	32	20	9	6	1	0	2	144
	%	21.5	22.9	6.9	22.2	13.9	6.3	4.2	.7	0	1.4	11.7
-90.0 to -100	#	38	25	10	14	5	1	1	0	1	0	95
	%	40.0	26.3	10.5	14.7	5.3	1.1	1.1	0	1.1	0	7.7
Total	#	185	196	96	297	187	87	54	28	13	86	1229
	%	15.1	15.9	7.8	24.2	15.2	7.1	4.4	2.3	1.1	7.0	100.0

TABLE 11

Distribution of Michigan Places in Ten Rate Categories of 1930-1970 Change in Size by Rates of Change in Nonextractive Industrial Work Force in Counties

Percent Change in Nonextractive Work Force		Rate Categories of Change in Size of Places										
		-50 to -100	-10 to -49.9	-9.9 to 9.9	10 to 49.9	50 to 99.9	100 to 199.9	200 to 299.9	300 to 399.9	400 to 499.9	500 to over	Total
0 to -100	#	32	27	6	10	2	1	0	0	0	0	78
	%	41.0	34.6	7.7	12.8	2.6	1.3	0	0	0	0	6.3
0 to 34.9	#	42	34	13	13	7	2	2	1	1	0	115
	%	36.5	29.6	11.3	11.3	6.1	1.7	1.7	.9	.9	0	9.4
35 to 69.9	#	37	23	13	36	15	5	5	2	1	5	142
	%	26.1	16.2	9.2	25.4	10.6	3.5	3.5	1.4	.7	3.5	11.6
70.0 to 99.9	#	7	18	11	29	23	12	13	2	0	14	129
	%	5.4	14.0	8.5	22.5	17.8	9.3	10.1	1.6	0	10.9	10.5
100.0 to 149.9	#	20	31	27	55	43	15	5	4	2	8	210
	%	9.5	14.8	12.9	26.2	20.5	7.1	2.4	1.9	1.0	3.8	17.1
150.0 to 199.9	#	18	22	9	54	32	9	4	2	2	5	157
	%	11.5	14.0	5.7	34.4	20.4	5.7	2.5	1.3	1.3	3.2	12.8
200.0 to 249.9	#	29	41	17	160	69	43	25	13	1/2	54	398
	%	7.3	10.3	4.3	25.1	16.3	10.8	6.2	4.2	1.7	13.6	32.4
Total	#	185	196	96	297	187	87	54	28	13	86	1229
	%	15.1	15.9	7.8	24.2	15.2	7.1	4.4	2.3	1.1	7.0	100.0

TABLE 12

Distribution of Michigan Places in Ten Rate Categories of 1930-1970
Change in Size by Rates of Change in Farm Population in Counties

Percent Change in Farm Population		Rate Categories of Change in Size of Places										
		-50 to -100	-10 to -49.9	-9.9 to 9.9	10 to 49.9	50 to 99.9	100 to 199.9	200 to 299.9	300 to 399.9	400 to 499.9	500 to over	Total
0 to 99998	#	1	1	2	0	1	0	0	1	0	2	8
	%	12.5	12.5	25.0	0	12.5	0	0	12.5	0	25.0	.7
0 to -29.9	#	6	10	8	30	20	17	15	5	4	30	145
	%	4.1	6.9	5.5	20.7	13.8	11.7	10.3	3.4	2.8	20.7	11.8
-30.0 to -39.9	#	6	14	3	20	39	22	10	8	2	12	136
	%	4.4	10.3	2.2	14.7	28.7	16.2	7.4	5.9	1.5	8.8	11.1
-40.0 to -49.9	#	23	34	31	89	53	17	9	1	1	11	269
	%	8.6	12.6	11.2	33.1	19.7	6.3	3.3	.4	.4	4.1	21.9
-50.0 to -59.9	#	17	33	7	76	41	16	4	5	2	13	214
	%	7.9	15.4	3.3	35.5	19.2	7.5	1.9	2.3	.9	6.1	17.4
-60.0 to -79.9	#	118	84	42	78	30	15	16	8	4	18	411
	%	26.2	20.4	10.2	19.0	7.3	3.6	3.9	1.9	1.0	4.4	33.4
-80.0 to -100	#	16	20	3	4	3	0	0	0	0	0	46
	%	34.8	43.5	6.5	8.7	6.5	0	0	0	0	0	3.7
Total	#	185	196	96	297	187	87	54	28	13	86	1229
	%	15.1	15.9	7.8	24.2	15.2	7.1	4.4	2.3	1.1	7.0	100.0