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Population Changes of North Dakota's Rural Trade Centers, 1960-1970

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POPULATION CHANGES OF NORTH DAKOTA'S
RURAL TRADE CENTERS, 1960-1970

by
Charles L. Durrenberger
State University of New York/Buffalo, 1968

A Thesis
Submitted to the Graduate Faculty
of the
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in partial fulfillment of the requirements
for the degree of
Master of Arts

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Department Geography

Degree Master of Arts

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Date

July 28, 1977

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Charles L. Durrenberger

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ABSTRACT

Research in trade relationships and hinterland analysis has shown that rural trade centers do not exist in isolation, but exhibit an interdependence with other rural and urban places. The purpose of this study is to examine relationships among trade centers by measuring their potential for growth.

The construct selected for growth analysis examines rural trade center population changes in relation to the size of rural trade centers, distance from urban centers, and the size of neighboring trade centers, both urban and rural. Trade centers having populations greater than 2,500 in 1970, were defined as urban. All trade centers considered were located within the politically defined boundaries of the State of North Dakota.

Detailed examinations of rural trade center relationships were made with respect to urban centers, and regional urban centers. The Fargo-Moorhead urbanized area located in Cass County was used as a case study. Urban centers were differentiated by size--2,500 to 5,000 (Category I) and 5,000 and over (Category II). Regional center population size was 10,000 and over. Population change of rural trade centers was selected as a measurement indicator. A positive population change from 1960 to 1970 was assumed to be indicative of a potential for future population growth and a symbiotic relationship. A negative population change was assumed to be indicative of a lack of growth potential and a competitive relationship.

The hypothesis selected for testing assumed rural trade centers to be at a disadvantage when located within 20 miles of urban centers. Underlying this assumption is the postulate that rural trade centers are integrated elements of a hierarchial system and function in association with urban centers. The methodology utilized tabular analysis to identify the relationships and correlation coefficients to measure the degree of association. Results of the tabular and statistical analyses were supplemented with field observations concerning the factors related to population change.

The results indicated weak associations between population change and distance to urban centers. It was found that Category I urban centers compete with rural trade centers. Also, a stronger association exists between growth of rural centers and distance to Category II and regional urban centers. Symbiotic relationships are most strongly developed in Cass County, however, growth patterns cannot be fully explained by the relationship between rural trade centers and the City of Fargo.

The correlation between rural trade center population change and distance to other rural trade centers was positive. Lack of statistical significance, however, prevented statistical verification of a competitive relationship. The correlation between size of rural trade center and population change was .18 and significant. In comparison to correlations between population change and distance to urban centers, this indicated that size of a rural trade center is a more important variable associated with growth in an area where relationships between urban and rural trade centers are weakly developed.

CHAPTER I

INTRODUCTION

In North Dakota, as in other predominantly rural areas, the small agricultural trade center is an important element of the central place hierarchy. Small hamlets, villages, and towns provide valuable services to their inhabitants and to the population living in their hinterlands.¹

One important aspect of the study of rural trade centers is population growth analysis. Population changes are of obvious concern to those living in rural areas, both as citizens of such centers and as inhabitants of the surrounding areas that are dependent upon the goods and services provided by these places. Population shifts are also of primary concern to those involved in the planning of rural areas, especially for the purpose of setting goals for development and evaluating the future needs of the rural population for schools, hospitals, and public services and utilities.

Research in trade relationships and hinterland analysis has shown that rural trade centers do not exist in isolation, but exhibit interdependence with other rural and urban places for the purpose

¹John Brush, "The Hierarchy of Central Places in Southwestern Wisconsin," Geographic Review, XLIII (July, 1953), p. 380; Howard Stafford, "The Functional Basis of Small Towns," Economic Geography, XXXIX (April, 1963), p. 165.

of providing goods and services.² In conjunction with this observation, one attribute found to be constantly related to the differential growth of trade centers is location.³ For example, studies have shown that in areas where transportation and communication facilities have improved, trade centers have prospered at the expense of those areas reflecting less development.⁴

Historical examination has demonstrated, however, that trade center interdependence was pre-dated by isolation of rural trade centers. An increase in mobility, which accompanied the modernization of transportation facilities, resulted in the growth of larger trade centers. Larger centers began to compete successfully with the smaller towns which had previously benefited from local isolation of their trade areas.⁵ As a result of the decline in isolation and the subsequent increase in competition among trade centers, numerous small trade centers declined or completely disappeared.⁶ The volume of

²Brian J. L. Berry and William L. Garrison, "The Functional Bases of the Central Place Hierarchy," Economic Geography, XXIV (April, 1958), p. 145.

³James E. Butler and Glenn V. Fuguitt, "Small-Town Population Change and Distance from Larger Towns: A Replication of Hassinger's Study," Rural Sociology, XXXV (September, 1970), p. 398.

⁴John E. Brush and Howard E. Bracey, "Rural Service Centers in Southwestern Wisconsin and Southern England," Geographical Review, XLV (October, 1955), p. 568; Richard L. Morrill, "The Development of Spatial Distributions of Towns in Sweden: An Historical-Predictive Approach," Annals, Association of American Geographers, LIII (March, 1963), p. 7.

⁵C. E. Lively, "Growth and Decline of Farm Trade Centers in Minnesota, 1905-1930," Bulletin 287, Minnesota Agricultural Experiment Station, St. Paul, (July, 1932), pp. 31-32.

⁶Lynn T. Smith, The Sociology of Rural Life, (New York: Harper and Brothers, 1947), pp. 457-460.

contacts between the farm and the large trade center increased simultaneously with a decline in allegiance to the small neighboring trade centers.⁷ Rural populations benefited from the increased mobility and were able to take advantage of the increased selection of goods and services available in the larger centers.

Definitions

For the purpose of the study the following definitions were adopted:

Rural trade centers--all incorporated places having a population of less than 2,500 in 1970. The universe consists of 339 centers. All incorporated places are assumed to function primarily as agricultural trade centers. Other functional associations are recognized (for example, county seat status); however, an agricultural dominance of function was assumed to exist. This assumption was based upon an examination of employment characteristics throughout the North Dakota study area.

Urban trade centers--all incorporated places in North Dakota classified as urban by the United States Bureau of the Census in 1970. The construct selected for testing the interaction hypothesis divides urban center size categories into two groups--2,500 to 4,999 (Category I) and 5,000 and over (Category II).

⁷C. C. Zimmerman, "Farm Trade Centers in Minnesota," Bulletin 269, Minnesota Agricultural Experiment Station, St. Paul, (September, 1930), p. 18; John H. Kolb and LeRoy J. Day, "Interdependence in Town and Country Relations in Rural Society," Research Bulletin 172, Wisconsin Experiment Station, Madison, (1950), pp. 3-4; J. H. Kolb, "Service Relations of Town and Country," Research Bulletin 53, Wisconsin Agricultural Experiment Station, Madison, (1923), p. 2.

Purpose and Scope of Study

The purpose of this study is to examine relationships among trade centers by measuring their potential for growth. The construct selected for growth analysis examines rural trade center population changes in relation to size, distance from urban centers, and the size of neighboring trade centers, both urban and rural. Study of location, a basic geographical concept, will be emphasized throughout the research. By studying population dynamics this thesis attempts to provide greater insight into the spatial factor of location--a factor consistently found to be associated with the growth and decline of trade centers.⁸

The hypothesis selected for testing assumes rural trade centers to be at a disadvantage when located within twenty miles of urban centers. Underlying this assumption is the postulate that rural centers are integrated elements in a hierarchical system and function in association with urban centers.⁹ Location of rural centers is a basic consideration and in essence involves an evaluation of a center's economic relationship with respect to urban centers.

Study of location is central to the understanding of "place." In describing the concept of location, Broek explains various facets of location.¹⁰ Two principal aspects are "site" and "situation." The situation concept of place is relevant to the present analysis.

⁸Butler and Fuguitt, "Small Town Population Change," p. 396.

⁹Ibid.

¹⁰Jan O. M. Broek, Geography, Its Scope and Spirit (Columbus: Charles E. Merrill Books, Inc., 1965), pp. 30-33.

In describing the situation of any one place emphasis is placed on its relationship to other places. This in turn may involve the examination of the interaction among the other places; which the present study addresses.

The modern trade center is considerably less isolated than when it was first established as a place for settlement and exchange. Advances in transportation and communication have increased the interaction between the farm and the rural community, and among trade centers. The study of the small rural trade center has important implications for the study of population change and redistribution.¹¹ In this sense, examination of population changes of North Dakota rural trade centers will be beneficial for evaluating and predicting the redistribution of population within the state.

The Importance of the Rural Trade Center

Significance of the rural agricultural trade center can be interpreted in many different ways. One aspect of the trade center is that it functions as an important segment of the rural social and cultural system.¹² In this situation the small town represents a social communications center where its citizens meet and converse with the dispersed rural population.¹³ In addition to this social

¹¹Butler and Fuguitt, "Small Town Population Change, " p. 396.

¹²Norman Moline, Mobility and the Small Town, 1900-1930 (Chicago: University of Chicago, Department of Geography, 1971), p. 1.

¹³D. G. Marshall, "Hamlets and Villages in the United States: Their Place in the American Way of Life," American Sociological Review, XI (April, 1946), p. 165.

function, the citizens of small rural trade centers are quick to emphasize the benefits of small town living:

The Springdaler . . . sees that the urban and metropolitan society is technically and culturally superior to his own community. . .

The community is constantly dependent on cultural and material imports and welcomes these as a way of 'keeping up with the times.' However, they believe that the very technical and cultural factors that make for superiority of the 'outside' also account for the problems of living that cities exhibit.¹⁴

Small towns also function as centers for local government.

Brunner, in his book on village communities, discusses the development of governmental functions:

Villages are important too, because they represent a tremendous experience in self government . . . Communities as small villages incorporate usually from what they consider to be real necessity; because they are unable to secure from township or county the services and facilities they desire.¹⁵

Quite conceivably, however, the most important function of a trade center is its capacity to provide basic material goods and economic services to the rural population. Taylor emphasizes this fact in his commentary on the characteristics of agricultural trade centers.

Agricultural hamlets and villages are primarily service centers for farm families. Such a center generally has farmland on all sides, and often it is difficult to determine where the farms leave off and the town begins. Although farm families may trade at more than one center, it is customary for them to seek services in a nearby town. Within the town the specialized-service type of establishment is dominant over the general-store type . . . One distinguishing feature of the country town is

¹⁴ Arthur J. Vidich and Joseph Bensman, Small Town in Mass Society, (Garden City, New York: Doubleday and Co., Inc., 1960), pp. 79-80.

¹⁵ Edmund de S. Brunner, Village Communities, (New York: George H. Doran Co., 1927), p. 19.

its almost complete dependence upon agriculture, with little or no supplementing means of livelihood.¹⁶

Stafford, in a more recent commentary, notes similar economic functions of small towns:

. . . these small places provide basic connections between the dispersed agricultural populations and the agglomerated urban population. For the most part, such direct connections as do exist are through goods and services which are provided in these small towns for the agricultural population surrounding them.¹⁷

Emphasizing economic functions of small trade centers and their geographic distribution, Brush writes:

Small towns and villages in agricultural areas of Anglo-America exist mainly because of their function as central places for the exchange of goods and services, each for its local farm trade. In any given area small centers are closely spaced and more numerous; large centers, offering greater services, are more widely spaced and less numerous.¹⁸

While this brief review of small rural trade center functional characteristics had undoubtedly omitted many specific functions found in small communities, the examination does imply that the small rural center is an important form of settlement and a central place for interaction and concentration of population.

Reference Studies and the Problem of the Thesis

This study examines the effects of two ecological processes--

¹⁶Carl Taylor, Rural Life in the United States, (New York: Alfred A. Knopf, Inc., 1949), pp. 80-81.

¹⁷Howard Stafford, "The Functional Basis of Small Towns," Economic Geography, XXXIX (April, 1963), p. 165.

¹⁸John Brush, "The Hierarchy of Central Places," p. 390.

competition and symbiosis--on population change of rural trade centers. Previous research had demonstrated the effects of the proximity of urban centers on rural trade center population changes. Growth has occurred more frequently and to a greater extent in urbanized areas.¹⁹ In this situation, small trade centers benefit from the proximity of large urban centers and from a symbiotic relationship.²⁰ However, proximity to a larger center has in other instances been associated with a lack of growth. Small communities in this situation have not benefited from their location.²¹

Two studies in particular have demonstrated an approach to the investigation of these processes in rural areas. An initial study was performed by Edward Hassinger in an examination of trade center characteristics in Minnesota.²² In the study Hassinger found that when nearest neighbor trade centers were only slightly larger than rural trade centers, population declines in small centers increased in frequency as the distances between centers decreased. Small rural centers found in proximity to extremely large urban centers, however, experienced an increase frequency of population gains. A second study, performed by Butler and Fuguitt, examined the effects of competition

¹⁹John Frazer Hart and Neil E. Salisbury, "Population Change in Middle Western Villages: A Statistical Approach," Annals, Association of American Geographers, LV (March, 1965), p. 145.

²⁰See Chapter III for a review of these characteristics in Cass County, North Dakota.

²¹Butler and Fuguitt, "Small Town Population Change," p. 397.

²²Edward Hassinger, "Factors Associated with Population Changes in Agricultural Trade Centers of Southern Minnesota, 1940-1950," (Unpublished Ph. D. dissertation, Dept. of Sociology, University of Minnesota, 1956), pp. 124-147.

and symbiosis for three Wisconsin population density areas--urban, rural, and remote.²³ In the rural and remote regions, as defined by Butler and Fuguitt, a competition effect was found to exist between urban and rural trade centers. In the urban region, a symbiotic relationship was found to exist between rural and urban trade centers; however, the relationship was not found to be statistically significant.

Results of these studies indicated that rural trade center population growth is influenced by the location of these centers with respect to urban trade centers. The effects of competition and symbiosis were shown to be associated with changes in population. The problem of this study is to measure these processes among rural and urban trade centers in the North Dakota study area and evaluate their effects.

Type of Study

This study represents a systematic examination of population changes in rural trade centers in North Dakota (Fig. 1). All trade centers considered are located within the politically defined boundaries of North Dakota.

Selection of a Study Area

In the previously discussed study by Hassinger, it was necessary to select an area dominated by agriculture. Hassinger believed "a study area was desired in which agriculture was first and dominant in importance. This would, in a broad way, control the

²³Butler and Fuguitt, "Small Town Population Change," p. 397.

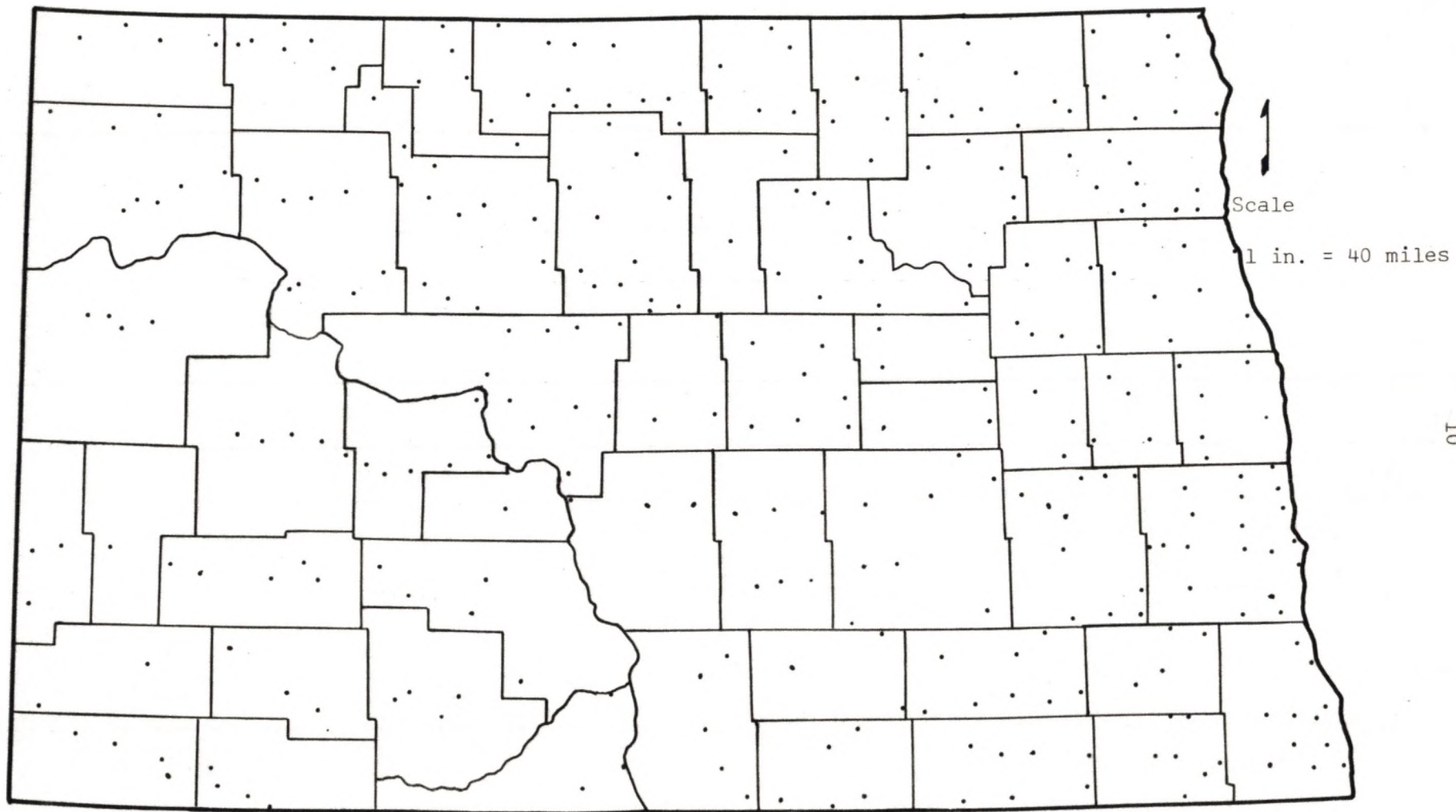


Fig. 1--North Dakota Rural Trade Centers

economic base of centers within the area."²⁴ Hassinger selected criteria that would be used to delineate an area in which agriculture dominated. He eliminated the urbanized area in southeastern Minnesota and also an area in northern Minnesota in which agriculture was less dominant.

The specific criteria used by Hassinger included occupational pattern, physical and economic resources of the area, and the background of settlement. For the purpose of the present study, it was not necessary to use such an extensive list of criteria in order to delineate a study area. Employment characteristics confirmed the expectation that most counties in North Dakota are dominated or extremely dependent upon agriculture as an economic base.

In 1970, slightly over 21 percent of all employed persons over 16 years of age were engaged in agricultural production in North Dakota.²⁵ As would be expected in North Dakota's urban areas, only two percent of the workers were employed in agriculture. However, in rural areas percentages of workers in agriculture increased. Among the rural non-farm populations, nine percent were engaged directly in agriculture. Among the rural farm population the percentage increases to 75 percent.

Comparisons of industrial employment figures indicate that agriculture remains the largest single industry in North Dakota (Table 1). There is a trend towards fewer employees in agriculture; however,

²⁴Hassinger, "Factors Associated with Population Changes," p. 37.

²⁵U.S. Department of Commerce, Bureau of the Census, United States Census of Population: 1970, Vol. I, Characteristics of the Population, pt. 36, North Dakota.

TABLE 1

INDUSTRY GROUP OF EMPLOYED PERSONS

FOR NORTH DAKOTA, 1940 TO 1970

Industry Group	Year			
	1940	1950	1960	1970
Agriculture, forestry & fisheries	107,139	98,841	70,166	43,525
Mining	987	755	2,017	1,638
Construction	4,148	11,270	11,426	10,548
Manufacturing	5,007	6,746	7,856	9,548
Railroad & railway express service	5,355	7,783	5,195	3,441
Trucking service & warehousing	1,867	2,756	2,674	2,801
Other transportation	558	1,041	1,011	1,244
Communications	1,208	1,947	2,418	2,525
Utilities & sanitary service	1,240	2,288	2,321	3,288
Wholesale trade	5,936	8,080	8,736	9,005
Food & dairy products stores	4,150	5,048	4,924	5,184
Eating & drinking places	4,125	6,988	6,954	8,180
Other retail	13,257	19,317	22,361	24,936
Finance, insurance & real estate	3,142	4,025	6,495	7,431
Business services	241	414	950	1,366
Repair services	3,505	5,757	3,069	2,567
Private households	6,899	2,781	5,477	3,245
Other personal services	4,976	4,951	5,661	6,189
Entertainment & recreation services	1,103	1,337	1,295	1,289
Educational services	9,668	10,092	14,108	20,389
Welfare, religious & nonprofit membership organizations	)	2,159	3,743	4,127
Hospitals	) 6,314	4,201	7,098	10,114
Other professional & related services	)	2,620	3,450	10,259
Public administration	6,621	8,333	10,317	10,903
Industry not reported	<u>2,750</u>	<u>3,930</u>	<u>3,939</u>	<u>8,041</u>
TOTAL	200,196	223,460	213,661	204,585

SOURCE: 1970 U.S. Census of Population, North Dakota PC (1) 36C.

it still remains the dominant industry.

Examination of data reveals that there are nine counties in which agricultural employment does not contribute the largest industrial group.²⁶ These counties include Burleigh, Cass, Grand Forks, Pierce, Ramsey, Stark, Stutsman, Ward, and Williams.²⁷ A major North Dakota service center is located in each county. This accounts for a dominance of retail employment rather than agricultural employment. Previous examination of the distribution of employment in urban and rural areas indicates that the rural areas continue to be agriculturally oriented. Therefore, it appears reasonable to assume that even in counties with retail employment dominating in the urban areas, agriculture will continue to be the major employment sector in the rural areas.

Number of Rural Trade Centers in 1970

According to the 1970 Census of Population, 360 incorporated places exist in North Dakota. Of these, 339 were defined as rural (having a population of 2,500 or less) in the 1960 census and 1970 census. One rural trade center, Mayville, had a population of 2,168 in 1960 and 2,544 in 1970. It was classified as an urban center in 1970.

Table 2 lists the number of rural trade centers by census designated categories. As indicated in the previous paragraph, the total

²⁶Neil Gustafson, Recent Trends/Future Prospects: A Look at Upper Midwest Population Changes (Minneapolis: Upper Midwest Council, 1973), p. 27.

²⁷For the location of counties and rural or urban trade centers, see the detailed map of North Dakota in the binder of this study.

number of rural trade centers in 1960 was 340. Four trade centers were added through incorporation. For the purpose of this study, 339 rural trade centers were selected for analysis. Mayville was excluded because of its change in status and the four recently incorporated trade centers were excluded because the population figures for 1960 were not available.

TABLE 2
NUMBER OF RURAL TRADE CENTERS 1960 AND 1970

Census Category of Population Size	Number of Centers	
	1960	1970
2,000 to 2,500	7	4
1,500 to 2,000	15	14
1,000 to 1,500	26	26
500 to 1,000	45	42
200 to 500	114	97
Less than 200	133	157
TOTAL	340	343

SOURCE: U.S. Bureau of Census, 1970 Census of Population, Number of Inhabitants, North Dakota PC(1)-A36 April, 1971

Organization of the Remainder of the Thesis

The remaining chapters of this thesis will be devoted to an examination of selected population characteristics of rural trade centers, a study of population changes of trade centers with respect to distances from regional centers with emphasis on changes in Cass County--North Dakota's only county located within a standard metro-

politan statistical area,²⁸ and a study of the growth potential of rural trade centers as influenced by their location with respect to urban centers. The final chapter will be devoted to a summarization and review of the findings of the previously presented chapters.

²⁸ A standard metropolitan statistical area is defined by the U.S. Bureau of Census as "a county or group of contiguous counties which contain at least one city of 50,000 inhabitants or more, or 'twin cities' with a combined population of 50,000."

CHAPTER II

SELECTED POPULATION CHARACTERISTICS OF RURAL TRADE CENTERS

The purpose for including this chapter is to review selected population characteristics of rural trade centers in North Dakota. Both geographical and non-geographical characteristics have been selected for this examination. Spatial attributes of each non-geographical characteristic are provided in order to increase the background understanding of trade centers and their population characteristics.

Several of these characteristics were selected because of their potential for affecting the statistical results of the succeeding measurements of trade center growth potential included in the remainder of the thesis. These characteristics include: population size, percentage change, and absolute change in population. The locational pattern of trade centers was reviewed because it is indicative of other factors that may affect population changes of rural trade centers--transportation and communication networks.

Location Patterns

The location of North Dakota rural trade centers is illustrated in Figure 1. The general distribution is characterized by a greater degree of concentration in the eastern and southeastern counties of

the state. In the western and southeastern areas of the state the density of trade centers is reduced.

Connor, in a study of the population of North Dakota examined the general distributional attributes of the state with relation to the physical geography.¹ Three primary factors are considered: topography, climate, and soil. Comparing the influence of these factors on demographic distribution, Connor concludes that population density varies with the agricultural desirability of the land and its productive capacities. Connor notes that agricultural productivity generally diminishes in a westerly direction throughout the state. The reduction in productivity results in an increased need for larger agricultural land holdings and results in a decreased population density in the western areas of the state.

A second factor that influenced the distribution of trade centers was the network of railways (Fig. 2). Expansion of rail construction reduced the number of trade centers because the advancement of the rail network reduced the need for a dense hierarchy of trade centers.² With the improvement of transportation facilities, competition between trade centers increased. Trade centers located at transfer points benefited from the increased trade and expanded economically. Ullman examined this phenomenon:

The chief change that transport improvement has wrought is in the scale of agricultural differentiation. Within

¹T. Dwight Connor, "The Population of North Dakota from 1890 to 1960: A Geographic Study." (Unpublished Masters Thesis, Dept. of Geography, University of North Dakota, 1960), pp. 54-72.

²Jesse C. Korthal, "The Growth and Decline of Incorporated Farm Trade Centers in North Dakota, 1909-1930." (Unpublished Masters Thesis, Dept. of Geography, University of North Dakota, 1935), p. 25.

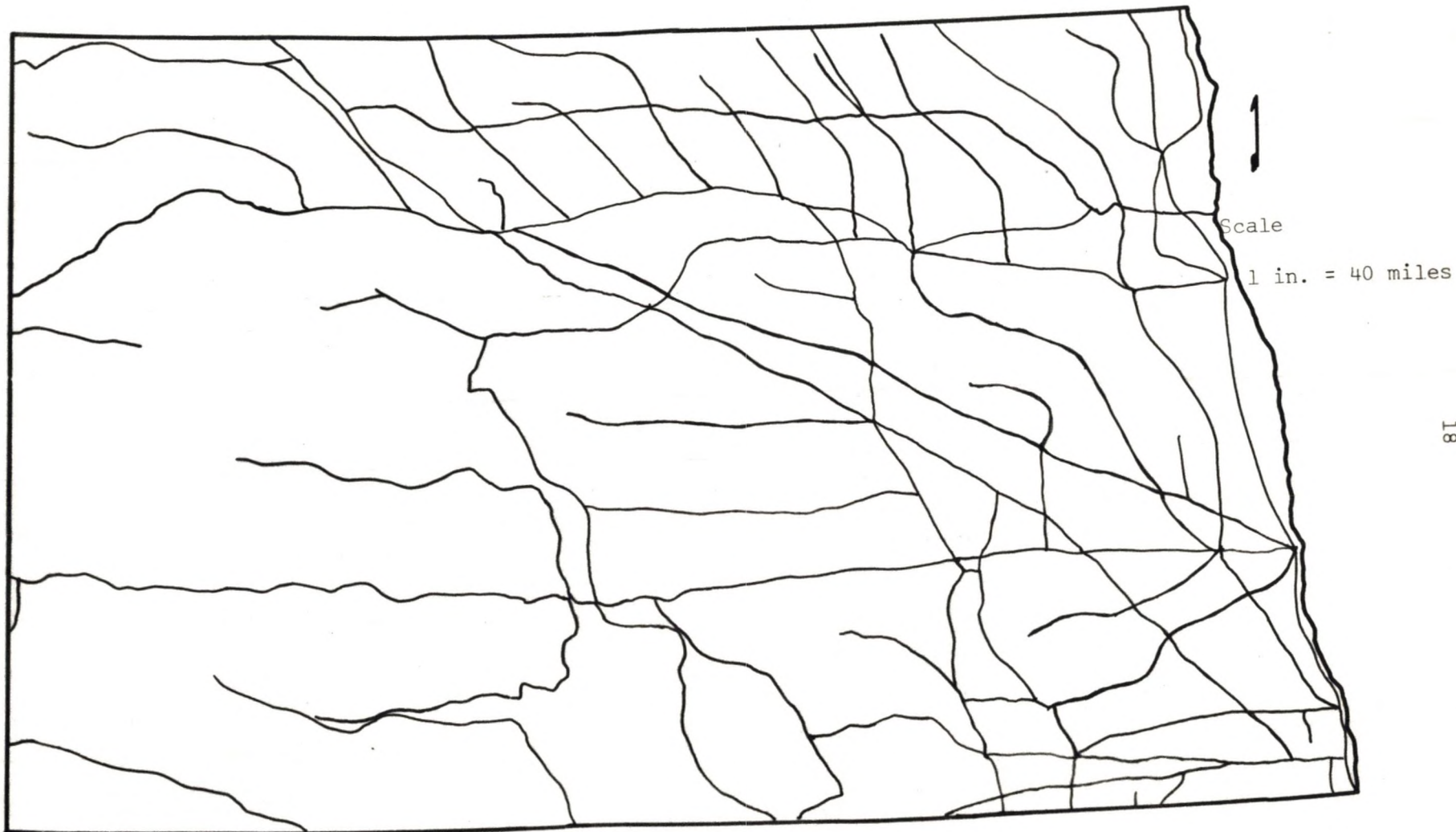


Fig. 2--North Dakota Rail Network, 1970

SOURCE: North Dakota Public Service Commission

the large specialized agricultural areas, for example, there is less subregional differentiation now than formerly, inasmuch as a wide range of subsistence or locally transportable crops need not be grown.³

An improved transportation system resulted with a concentration of economic services and an expansion in the scale of the agricultural producing areas in North Dakota. The distribution of trade centers is currently indicative of this past adjustment.

The highway network has similarly reduced the need for as many trade centers (Fig. 3). Ease of travel stimulated an increase in the frequency and length of trips made to rural trade centers. The larger trade center, which in the past was too distant to compete with more convenient and closer rural centers, began to gain an advantage over smaller centers because of a greater variety of goods and services. Consequently, economic growth favored larger trade centers at the expense of smaller centers.

Size of Rural Trade Centers

A third characteristic of trade centers is size. Figure 4 illustrates the distribution of centers by size category. A central place hierarchy is evident with many of the larger centers functioning as county seats. Secondly, the arrangement of centers reflects the geographic influence of the rail network.

The distribution of trade centers presents a linear pattern of settlements with several small centers located between two larger centers. Harris and Ullman examine this aspect of the linear pattern

³Edward Ullman, "The Role of Transportation and the Basis of Interaction," Man's Role in Changing the Face of the Earth, ed. by William L. Thomas (Chicago: University of Chicago Press, 1956), p. 863.

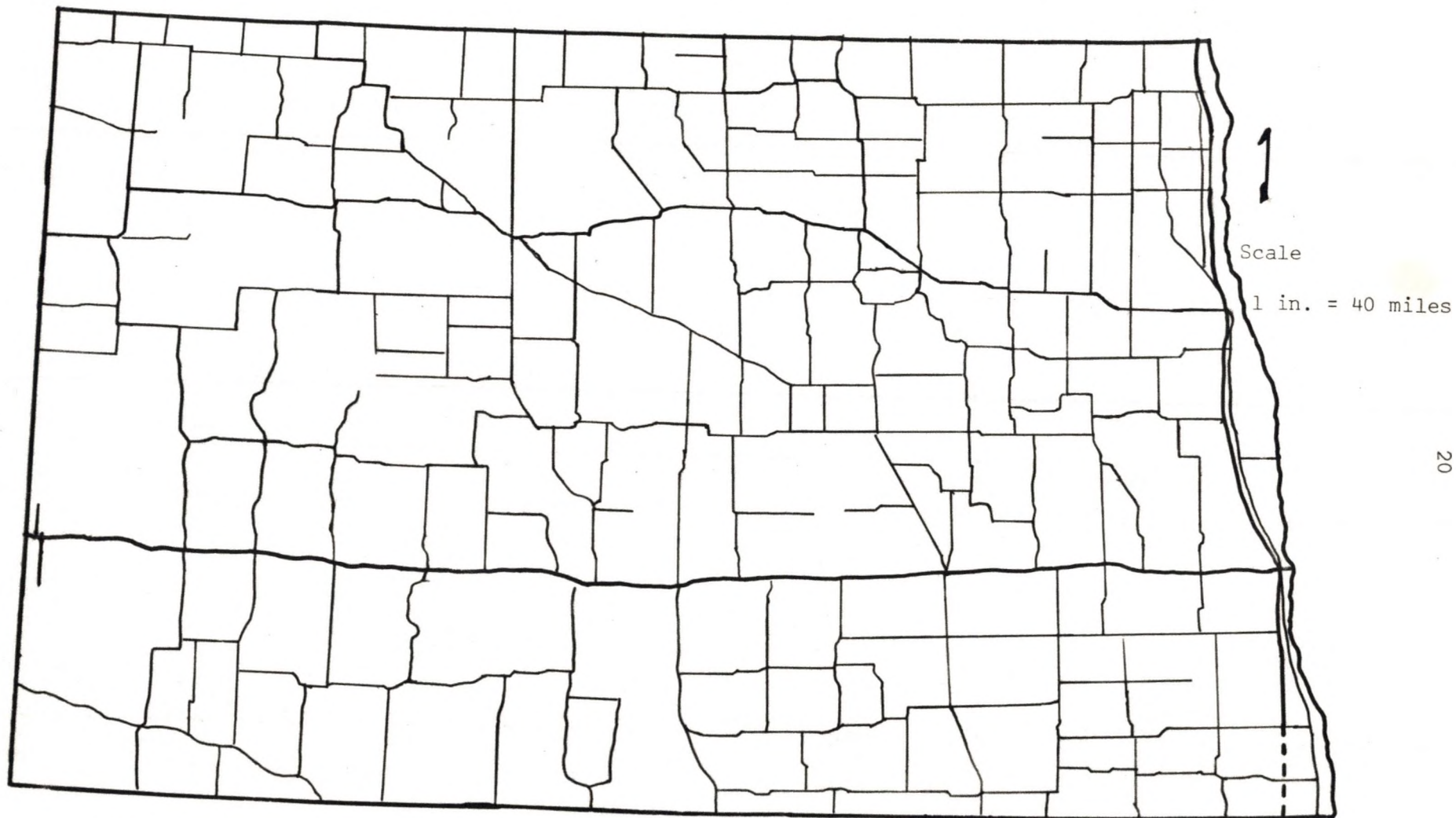


Fig. 3--North Dakota Highway Network, 1970

SOURCE: North Dakota Highway Department
North Dakota Public Service Commission

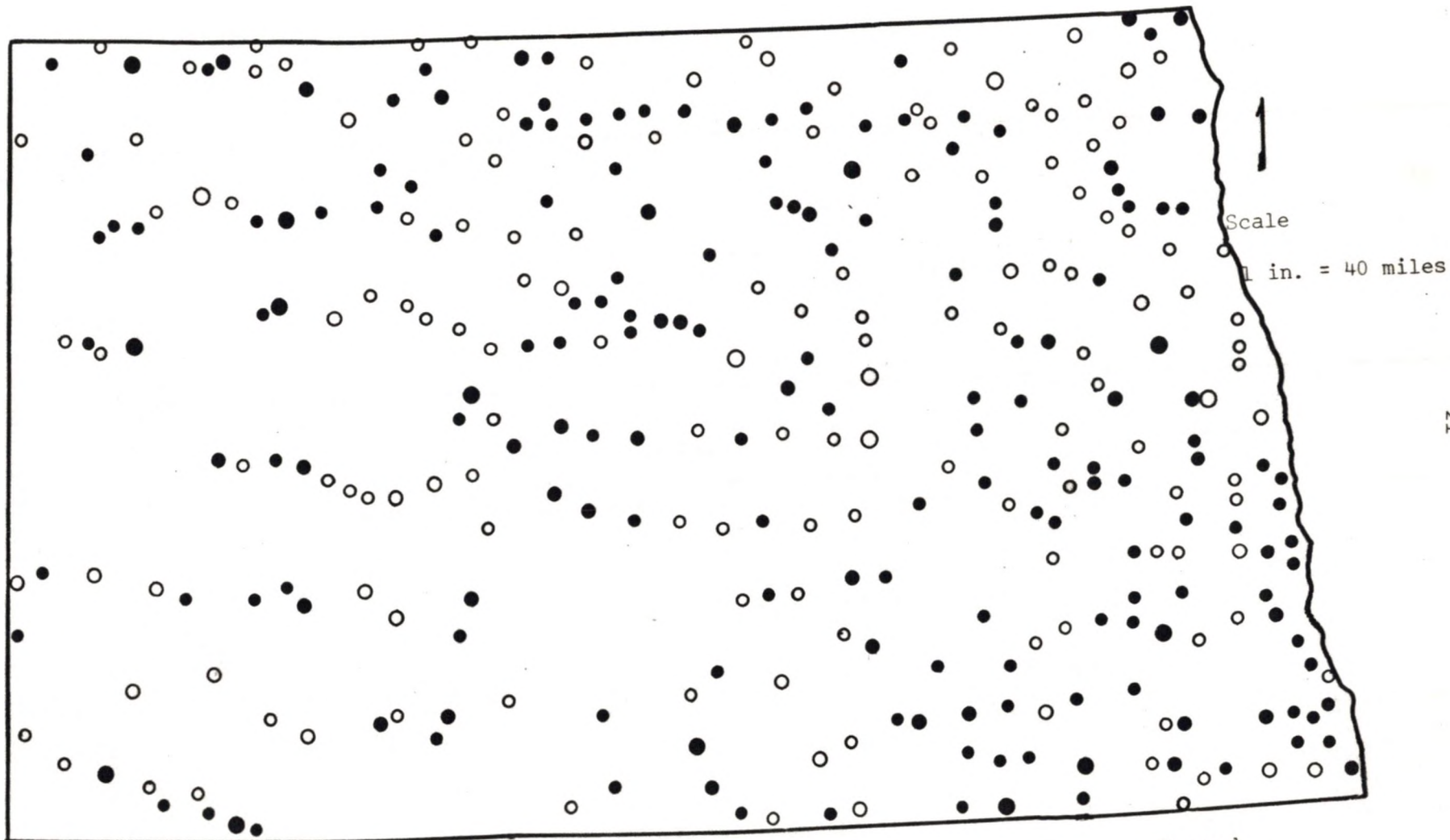


Fig. 4--Size of Trade Centers, 1960

SOURCE: U.S. Bureau of Census, Number of Inhabitants
North Dakota PC (1)-A36

- Legend
- 0-200
 - 200-500
 - 500-1,000
 - 1,000-1,500
 - 1,500-2,000
 - 2,000-2,500

of center alignment noting that trade areas can be altered by transportation routes.⁴ Trade areas of centers with a linear alignment tend to become elongated at right angles to trade routes. In this manner they contrast with other spatial arrangements wherein trade centers become extended parallel, but not perpendicular, to trade routes.

Population figures for rural trade centers substantiate the observation that small trade centers are losing population (Appendix I). Table 3 illustrates the changes in rural population by size of place. In 1960 the total rural, farm (other rural), and non-farm population represented almost 65 percent of the total population of the state. This percentage declined to approximately 56 percent in 1970. Similarly, the percentage of the rural non-farm population to the total population declined from 1960 to 1970. In 1960 approximately 25 percent of the population resided in rural trade centers. By 1970 the percentage had declined to 23 percent.

The rural non-farm population declined less from 1960 to 1970 than the rural farm segment of the population. As previously stated, the non-farm population declined from approximately 25 percent to 23 percent. The farm population declined from 40 percent to 33 percent. The non-farm population increased its percentage of the total rural population from about 39 percent to 41 percent.

⁴Chauncy D. Harris and Edward L. Ullman, "The Nature of Cities," The Annals of the American Academy of Political and Social Sciences, CCXLII (November, 1945), pp. 8-9; Edward Ullman, "A Theory of Location for Cities," American Journal of Sociology, XLVI (June, 1941), p. 860.

TABLE 3

RURAL POPULATION BY SIZE OF PLACE: 1960 AND 1970

	1970			1960		
	Population	% of Total Population	Percent Distribution	Population	% of Total Population	Percent Distribution
Places of 1,000 to 2,500	65,434	10.6	19.0	75,108	11.9	18.3
2,000 to 2,500	9,134	1.5	2.6	15,479	2.4	3.8
1,500 to 2,000	23,222	3.8	6.7	25,959	4.1	6.3
1,000 to 1,500	33,088	5.4	9.6	33,670	5.3	8.2
Places less than 1,000	75,735	12.3	22.0	83,653	13.2	20.4
Other rural	203,150	32.9	59.0	250,997	39.7	61.3
Total	344,319	55.7	100.0	409,738	64.8	100.0

SOURCE: U.S. Bureau of Census, Number of Inhabitants, North Dakota PC (1)-A36.

Population Changes

A fourth characteristic examined is the population change of trade centers. Figure 5 illustrates the distribution of population change by rural trade center size. While the generalized pattern of change indicates state-wide population losses, population growth is noted in Cass County. Also, some centers that gained population from 1960 to 1970 appear to exist in isolated locations throughout the state. Cass County contains nine rural trade centers that gained population. Proximity to Fargo, North Dakota's largest urban center, and improvements in highway transportation provide two explanations for this growth.

In western and southern sections of the state there were relatively few trade centers which exhibited growth from 1960 to 1970. Mercer, Ward, and Stark counties contained three, some counties had only one, and many had no rural trade centers. The large urban centers of Minot and Dickinson appear to represent one stimulus to growth while other rural centers experienced growth because of the economic development of lignite coal deposits.

Table 4 presents population gains and losses by census categories. Approximately 84 percent of all rural trade centers declined in population. Trade centers with less than 200 persons experienced extremely high percentages of losses with 41 percent of all such towns declining 30 or more percent. Over 32 percent of trade centers with fewer than 200 people declined with moderate losses of between 15 and 29.9 percent. Trade centers having populations of 200 to 499 persons,

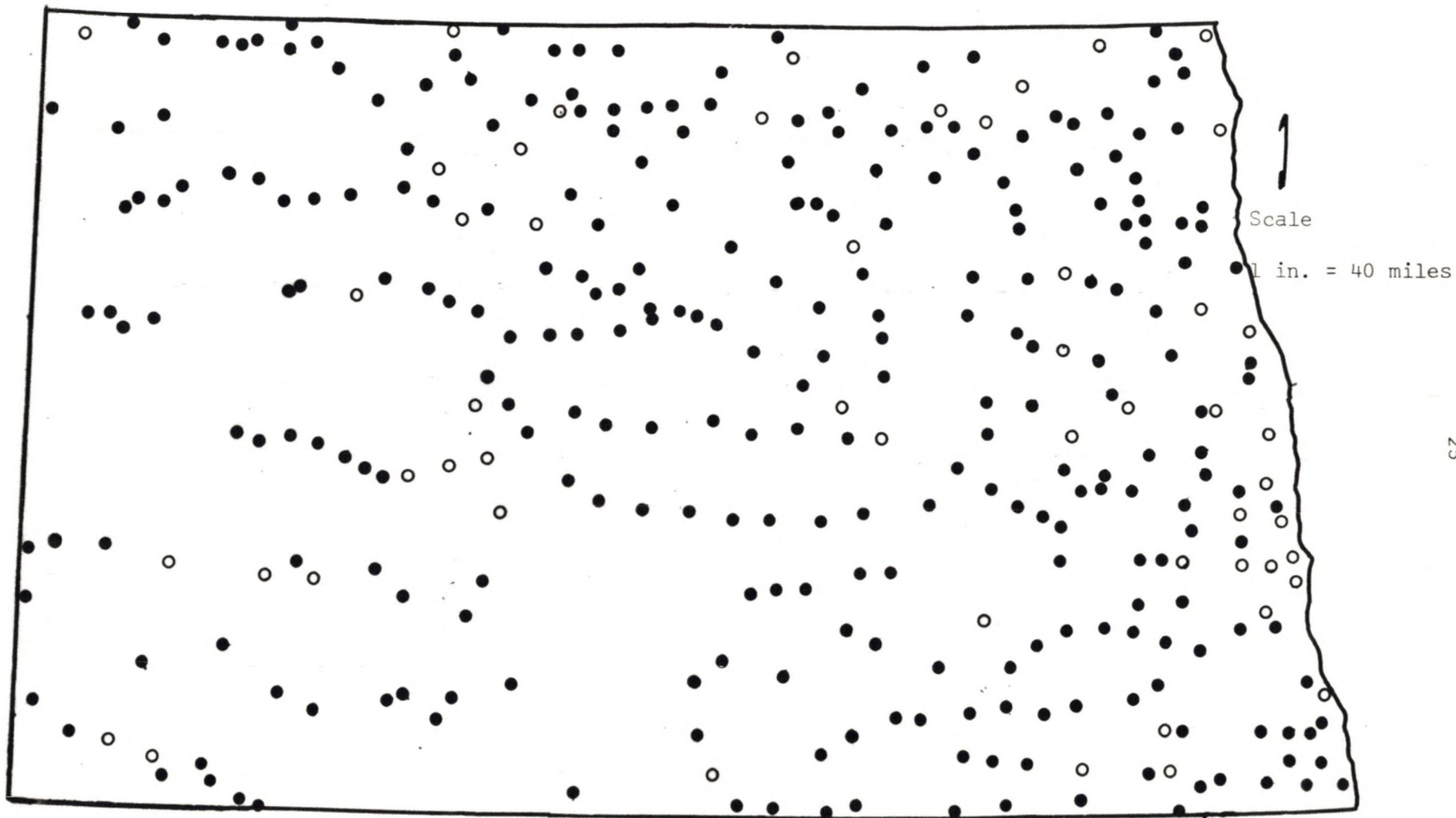


Fig. 5--Population Change 1960-1970

SOURCE: U.S. Bureau of Census, Number of Inhabitants
North Dakota PC (1)-A36

Legend

○ Gains

● Losses

TABLE 4

TRADE CENTER POPULATION CHANGE BY SIZE OF TRADE CENTER

Population Size 1960	Gains			Losses			Total
	0 - 14.9%	15 - 29.9%	30 & over	0 - 14.9%	15 - 29.9%	30 & over	
Less than 200	5.3	3.9	2.2	15.8	31.6	41.1	100.0
200 to 499	4.4	2.2	3.5	29.0	40.0	17.5	100.0
500 to 999	13.3	4.4	---	48.9	28.9	4.4	100.0
1,000 to 1,499	34.6	---	---	50.0	15.4	---	100.0
1,500 to 1,999	13.3	---	---	73.3	13.3	---	100.0
2,000 to 2,500	33.3	---	---	50.0	16.7	---	100.0
Total	9.7	3.8	2.1	30.1	31.6	22.8	100.0

SOURCE: Thomas K. Ostenson, Reference Tables: Population Change of Counties and Incorporated Places, 1950-1970, (Fargo: Department of Agricultural Economics, North Dakota State University, 1971), pp. 34-44.

similarly declined, but declines were more moderate with fewer losses of over 30 percent.

Trade centers with populations above 500 generally experienced only small or moderate population losses. Most losses remained less than 15 percent. The highest percentage of population loss of less than 15 percent occurred among trade centers having populations of 1,000 to 1,500. Almost three-quarters of the centers in this category lost less than 15 percent of their populations.

Population gains, for the most part, were low with few centers exhibiting large (30 percent and over) or even moderate increases

(15 to 29.9 percent). Two size categories, 1,000 to 1,499 and 2,000 to 2,500, contained over 30 percent of the trade centers that increased in population from 0 to 14.9 percent.

Figure 6 illustrates the relationship between trade center size and population change. The distribution of change provides evidence to support the observation that larger centers are less inclined to gain or lose population. This is evidenced by the smaller percentage changes among larger centers. Small centers increased or declined in population to a greater extent. A correlation coefficient of .18 was obtained from a comparison of trade center size and population change. Although small, the coefficient was significant⁵ at the 99 percent level of probability. In addition to the results indicated by tabular analysis of trade centers, statistical analysis indicates that large centers exhibit a greater inclination to retain population.

Absolute Population Change

An alternate method for evaluating population change has been suggested by Kariel in a study of population change in the North Central States.⁶ Kariel designed the study to demonstrate the practical applications of using absolute values of population change. In addition to examining absolute population changes, Kariel separately

⁵Significance is defined as the probability of accepting a false hypothesis. For this example, there is less than a one percent probability that there is not an association between the two variables.

⁶Herbert G. Kariel, "Some Aspects of the Spatial Distribution of Population Change in the West North Central States," Professional Geographer, XIV (January, 1962), pp. 17-23.

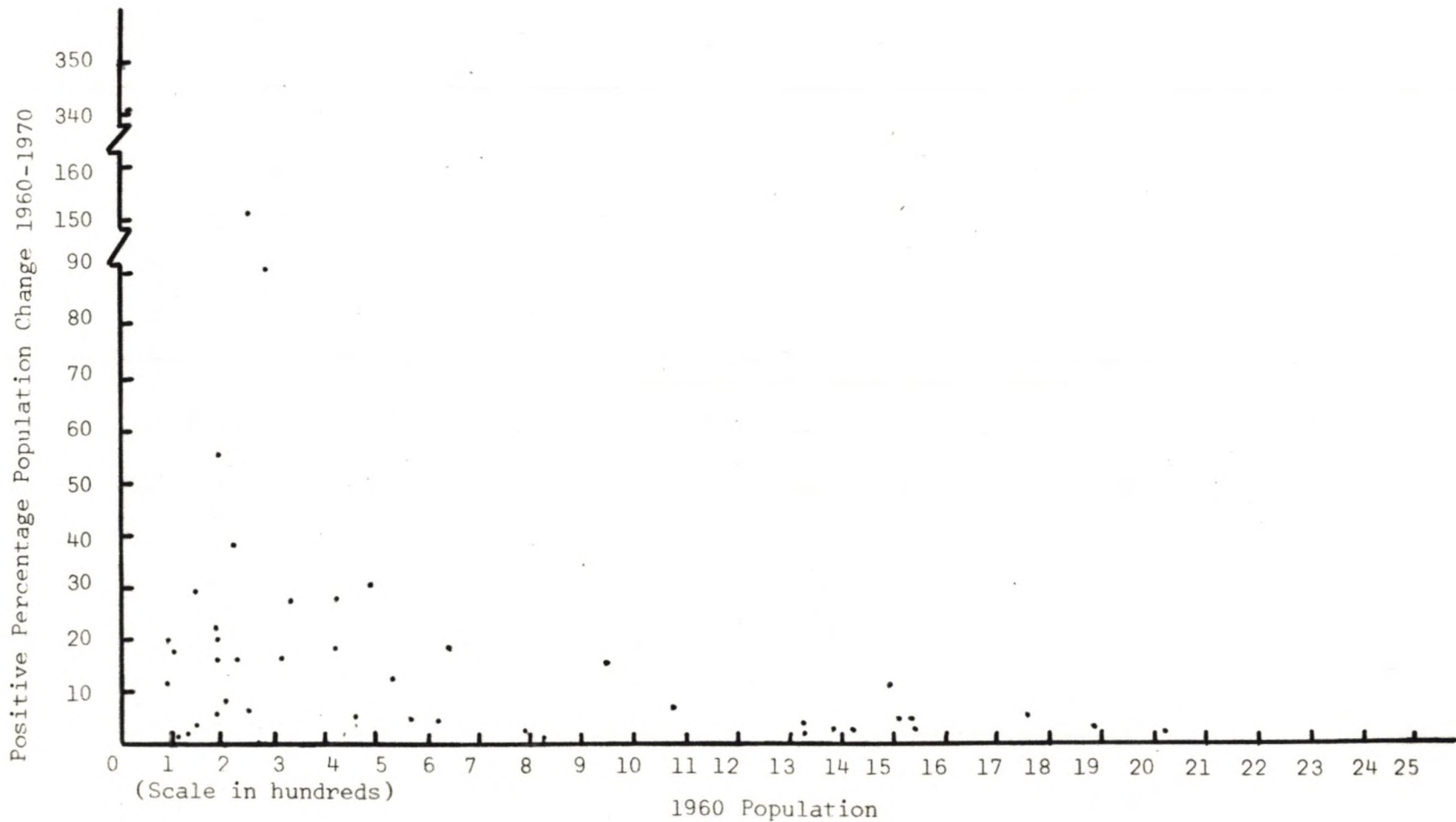


Fig. 6--Population Change of Rural Trade Centers, 1960-1970

SOURCE: U.S. Bureau of Census, Number of Inhabitants

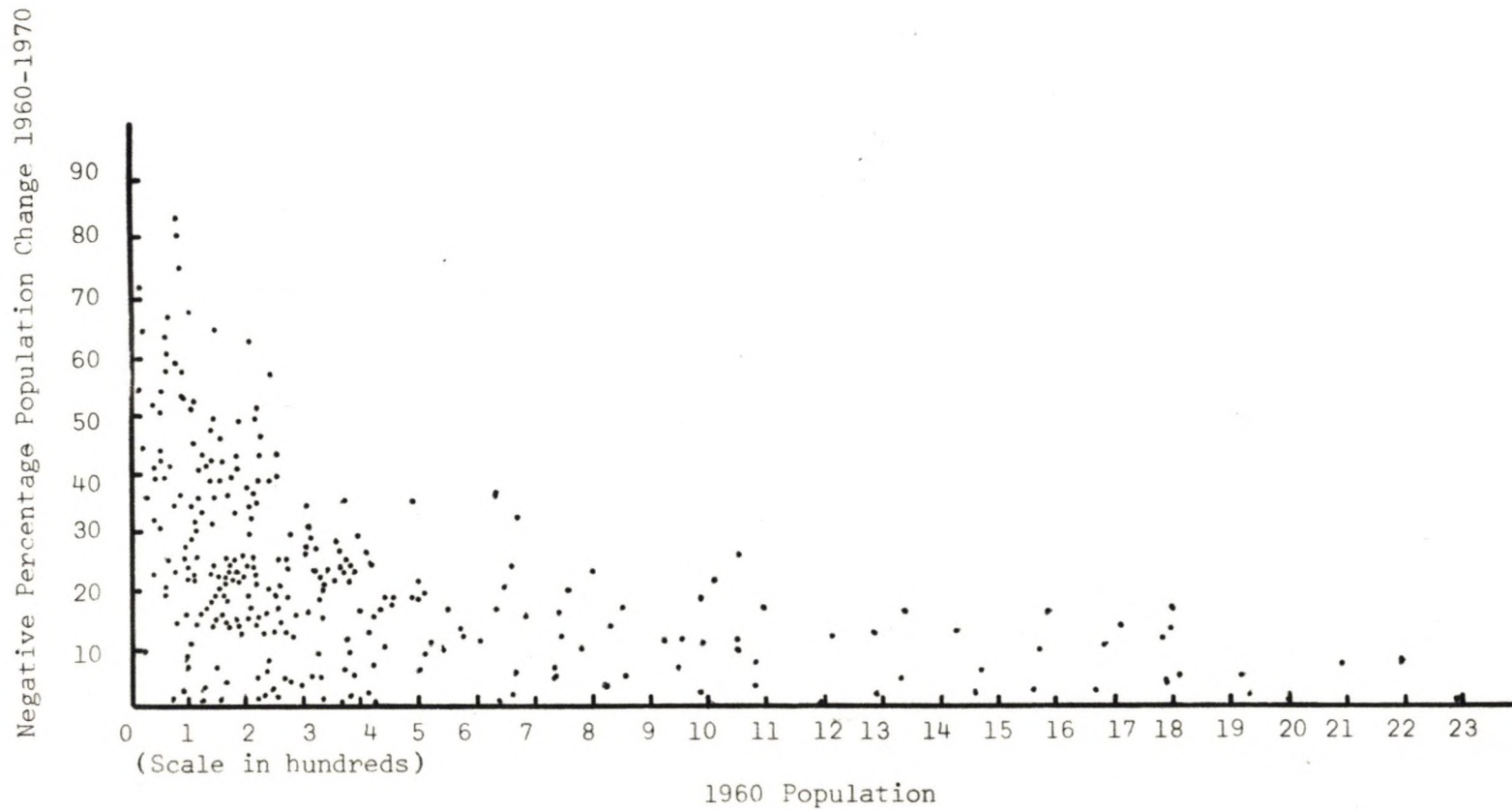


Fig. 6--Population Changes continued

considered factors that influenced population gains and losses.

For the present study, Kariel's approach of the use of absolute values has been adopted to further evaluate population changes of rural trade centers. One advantage in the use of absolute values can be demonstrated with consideration of the population changes of several centers. For example, Eckman in Bottineau County has a population change of over 80 percent (Appendix I). Examination of absolute change in population reveals that the number of persons increased from five to nine. Loma, a small center in Cavalier County, had increased its population size by three times its 1960 population from 1960 to 1970. Examination of absolute change, however, reveals a change of only 65 persons.

Table 5 provides a summary of absolute changes for all rural centers. From 1960 to 1970, in general, as the size of the trade centers increased, the number of persons gained increased. Average absolute losses for the various categories ranged from 36 persons to 310 persons. Average absolute gains for each category increased with an increase in center size; however, with less regularity than losses in population. Trade centers with populations of 200 to 1,499 characterize average absolute population changes that are greater than most other size category trade centers. The average absolute change was 80 persons for trade centers in this category. Centers with sizes of 1,500 to 1,999 had slightly smaller changes that averaged 62 persons. Only trade centers with populations greater than 2,000 persons averaged population gains larger than trade centers in these other size categories.

Borchert commented on the large growth rate of some small trade

TABLE 5
 ABSOLUTE POPULATION CHANGE OF RURAL
 TRADE CENTERS BY CENSUS CATEGORY

Population Census Category	Population Gains			Population Losses		
	Total Population Gains	No. of Trade Centers	Ave. Per Center	Total Population Losses	No. of Trade Centers	Ave. Per Center
2,000 to 2,500	470	2	235	635	4	159
1,500 to 1,999	124	2	62	1,936	13	149
1,000 to 1,499	412	9	46	1,803	17	106
500 to 999	462	8	58	3,399	37	92
200 to 499	1,286	16	80	5,866	99	59
Less than 200	465	13	36	4,263	119	36
Total	3,219	50	64	17,902	289	62

SOURCE: Compiled from census data.

centers in the upper midwest.⁷ Localized mining operations, major construction activity, recreational development, and the presence of military bases were voted as largely responsible for rapid growth rates among smaller trade centers from 1930 to 1960.

The individual occurrences of trade center size as plotted against absolute change are illustrated in Figure 7. As indicated by tabular analysis, absolute population change varies with the size of the trade

⁷John Borchert, The Urbanization of the Upper Midwest, 1930-1960, Urban Report No. 2, Upper Midwest Economic Study, (February, 1963), pp. 17-18.

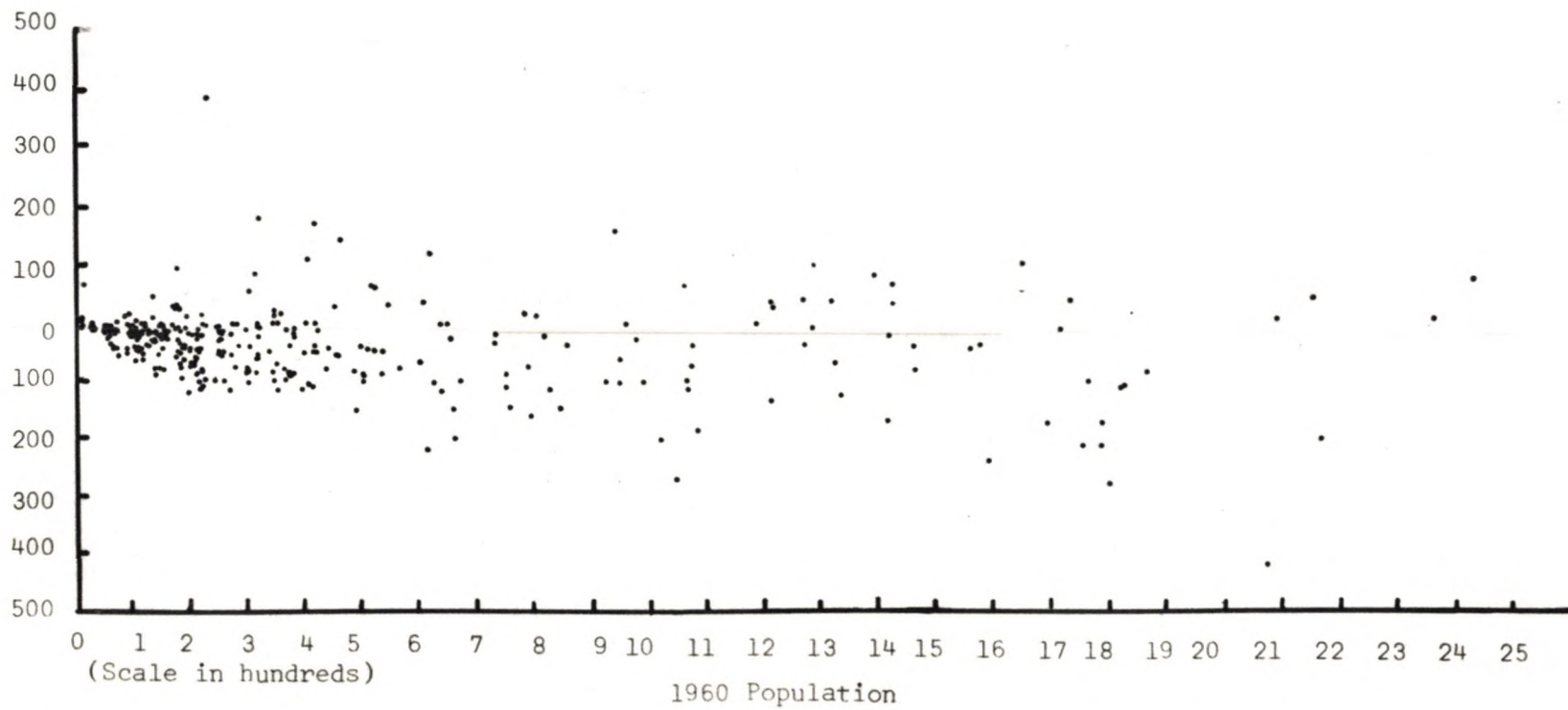


Fig. 7--Absolute Population Changes of Rural Trade Centers

center. Trade centers that lost population appear to have a positive relationship between size and population change. Between the centers that gained population, the relationship between size and population change appears absent.

The distribution of change indicates that few centers gained more than 100 in population. Only two centers gained more than 200 persons. Similarly, only 46 centers lost more than 100 persons. Nine centers lost more than 200 persons. Extremely small centers with populations of less than 200 exhibit clustering at values from 20 to 30 and from 40 to 55. Population gain patterns are less apparent with much scattering.

CHAPTER III

POPULATION CHANGES WITH DISTANCE FROM REGIONAL CENTERS AND POPULATION CHANGES IN CASS COUNTY, NORTH DAKOTA

Included in this chapter is an examination of regional trade center effects on small trade center population change with a detailed study of population changes in Cass County--the only county in North Dakota classified as part of a standard metropolitan statistical area. This analysis appeared warranted because of the evidence presented in Hassinger's study of rural trade center population changes and other significant studies of population changes in the middle western states. The statistical analysis is supplemented with information gathered from field observations and interviews.

In Hassinger's study of area-wide population changes in southern Minnesota, area-wide population changes were examined to determine their effect on rural trade center changes.¹ Factors that were examined included: (1) changes in rural farm population; (2) Hagood level-of-living index; (3) density of rural farm population; and (4) variations attributed to economic areas. Area-wide population changes were not found to significantly influence rural trade center populations. It was therefore concluded that the characteristics of individual centers or the relationships among centers must affect rural center population centers.

One study, by Rikkinen, examined population changes

¹Hassinger, "Factors Associated with Population Changes," pp. 84-85.

of villages and townships as equated to distance from Duluth, Minnesota.² For the decades 1940 to 1950 and 1950 to 1960 Rikkinen's study clearly indicated that a negative relationship existed between population change and community's distance from Duluth.

In another study of trade centers in nine middle western states, Hart and Salisbury found an association between population change of small trade centers and distance to regional centers.³ In addition to finding a negative association between population change and distance from urban centers, Hart and Salisbury statistically proved distance a more important variable than the size of the smaller centers for influencing population change.

Population Change with Distance from
Regional Centers

A crude examination of population change with distance from regional centers was performed for the North Dakota study area. For this analysis nine urban centers were classified as regional centers: Fargo, Grand Forks, Bismarck, Minot, Dickinson, Williston, Jamestown, Wahpeton, and Devils Lake. The criterion selected for determination of a regional center was a population of 10,000 or more. Devils Lake and Wahpeton have populations of less than 10,000, however, they were included because of their prominent geographical position with respect to the other major urban centers. Devils Lake fits into the general spatial east-west pattern of urban centers

²Kalevi Rikkinen, "Change in Village and Rural Population with Distance from Duluth," Economic Geography, XLIV (October, 1968), pp. 312-25.

³Hart and Salisbury, "Population Change in Middle Western Villages," pp. 140-60.

across the state. Wahpeton's population was less than 10,000 in 1970, however, when the neighboring center of Breckenridge, Minnesota, is considered, the total population of the two communities meets the minimum criterion of 10,000 persons.

The selection of a regional trade center population size of 10,000 was based upon an analysis of trade centers performed by Borchert in a study of incorporated places in the upper midwest.⁴ Borchert classified trade centers into categories based on their level of economic activity. All regional centers selected for the present study were classified by Borchert as primary wholesale-retail centers, secondary wholesale-retail centers, or complete shopping centers. Figure 8 presents a summary of the various levels of activity for each category of trade center hierarchy.

In the Borchert study the median population for complete shopping centers--the lowest order center designated as a regional center--was 10,100.⁵ These centers include Jamestown, Wahpeton, Dickinson, and Williston. The median population for higher order centers increased significantly above the minimum figure of 10,000. For secondary wholesale-retail centers the median population was 38,200. Bismarck, Grand Forks, and Minot were classified as secondary trade centers in the Borchert study. The median population for a primary wholesale-retail center was 73,200, however, the City of Fargo was the only city in this category.

Two urban centers were not classified as regional centers--Valley

⁴John R. Borchert, The Urbanization of the Upper Mid-west, pp. 9-12.

⁵Ibid., p. 51.

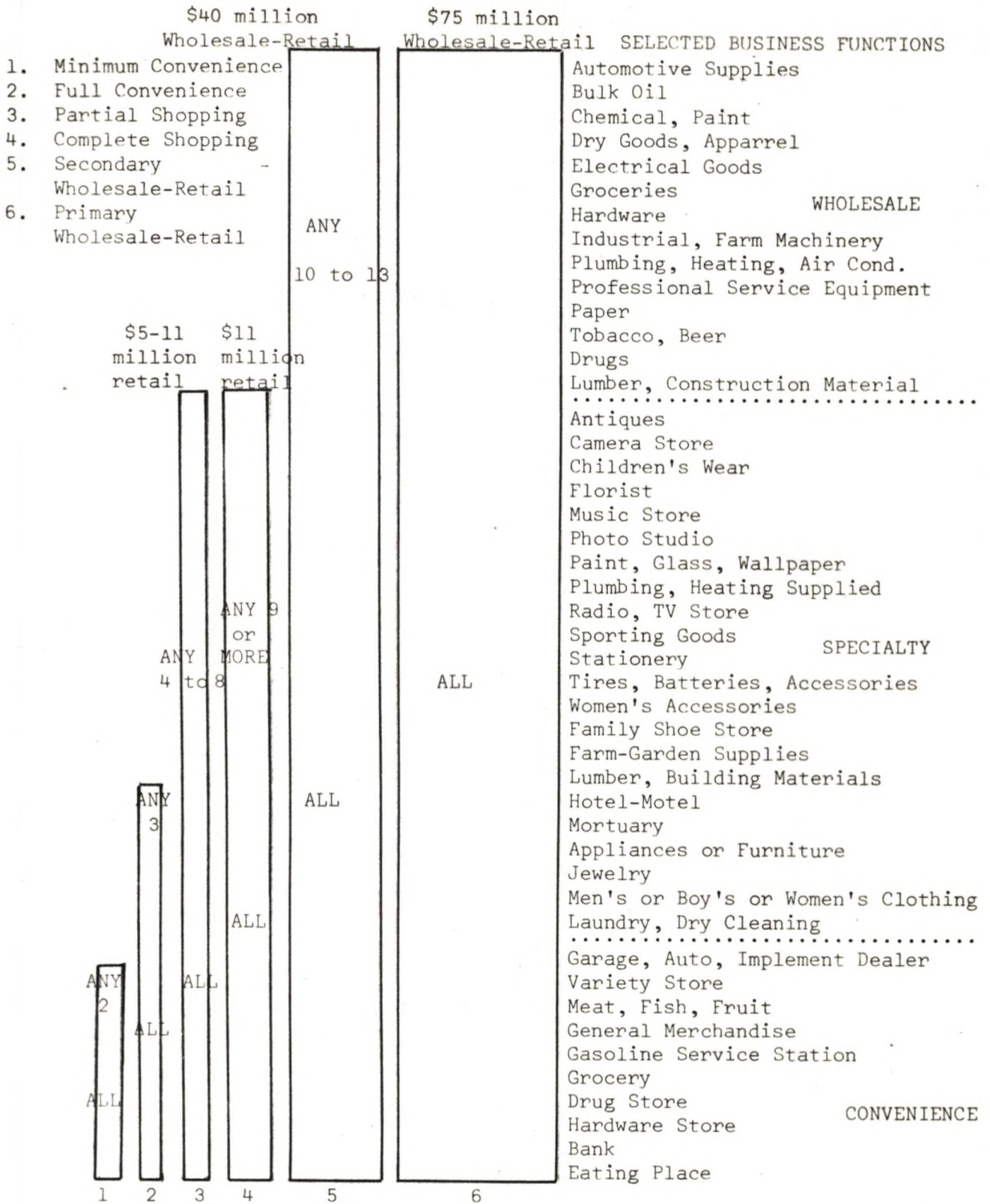


Fig. 8--Summary of Six-Levels of Trade Center Hierarchy

SOURCE: John R. Borchert, The Urbanization of the Upper Midwest, 1930-1960

City and Grafton. In view of their geographic position with respect to larger urban centers it was assumed that their size was not significant enough to warrant regional center designation. Valley City is over-shadowed by Jamestown and Grafton's hinterland is dominated by the City of Grand Forks.

Several other design considerations should be mentioned. First, the trade areas of the eastern-most and western-most cities are truncated by state boundaries. No attempt was made to evaluate population changes of rural trade centers outside the State of North Dakota. Second, the cities of Mandan and West Fargo were considered part of their larger neighboring communities of Bismarck and Fargo. Finally, distance intervals of 0 to 20 miles, 20 to 50 miles, and 50 miles and beyond were utilized. Growth categories were divided into gains and losses.⁶

Table 6 presents a summary of community growth characteristics with distance from regional centers. Approximately 22 percent of all trade centers that grew were located within 20 miles of a regional center. Forty-five percent of growing trade centers were located from 20 to 50 miles of a regional urban center. About one-third of all growing communities were located farther than 50 miles from a regional center.

Trade centers that lost population during the last decade also were unequally distributed. Twelve percent of declining communities

⁶See Design Considerations in Chapter IV for rationale on the selection of these criteria. The additional distance categories of 20 to 50 miles and 50 miles and over were selected randomly for the purpose of this study of regional trade centers.

were located within 20 miles of a major urban center. Over 50 percent of declining communities were located at an interval of 20 to 50 miles from a regional center. Slightly over one-third were located farther than 50 miles from a regional center. This would suggest that the urbanizing effect of regional centers in North Dakota is weakly developed.

TABLE 6
POPULATION CHANGE CHARACTERISTICS
WITH DISTANCE FROM REGIONAL CENTERS
OF RURAL TRADE CENTERS BY GROWTH CATEGORIES

Population Change Categories	Distance from Regional Centers in Miles			Totals
	0 to 20	20 to 50	50 and beyond	
Population Gains				
Number	11.0	22.0	16.0	49.0
Percent	22.0	45.0	33.0	100.0
Population Losses				
Number	35.0	151.0	104.0	290.0
Percent	12.0	52.0	36.0	100.0

Table 7 illustrates the relationships between distance and growth of small trade centers by distance categories. Rather different results are indicated with distances controlled. Of the 46 trade centers located within 20 miles of regional centers, 24 percent grew during the last decade. This percentage is considerably higher than the growth percentage of communities located at a distance beyond 20 miles. Thirteen percent of all centers located from 20 to 50 miles grew in population. Also 13 percent of all trade centers beyond 50 miles gained population from 1960 to 1970.

TABLE 7
 POPULATION CHANGE CHARACTERISTICS
 OF RURAL TRADE CENTERS BY DISTANCE CATEGORIES

Distance From Regional Center	Population Change Characteristics				Totals	
	Population Gains		Population Losses		Number	Percent
	Number	Percent	Number	Percent		
0 to 20 miles	11	24.0	35	76.0	46	100.0
20 to 50 miles	22	13.0	151	87.0	173	100.0
50 miles and beyond	16	13.0	104	87.0	120	100.0

Figure 5 illustrates the distribution of population changes. Only one area exhibits strong rural trade center growth near a regional center. The Fargo urbanized area contains eight small communities that grew during the last decade. Five of the eight trade centers are located within 20 miles of Fargo. They include Davenport, Horace, Mapleton, Casselton, and Riverside.⁷

In areas around other regional centers the influence of a large urban center is not as evident. Within 20 miles of Grand Forks only Thompson has gained population as a result of the growth of its neighboring regional center.⁸ Near Minot only Surrey and Deslacs have grown. Gladstone is the only community within 20 miles of Dickinson that has grown. Similarly around Jamestown, Wahpeton, and Devils Lake few communities gained population from 1960 to 1970. Within

⁷A more extensive discussion of urban growth in the Fargo area is presented in the following section.

⁸This observation was substantiated by a review of building permit data obtained from the Grand Forks County Assessor.

20 miles of two regional centers--Bismarck and Williston--no incorporated places exhibited growth during the previous decade. These few occurrences of growth among trade centers near regional centers would appear to substantiate the statement above that urbanizing effects of North Dakota's regional centers are weakly developed except in the Fargo metropolitan area.

Population Change in Cass County, North Dakota

As previously cited in "Reference Studies and the Problem of the Thesis," research in the study of small trade center population change has indicated that trade centers may economically compete with or complement neighboring communities, depending upon location and size. In the preceding examination of regional centers it was suggested that the City of Fargo may influence development in the surrounding hinterland in Cass County. This examination of rural trade center population increase or decline was an effort to evaluate the spatial patterns of population changes and the possible factors influencing the changes. This study demonstrates such relationships.

Table 8 illustrates the population figures and 1960 to 1970 population changes for each incorporated place in Cass County. As shown, 50 percent of all rural trade centers grew during the previous decade. However, the spatial patterns of population change appear to indicate different processes, location characteristics, or community characteristics to be in operation (Fig. 9).

Proximity to Fargo appears to be associated with the growth of these small communities. Continued expansion of residential development

TABLE 8
 POPULATION OF INCORPORATED PLACES
 IN CASS COUNTY

Incorporated Place	Population		Percent Population Change 1960-1970
	1960	1970	
Alice	124	83	-33.1
Amenia	117	80	-31.1
Argusville	118	118	00.0
Arthur	325	412	26.8
Ayr	81	48	-40.7
Buffalo	234	241	3.0
Casselton	1,394	1,485	6.5
Davenport	143	147	2.8
Gardner	107	96	-10.3
Grandin	147	187	27.2
Horace	178	276	55.1
Hunter	446	362	-18.8
Kindred	580	495	-14.7
Leonard	232	221	- 4.7
Mapleton	180	219	21.7
Page	432	367	-15.0
Tower City	300	287	- 3.7
Riverside	93	104	11.8

SOURCE: Thomas K. Ostenson, Reference Tables: Population Change of Counties and Incorporated Places in North Dakota, 1950-1970, North Dakota State University, Department of Agricultural Economics, Agricultural Economics Statistical Series, Issue No. 5 (December, 1971), pp. 35-6.

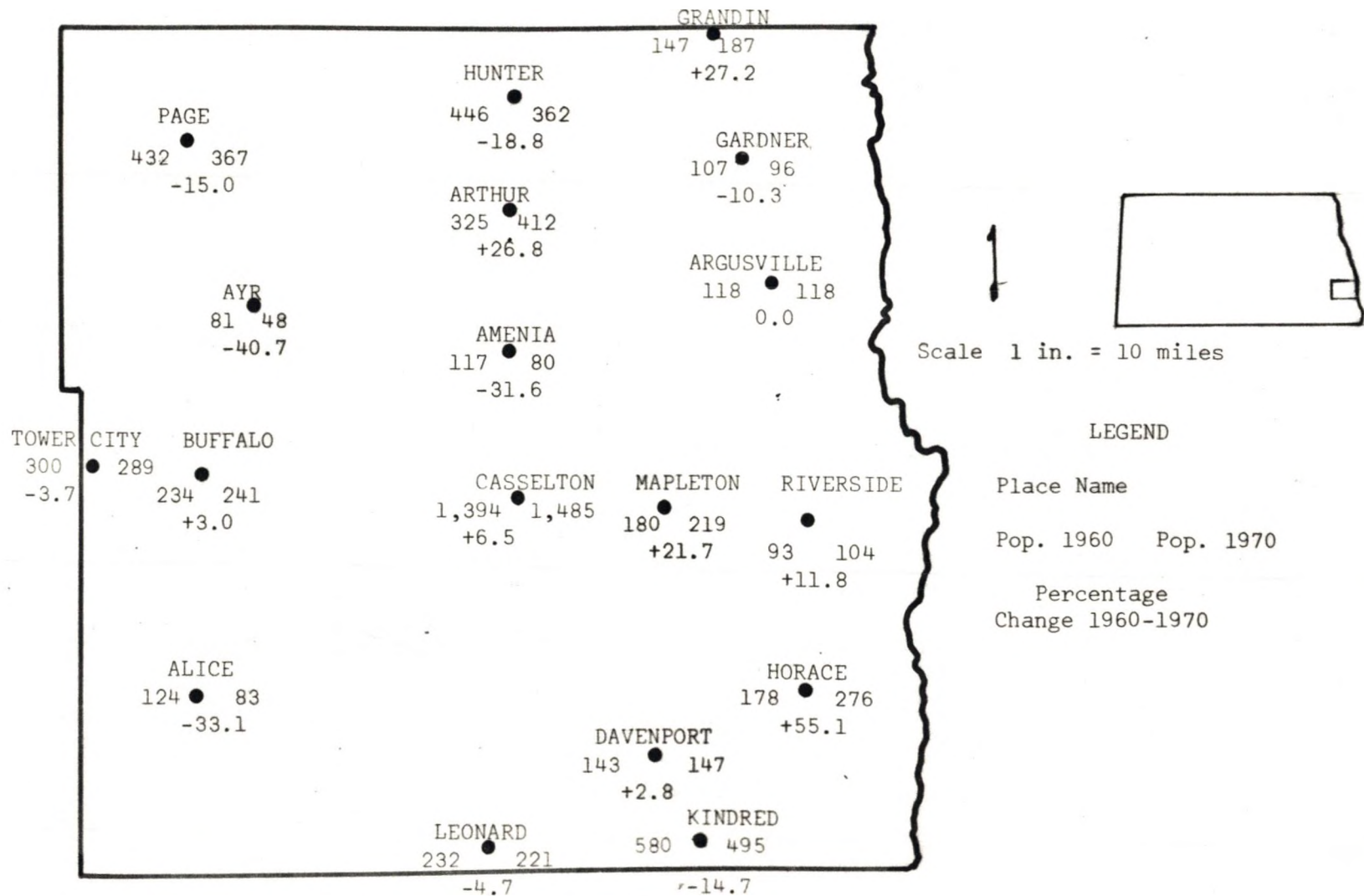


Fig. 9--Population Changes of Rural Trade Centers in Cass County, North Dakota

SOURCE: Thomas K. Ostenson, Reference Tables: Population Change of Counties and Incorporated Places in North Dakota, 1950-1970, North Dakota State University, Department of Agricultural Economics, Agricultural Economics Statistical Series, Issue No. 5 (December, 1971), pp. 35-6.

since 1970 in the cities of Horace, Mapleton, and Riverside (formerly the City of West Fargo Industrial Park) suggests that these communities have become bedroom satellites around Fargo.⁹ Commercial and industrial development has not occurred with the residential growth of these communities. This suggests that economic development is occurring elsewhere and the communities' populations are increasing as a result. One survey conducted in the City of Horace revealed that 80 percent of all employed residents worked in Fargo or West Fargo.¹⁰ Secondly, the survey revealed that the quality of life and low taxes were principal reasons for immigration of newly arrived residents.

Examples of other trade center population changes do not demonstrate the same locational benefits. Argusville, a small community located 12 miles north of Fargo, has not benefited from its proximity to the large urban center. Its size has remained stable during the past census period. The community of Gardner is in a similar situation. Both communities have direct access to a major north-south limited access highway, however, neither has benefited from this development attribute. Grandin, a somewhat larger community located seven miles north of Gardner, and farther from Fargo than Argusville and Gardner, however, has grown considerably during the previous decade.

A personal interview was held with the mayor to discuss recent development changes in the City of Grandin.¹¹ When asked why the community was growing, three reasons were cited: (1) Proximity to

⁹ Personal observation.

¹⁰ House to house survey performed by the Lake Agassiz Regional Council, June, 1975.

¹¹ Personal interview with Darrell Wischer, Mayor, City of Grandin, North Dakota, June, 1976.

Hillsboro; (2) location of a small steel fabricating factory in the city; and (3) the settlement of retired people from surrounding rural areas.

One of the major factors contributing to the growth of the City of Grandin is its proximity to Hillsboro, North Dakota. (Hillsboro is located 13 miles north of Grandin in Traill County.) The City of Hillsboro has grown as a result of the location of a sugar-beet processing plant three miles north of the city in 1970. Economic expansion followed factory construction. Lack of a sufficient number of housing units to accommodate workers' families caused development pressures in neighboring communities.

The resulting growth of Grandin from economic expansion in the Hillsboro area suggests a situational advantage over the communities of Gardner or Argusville. The small size of Grandin, together with its lower living costs, provides a locational benefit to those who are unable to live in Hillsboro or who prefer to commute and take advantage of the lower living costs. Economic pressures in the Fargo area may not have prompted residential development in Argusville or Gardner. Similarly, development pressures from the Hillsboro area may not have spread to these communities.

An alternate explanation suggests site characteristics as the possible reason for lack of population growth in Gardner and Argusville. The locational factor cited was flood hazard.¹² Local flooding could explain a reluctance of local builders to invest in residential construction.

¹²Personal interview with Robert Conklin, Lake Agassiz Resource, Conservation, and Development Project Coordinator, Fargo, North Dakota, June, 1976.

A similar pattern of alternating population changes at trade centers is apparent along State Highway 18, north of Interstate Highway 94. Casselton and Arthur exhibited population increases from 1960 to 1970, however, Amenia and Hunter declined in population size. Size may in part explain the growth of Casselton, the largest community in central Cass County. Hunter, the largest of the three Cass County communities in 1960 located north of Casselton, has not benefited from its slightly larger size. Competition from Casselton and neighboring Arthur may have reduced Hunter's growth potential. Amenia, the smallest city north of Casselton, may similarly be competing with its larger neighbors of Casselton and Arthur.

One possible explanation for loss of population was suggested for the City of Hunter.¹³ Loss of a major farm implement dealership resulted in an increase in patronage to the neighboring community of Arthur. This factor suggested that trade and economic relationships may have some bearing on the growth of rural trade centers.

These spatial patterns of small town population change in Cass County suggest a variation in the locational attributes of the communities that were reviewed. One group of communities in proximity to an expanding urban center is growing. Other communities in similar locations may have a potential for growth but the potential depends upon their relationship with neighboring small communities.

In view of this evidence in the possible variations in factors influencing population change of trade centers in Cass County, a study of all rural trade centers in North Dakota appeared warranted.

¹³Telephone interview with Alex Sorinson, Housing Coordinator, City of Hunter, North Dakota, June 28, 1976.

In the reference studies performed by Hassinger and Butler and Fuguitt, variations in the spatial patterns of population change were suggested as an indication of a differentiation of ecological processes between rural and urban trade centers and also a differentiation among rural centers. Their studies emphasized that the patterns of population change resulting from the processes of competition and symbiosis were found in areas distance from dense urban concentrations of people. For the purpose of evaluating these relationships an interaction hypothesis was formulated and tested. This analysis is presented in Chapter IV.

CHAPTER IV

STUDY OF GROWTH POTENTIAL OF RURAL TRADE CENTERS

One aspect the study of growth potential involves is the examination of the relationships between rural trade centers and larger urban centers. One relationship that has been studied is the association between rural trade center population change and the size of trade centers. A second relationship is the association between population change of rural centers and their distance from urban centers. A third relationship is the association between population change of rural centers and their distance from other centers of the same size.

The approach of this study combines the approaches of the previously cited reference studies: "Factors Associated with Population Changes in Agricultural Trade Centers of Southern Minnesota, 1940-1950," by Edward Hassinger, and "Small-town Population Change and Distance from Larger Towns: A Replication of Hassinger's Study," by James E. Butler and Glenn V. Fuguitt. Similarly, a comparison of the results of the present study to the two reference studies is provided in the analysis.

Data and Method

Following the approaches used in the Minnesota and Wisconsin studies, the initial step was to identify the relationship between population change of rural trade centers and their distance to their

nearest large urban neighbor by tabular analysis. The second step was to measure the relationship between variables by the use of correlation coefficients.

Variables

For the purpose of the study the following variables are defined:

Dependent variable--population change from 1960 to 1970.

Independent variables--distance to nearest neighbor, both urban and rural; size of nearest neighbor, both urban and rural.

Distance--straight line distance measured to the nearest one-tenth of a mile between trade centers. For measurement of distance to large centers when there were "twin city" population centers such as Fargo-West Fargo and Bismarck-Mandan, distance was measured to the center of the larger of the two centers. Distances were measured from the center of places on an official North Dakota State Highway Department map. Linear distances were selected for the ease in measurement. Initially, highway mileage was considered to be more accurate, however, discrepancies were found to be minor and in proportion to straight line measurement.

The population variable was selected as a measurement indicator of trade center growth for various reasons over other acceptable alternatives--variations in retail functions. One initial consideration was the relationship between population change and numerous other geographical, social, and economic variables. Kariel summarizes several relationships:

Spatial distribution of population, population composition, and population growth or decline are related largely to areal differences in employment opportunities, types of

economic activities, and other social and economic factors.¹

A second consideration was that the use of the population data measure of decline or growth of a trade center reduces all the diverse elements to a single common denominator.² Thirdly, the use of other measures of change lack consistency. For example, Stafford discusses the functional relationships that exist in small towns:

In small towns the number of functions is smaller than the number of establishments because of duplication; in very small towns there is almost a 1:1 correspondence because of a town's ability to support more than one function. . . In small towns there is a disproportionate amount of variation in functions. As size increases fewer functions are added. More establishments are added as size increases. This supports that there is a definite limit to the functional complexity of urban places and that greater numbers of people found in larger places do not desire different kinds of functions, but merely convenient access to the same areas.³

There are, however, notable inadequacies applicable to the use of population data as a measure of settlement importance. As implied in the previous examination of the favorable characteristics of population data, there does exist a disparity between their population numbers of any one place and the relative economic importance of many small towns.⁴

Berry, in "The Impact of Expanding Metropolitan Communities upon the Central Place Hierarchy," discusses three conditional statuses

¹Herbert C. Kariel, "Some Aspects of the Spatial Distribution of Population," p. 17.

²Brush, "Hierarchy of Central Places," p. 382.

³Howard Stafford, "The Functional Basis of Small Towns," Economic Geography, XXXIX (April, 1963), p. 170.

⁴John Frazer Hart, Neil E. Salisbury, and Everett G. Smith, "The Dying Village and some Notions about Urban Growth," Economic Geography, XLIV (October, 1968), pp. 343-44.

of small community population and functional bases.⁵ Near large urban centers there exist communities with population total consistent with their central place positions. Under another set of circumstances, a population imbalance occurs when small communities lie within the central place system of a larger center. A third condition of imbalance exists where a specialized business center develops in an area without an appropriate supporting population or complete set of central functions.

Brush discusses a similar imbalance in a study of central places in southwestern Wisconsin.⁶ In the study Brush found that in ranking agglomerated settlements according to population size, evidence does not support the rank size rule.

Design Consideration

In the constructs developed in the reference studies, areas were delineated by comparison of selected social and economic variables in individual counties. Hassinger, in the study of Minnesota trade centers, delineated a "farm" region for intensive study. Butler and Fuguitt expanded their analysis to include the entire state of Wisconsin. Their design incorporated comparisons of three regions--urban, farm, and remote. As previously discussed under study area delineation, North Dakota exhibits a similarity to the Minnesota and Wisconsin "farm" regions. In view of these results the entire state was classified as a "farm" region and utilized as the study area.

Following the format of the Hassinger study, Butler and Fuguitt

⁵Brian J. L. Berry, "The Impact of Expanding Metropolitan Communities upon the Central Place Hierarchy," Annals, Association of American Geography, L (June, 1960), p. 115.

⁶Brush, "Hierarchy of Central Places," pp. 382-85.

compared population changes at two distance intervals: those occurring within ten miles of large centers, and those occurring beyond ten miles. Two population categories were used: population gains of five percent or more, and population gains of less than five percent. After a preliminary application of these constructions to the North Dakota study area, the results indicated that the design would require revision in order to compare the results of the present study and the reference studies.

In North Dakota only three rural trade centers which accounted for one percent of all rural trade centers were located within ten miles of an urban center. Tabular analysis, the initial step in the study of trade center growth potential, was not possible using a sample universe of only three trade centers.

For the purpose of the present study a construct using a distance interval of 20 miles was selected. Examination of highway flow diagrams indicated that traffic volumes are highest within a radius of 20 miles--particularly near large urban centers. This observation would tend to substantiate the observation that population growth is occurring within these distances of large urban centers.

Measurement of rural trade center distances between urban trade centers with populations of 2,500 to 4,999 indicated that a 20-mile radius was the median distance between the closest and most distant rural center. While hinterland development around these urban centers tends to be more rural with less commuter traffic, selection of the 20-mile radius interval appeared justified in view of its measurement as the median distance between centers.

A similar problem to that encountered in the selection of a distance interval occurred in the selection of population change

categories. The categories used in the reference studies proved unsatisfactory for the present study. Less than ten percent of all rural communities gained population in excess of five percent. In order to maintain a more sizeable sample universe for testing of the hypothesis, population growth categories were divided into population gains and population losses. A positive population change from 1960 to 1970 was assumed to be indicative of a potential for future population growth and of a symbiotic relationship with a neighboring urban center.

Results

Relationship Between Growth and Distance from Urban Centers

Table 9 provides a summary of population gains and losses for rural centers with respect to distance from urban centers. Twenty-five percent of all rural trade centers located within 20 miles of urban North Dakota centers gained population. Beyond the 20 miles only 12.5 percent experienced population increase. The difference was statistically significant,⁷ but not as hypothesized. Rural trade centers were expected to exhibit greater losses when located within 20 miles of urban centers because of competition, but they did not. The results indicate a strong symbiotic relationship between rural and urban trade centers.

In Minnesota, Hassinger found a significant positive association between urban and rural trade centers. Rural centers did not

⁷For the purpose of the present study, a chance occurrence probability of five percent is considered significant.

benefit from proximity to large centers, but showed a propensity to decline. Initial examination of the two areas indicated a dominance of different processes for each distance interval.

TABLE 9

PERCENTAGE DISTRIBUTION OF RURAL TRADE CENTERS BY 1960-1970 POPULATION CHANGE AND BY DISTANCE FROM NEAREST URBAN NEIGHBOR

Population Change 1960-1970 of Rural Trade Centers	Distance from nearest urban center	
	Less than 20 miles (N = 68)	20 miles or more (N = 271)
Gained population	25.0	12.5
Lost population	75.0	87.5
Total	100.0	100.0

$$\chi^2 = 6.6, \text{ d.f.} = 1; p < .05$$

In order to further examine the relationship between rural and urban centers, urban centers were divided into two subgroups: Category I--2,500 to 4,999 and Category II--5,000 and over. The initial test for an association between population change and distance was repeated. The results are summarized in Table 10.

Examination of the data reveals that rural trade centers benefited from their proximity to Category II urban centers. The relationship was statistically significant, more than 30 percent of rural trade centers located within 20 miles of a Category II center increased in population. The results were consistent with the initial findings and indicative of an intensified symbiotic relationship near Category II urban centers. Places located within 20 miles of Category I urban centers, however, did not indicate an increased tendency to gain

population. In this situation, a more distant location was conducive to growth which suggests competition among centers. Statistically, the relationship was not significant, but it was consistent with the hypothesis.

TABLE 10

PERCENTAGE DISTRIBUTION OF RURAL TRADE CENTERS, BY 1960-1970
POPULATION CHANGE, DISTANCE FROM NEAREST URBAN CENTER
AND POPULATION OF NEAREST URBAN CENTER

Population Change 1960 to 1970 of Rural Trade Centers	Distance from nearest urban center, by 1960 population of urban center			
	Category I-- Population 2,500-4,999		Category II-- Population 5,000 and over	
	Less than 20 miles (N = 13)	20 miles or more (N = 24)	Less than 20 miles (N = 55)	20 miles or more (N = 247)
Gained Population	0.0	12.5	30.9	12.6
Lost Population	100.0	87.5	69.1	87.4
Total	100.0	100.0	100.0	100.0
	$\chi^2 = 1.9, \text{d.f.} = 1$ $p > .05$		$\chi^2 = 11.5, \text{d.f.} = 1$ $p < .05$	

The patterns of growth for North Dakota compare favorably with the Wisconsin and Minnesota farm regions (Table 11). In Minnesota, rural centers were less likely to gain population when located near small urban centers from 1940 to 1950. Similarly, Wisconsin rural centers in the remote and farm regions showed fewer occurrences of growth when located near small urban centers between 1940 and 1950. For the decade 1950 to 1960, however, the apparent direction of the relationship was reversed. In the urban Wisconsin region no associations

were found to exist for either decade.

TABLE 11

PERCENTAGE OF SMALL TOWNS GAINING FIVE PERCENT OR MORE
IN POPULATION BY DISTANCE TO NEAREST LARGE TOWN AND*
SIZE OF NEAREST LARGE TOWN, 1940-1950 AND 1950-1960

Size of Nearest Large Town * by Location	Distance to Nearest Large Town *							
	1940-1950		1950-1960					
	Less than 10 miles	10 miles or more	Less than 10 miles	10 miles or more				
	Percent	N	Percent	N	Percent	N	Percent	N
Minnesota								
Farm								
2,000-4,999	29	(83)	53	(131)				
5,000 or more	70	(31)	51	(61)				
Wisconsin								
Farm (west)								
2,500-4,999	50	(14)	57	(49)	44	(23)	38	(50)
5,000 or more	64	(22)	48	(67)	38	(21)	40	(63)
Remote (north)								
2,500-4,999	33	(12)	56	(41)	31	(13)	17	(46)
5,000 or more	63	(8)	47	(32)	56	(9)	19	(31)
Urban (southwest)								
2,500-4,999	82	(51)	81	(21)	83	(52)	76	(21)
5,000 or more	82	(44)	81	(47)	86	(49)	79	(43)

*Titles written in terminology used in reference studies "Small Towns" are equivalent to rural centers and "Large Towns" are equivalent to urban centers in this study.

SOURCE: Butler and Fugitt, "Small Town Population Change," p. 402.

In order to improve upon the tabular design and measure the degree of association between population growth and distance to nearest urban trade center correlation coefficients were computed. In addition, coefficients reduce discrepancies in design and provide a more

uniform basis for comparison. Coefficients eliminate the error that may be induced by the comparison of dichotomized variables. Each dependent variable is compared on continuum with the independent variable and this reduces the error that may be attributed to the comparison of percentages with small sample sizes.

Table 12 indicates the computed correlation coefficients between distance from urban centers and size of urban centers for rural trade center location in the states of North Dakota, Wisconsin, and Minnesota. For North Dakota a moderate positive correlation (.19) between population change and distance was found to exist when the nearest urban neighbor was slightly larger. The correlation was consistent with the tabular analysis and in the predicted direction according to the hypothesis. A weak negative association was indicated for the relationship between rural trade center population change and distance to nearest Category II urban center. This pattern was similar to the tabular analysis, however, not necessarily substantive due to the lack of statistical significance.

In comparison to Minnesota, North Dakota experienced a more intensified competition effect between rural trade centers and Category I urban centers, however, when the nearest urban center had a population of over 5,000 Minnesota rural trade centers appeared to benefit to a greater degree than North Dakota rural trade centers. The Wisconsin "farm" region had the strongest associations, but only from 1940 to 1950.

TABLE 12

PEARSONIAN CORRELATION COEFFICIENTS BETWEEN DISTANCE TO NEAREST URBAN CENTER AND POPULATION CHANGE FOR NORTH DAKOTA RURAL TRADE CENTERS BY SIZE OF NEAREST URBAN CENTERS, 1960-1970, AND COMPARISONS WITH MINNESOTA AND WISCONSIN

Size of Nearest Urban Trade Center By Location	Pearsonian Correlation Coefficients		
	1940-1950	1950-1960	1960-1970
North Dakota			
Farm			
2,500-4,999			0.19
5,000 or more			-0.04
Wisconsin			
Farm (west)			
2,500-4,999	0.25	0.01	
5,000 or more	-0.22	-0.20	
Remote (north)			
2,500-4,999	-0.05	-0.04	
5,000 or more	-0.07	-0.10	
Urban (southeast)			
2,500-4,999	-0.13	0.00	
5,000 or more	-0.24	-0.43	
Minnesota			
Farm			
2,500-4,999	0.08		
5,000 or more	-0.11		

SOURCE: Butler and Fuguitt, "Small Town Population Change," p. 404.

Relationship Between Growth and Distance
from Center of the Same Size

The competition effect was further examined by measuring the relationship between rural trade center population change and distance to nearest neighbor of the same size (2,500 or less). A weak positive association was found (.04). This would suggest that small centers compete to a greater extent with Category I urban centers than

they compete with each other. Density of settlement, as reflected by the distance to nearest rural trade center neighbor, does not appear to influence growth as significantly as the proximity to a Category I urban neighbor.

Evidence of a competition effect among rural trade centers in North Dakota was in marked contrast to the results obtained for the Wisconsin study area (Table 13). For Wisconsin, negative associations were found for both decades and for all regions. In the farm region the association between population change of rural trade centers and distance to other rural trade centers was weak for the decade 1940-1950. A stronger relationship existed between rural trade centers and larger urban trade centers from 1940 to 1950 (Table 12).

TABLE 13

PEARSONIAN CORRELATION COEFFICIENTS BETWEEN DISTANCE TO NEAREST TRADE CENTER OF SAME SIZE AND POPULATION CHANGE FOR NORTH DAKOTA RURAL TRADE CENTERS, 1960-1970, WITH COMPARISON TO WISCONSIN

Location	Pearsonian Correlation Coefficient		
	1940-1950	1950-1960	1960-1970
North Dakota			
Farm			0.04
Wisconsin			
Farm (west)	-0.05	-0.20	
Remote (north)	-0.29	-0.20	
Urban (southeast)	-0.08	-0.05	

SOURCE: Butler and Fuguitt, "Small Town Population Change," p. 405.

From 1950 to 1960, however, density of settlement became an important factor with population changes becoming strongly associated with

distance to nearest trade center of the same size and distance to large urban center (Tables 12 and 13).

Size of Trade Center Controlled

Population change of rural trade centers was not the only factor related to distance from urban centers; size of rural centers increased with distance (Table 14). Also the coefficient of correlation between size and population change was .18 and significant. Therefore, in order to isolate the effects of distance, size of trade center was controlled.

TABLE 14
AVERAGE SIZE OF RURAL TRADE CENTERS FOR SELECTED DISTANCE
INTERVALS FROM NEAREST URBAN TRADE CENTER

Urban Trade Center Category	Average Size of Trade Centers by Distance Intervals				
	0-15	16-30	31-45	36-60	61-75
Category I (2,500--4,999)	125	374	753	524*	
Category II (5,000 or more)	273	432	509	564	440

* Number of cases = 1.

Table 15 shows the relationship between population change and distance from large centers for three size categories of small trade centers. Places with less than 500 population (Category A rural trade centers) indicated a tendency to decline when located near Category I urban centers. When located near Category II urban centers, Category A rural trade centers indicated an increased tendency

TABLE 15

PERCENTAGE DISTRIBUTION OF RURAL CENTERS, BY 1960-1970 POPULATION CHANGE, DISTANCE FROM NEAREST URBAN CENTER, AND POPULATION OF NEAREST URBAN CENTER, WITH POPULATION OF RURAL CENTERS CONTROLLED

Population Change, 1960-1970, by 1960 Population of Rural Center	Distance from Nearest Urban Center, by 1960 Population of Urban Center			
	Category I Population 2,500-4,999		Category II Population 5,000 or more	
	Less than 20 miles	20 miles or more	Less than 20 miles	20 miles or more
Category A Population 0 to 500	(N = 11)	(N = 17)	(N = 45)	(N = 174)
Gained Population	00.0	05.9	31.1	08.6
Lost Population	100.0	94.5	68.9	91.4
All	100.0	100.0	100.0	100.0
	$X^2 = .04$, d.f. = 1; P > .05		$X^2 = 13.8$, d.f. = 1; P < .001	
Category B Population 501 to 1,000	(N = 1)	(N = 5)	(N = 5)	(N = 34)
Gained Population	00.0	20.0	20.0	17.6
Lost Population	100.0	80.0	80.0	83.4
All	100.0	100.0	100.0	100.0
	Not enough cases for X^2 $X^2 = .25$, d.f. = 1; P > .05			
Category C Population 1,001 to 2,500	(N = 1)	(N = 2)	(N = 5)	(N = 39)
Gained Population	00.0	50.0	40.0	25.6
Lost Population	100.0	50.0	60.0	74.4
All	100.0	100.0	100.0	100.0
	Not enough cases for X^2 $X^2 = .009$, d.f. = 1; P > .05			

for population growth. Such patterns are similar to those presented in the previous analysis. A competition effect was indicated when rural trade centers were located near Category I urban centers and a symbiotic relationship when they were located near Category II urban centers--the only relationship statistically significant.

Similar patterns of growth were depicted for the remaining two size categories (Category B--501 to 1,000 and Category C--1,001 to 2,500), however, the number of occurrences was limited. Few small places were located within the 20 mile radius of Category I urban centers and for both categories the weak associations lacked significance. For these categories of rural centers the association between population growth and distance also lacked significance with relation to their location near Category II urban centers. The associations reflect symbiotic relationships, however, this may be in part due to the limited number of occurrences.

Correlation coefficients were computed to measure the degree of association between the population change of rural centers and distance to urban centers (Table 16). For the three size categories of rural trade centers positive associations between population growth and distance to Category I urban centers were tabulated. The coefficient of correlation was .18. The association between population growth and distance for Category B and Category C rural centers remained negative when located in proximity to Category II urban centers. Category C rural trade centers showed a reversal of the association which could indicate slight competition with Category II urban centers. The correlation did not statistically verify the relationship indicated in the previous tabular analysis. Previous results indicated

an increased tendency for Category C centers to gain population when located near Category II urban centers. The relatively few occurrences located within 20 miles of Category II urban centers skewed the initial results.

TABLE 16

PEARSONIAN CORRELATION COEFFICIENTS BETWEEN DISTANCE TO NEAREST URBAN CENTER AND POPULATION CHANGE OF RURAL CENTER, BY SIZE OF URBAN CENTER

Category of Rural Trade Center	Pearsonian Correlation Coefficients by Urban Trade Center Category		
	Category I 2,500-4,999	Category II 5,000 or more	All Centers
Category A (0 to 500)	.05 (N = 18)	-.07 (N = 219)	-.04 (N = 237)
Category B (501 to 1,000)	.68 (N = 6)	-.06 (N = 39)	.002 (N = 45)
Category C (1,001 to 2,500)	.90 (N = 3)	.12 (N = 44)	.16 (N = 47)
All Centers	.18 (N = 37)	-.03 (N = 302)	-.005 (N = 339)

Analysis

Results of the test utilized to evaluate the relationships between rural trade center population growth and distance to nearest urban neighbor suggest that rural places are at an advantage when located in proximity to urban centers. Rural center growth, however, was more strongly associated with proximity to Category II urban centers. Closer examination of the relationship between growth and distance revealed that rural trade centers were more inclined

to decrease in population when located near Category I urban centers.

Spatial patterns of population growth support the present findings (Figure 9). Cass County, the only North Dakota county located in the Fargo-Moorhead Standard Metropolitan Statistical Area, contained almost ten percent of the rural trade centers that increased in population from 1960 to 1970. Other situations support the hypothesis that rural trade centers are at a disadvantage when located near Category I urban centers. Portland, located within one mile of Mayville in Trail County, lost almost 12 percent of its total population from 1960 to 1970. Rural trade centers near Rugby and Bottineau failed to benefit from the proximity of a small urban center.

The results of the present study support the findings of the Minnesota and Wisconsin studies. In North Dakota, competition between rural centers and Category I urban centers was more intensified than Minnesota, however, both studies verified the relationship. The symbiotic relationship between rural trade centers and Category II urban centers was less pronounced. In the farm region of Wisconsin, a slightly stronger competition effect was revealed, but only during the 1940's. Similarly, a more intensified negative association was measured between rural trade centers and urban centers with over 5,000 population from 1940 to 1950 than was recorded in North Dakota from 1960 to 1970.

A reversal of trade center relationships was suggested as a probable explanation for the lack of strong positive associations between growth and distance to small urban centers from 1950 to 1960 in Wisconsin. Weak associations were interpreted to imply that rural trade centers were becoming complementary in function to their urban

neighbors through specialization of services. In North Dakota, competition among rural trade centers and Category I urban centers was indicated by positive associations. This would suggest that rural trade centers are not specializing their services in order to complement their larger neighbors, but are remaining in direct competition by offering similar services.

Commuting was emphasized by Butler and Fuguitt as one means of explaining negative associations between small places and large urban centers. The Fargo metropolitan area, as indicated by the growth characteristics of small towns neighboring Fargo and West Fargo, may be North Dakota's primary suburbanizing growth area. Daytime traffic volumes on the interstate highways are heaviest between Fargo and the neighboring communities of Casselton, Mapleton, Harwood (unincorporated), and Horace (Figure 10). Verification as to the extent to which suburbanization is effecting the growth of these small centers, would require examination of the changes in the levels of trade and service activity with respect to changes in population. Increases in population without resulting increases in functional activities would imply a trend toward increasing importance being placed on residential occupancy.

Results of the present analysis require evaluation in terms of several over-riding considerations. One principal consideration is the non-spatial growth characteristics of North Dakota rural trade centers. The number of places gaining in population was extremely low. The actual relationships among trade centers may, in effect, remain obscured by regional growth characteristics. This rationale, under different circumstances, was suggested by Butler and Fuguitt

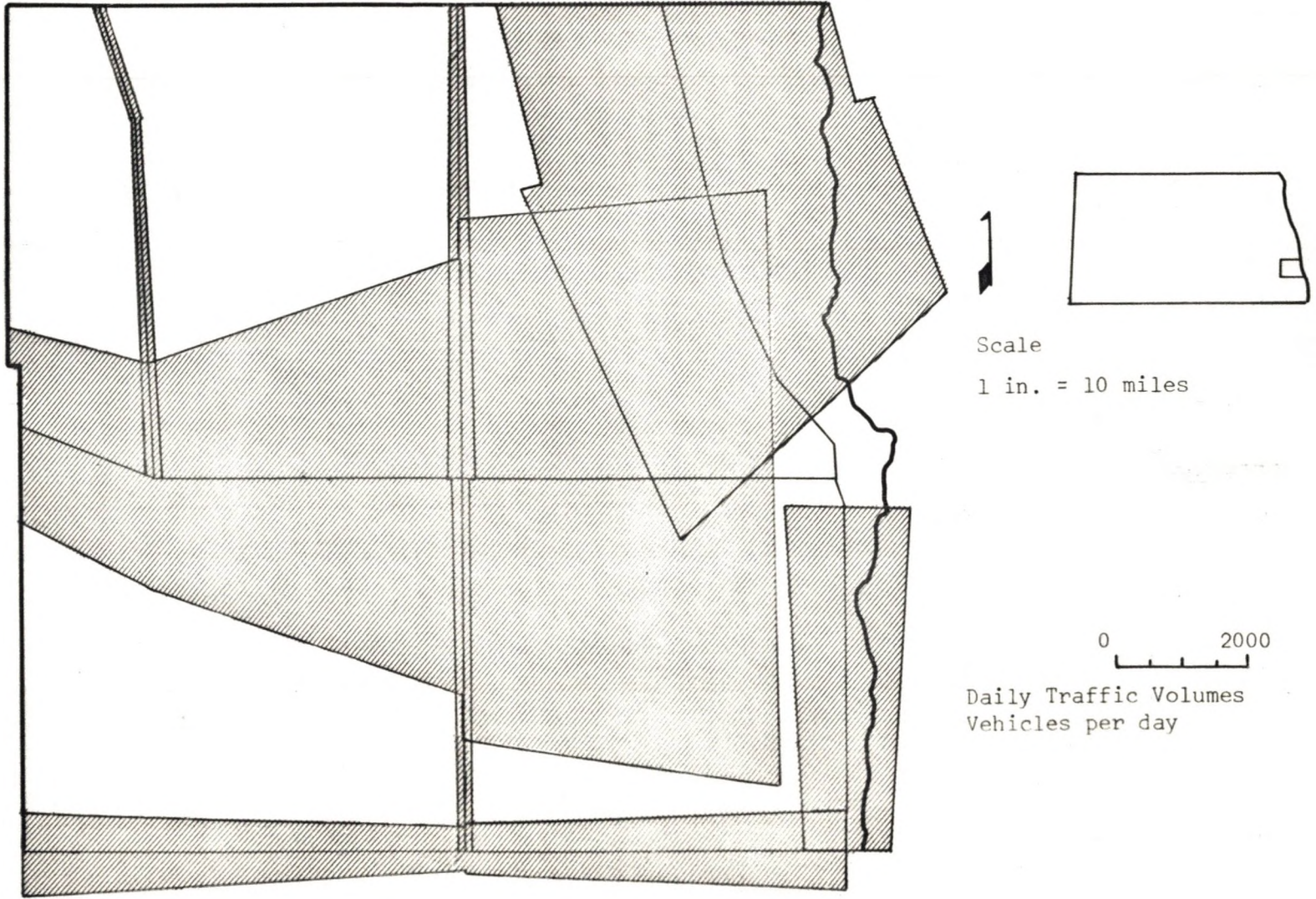


Fig. 10--Daily Traffic Volumes, Cass County, North Dakota

SOURCE: North Dakota Highway Department, North Dakota Highway Statistics, 1975

with respect to their findings in the "remote" region of northern Wisconsin. Negative associations between population change and distance to nearest neighbor suggested accommodation among centers. As noted, however, this was not necessarily the correct conclusion. Growth may have resulted from an upsurge of commuter activity.

A second consideration is the isolated pattern of population growth occurrences. As previously postulated, location of rural trade centers frequently has been associated with differential growth patterns. Weak patterns of growth suggest site preference and localized development. Historical preference for governmental services, placement of military installations, or isolated economic development because of local mining operations, provide viable alternatives to situational explanations based upon trade center relationships.

Summary

In this chapter rural trade center relationships with urban centers were examined. The locational situation of rural trade centers with respect to urban centers was postulated as an underlying factor associated with population change. The hypothesis assumed rural centers in proximity to urban centers to be at a disadvantage in maintaining population growth. Growth of rural trade centers was examined in relation to distance from nearest urban center and the size of the urban center. Urban centers were divided into size categories--Category I, 2,500 to 5,000 and Category II, 5,000 or more-- in order to test the effects of competition and symbiosis.

Results revealed a moderate positive association between growth and distance to Category I urban centers. This suggested that rural

places are at a disadvantage in maintaining population when located in proximity to Category II urban centers. A weak negative association between growth and distance from Category II urban centers was found to exist and suggested a locational advantage for rural trade centers located within 20 miles of large urban centers. Lack of significance, however, prevented statistical verification of the relationship.

CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of this study has been to examine the relationships between change of population size of rural trade centers and distance from neighboring trade centers in North Dakota. Principal emphasis of the study was placed upon the relationship between rural trade centers and neighboring urban centers, however, other relationships such as relationships among rural trade centers--population change and distance to other rural trade centers--was examined.

For the purpose of the study census definitions of rural and urban were adopted. Rural trade centers were defined as all incorporated places having a population less than 2,500 in 1970. Urban centers were defined as all places having a population of 2,500 or more in 1970.

Previous research has examined the relationship between rural trade center population change and distances from urban centers for study areas in the upper midwest. Two studies entitled: "Factors Associated with Population Changes in Agricultural Trade Centers of Southern Minnesota," by Edward Hassinger and "Small-town Population Change and Distance from Larger Towns: A Replication of Hassinger's Study," by James E. Butler and Glenn V. Fuguitt, were used as principal references for the present analysis. Examination of the characteristics of the study areas delineated in Minnesota by Hassinger and in Wisconsin by Butler and Fuguitt indicated a similarity of economic

activity. In North Dakota most rural trade centers function as agricultural trade centers. This similarity existed in the Minnesota study area and in the Wisconsin "farm" area. A similarity in the economic activities of an area would therefore in a broad way control the activities of the trade centers located within its boundaries and allow for a comparison of the relationships of economically similar trade centers.

Examination of the distribution characteristics of population change of rural trade centers near regional trade centers indicated that a concentration of expanding rural trade centers was located in Cass County in an area surrounding Fargo, North Dakota's only urban center located in a standard metropolitan statistical area. Results of the study indicated that population expansion in rural trade centers could not solely be attributed to suburbanization of an expanding metropolitan trade center. More local conditions such as industrial development could also be contributing factors. Around North Dakota's regional centers expansion resulting from the suburbanization of an immediate hinterland were limited to those areas within 20 miles.

In order to examine the factors influencing population changes of rural trade centers the study of the relationships between rural centers and urban centers was extended to cover the larger study area of the entire state. For this purpose a two-step analysis was performed. Relationships between centers were initially examined using continuancy tables. A rigorous analysis using correlation coefficients was performed to quantify the relationships indicated in the tabular analysis.

The hypothesis being tested assumed rural trade centers in proximity to urban centers to be at a disadvantage in maintaining population growth. Growth of rural trade centers was examined in relation to their distance from neighboring urban centers and the size of the nearest urban center. Urban centers were divided into two size categories--Category I, 2,500 to 5,000 and Category II, 5,000 or more.

The study of trade center relationships attempted to provide evidence of a competitive relationship between rural centers and urban centers. This was the relationship hypothesized.

APPENDIX I

RURAL TRADE CENTER POPULATION STATISTICS

Place Name	1960 Population	1970 Population	Percentage Change 1960-1970	Absolute Change 1960-1970
Abercrombie	244	262	7.4	18
Adams	360	284	-21.1	- 76
Alamo	182	124	-31.9	- 58
Alexander	269	208	-22.7	- 61
Alice	124	83	-33.1	- 41
Almont	190	109	-42.6	- 81
Alsen	228	201	-11.8	- 27
Ambrose	220	109	-50.5	-111
Amenia	117	80	-31.6	- 37
Amidon	84	54	-35.7	- 30
Anamoose	503	401	-20.3	-102
Aneta	451	376	-16.6	- 75
Antler	210	135	-35.7	- 75
Ardoch	106	70	-34.0	- 36
Argusville	118	118	0.0	0
Arnegard	228	141	-38.2	- 87
Arthur	325	412	26.8	- 87
Ashley	1419	1236	-12.9	-183
Ayr	81	48	-40.7	- 33
Balfour	159	93	-41.5	- 66
Balta	165	133	-19.4	- 32
Bantry	93	40	-57.0	- 53
Barney	115	81	-29.6	- 34
Bartlett	39	19	-51.3	- 20
Barton	80	34	-57.5	- 46
Bathgate	175	133	-24.0	- 42
Beach	1460	1408	- 3.6	- 52
Belfield	1064	1130	6.2	66

RURAL TRADE CENTER POPULATION STATISTICS (Continued)

Place Name	1960 Population	1970 Population	Percentage Change 1960-1970	Absolute Change 1960-1970
Benedict	129	72	-44.2	- 57
Bergen	52	24	-53.8	- 28
Berlin	78	76	- 2.6	- 2
Berthold	431	398	- 7.7	- 33
Berwick	33	56	-41.1	- 23
Beulah	1318	1344	2.0	26
Binford	261	242	- 7.3	- 19
Bisbee	305	388	-21.4	- 83
Bowbells	584	687	-15.0	-103
Bowdon	229	259	-11.6	- 30
Bowman	1762	1730	1.8	32
Braddock	106	141	-24.8	- 35
Brinsmade	36	110	-67.3	- 74
Brocket	95	153	-37.9	- 58
Bucyrus	42	60	-30.0	- 18
Buffalo	241	234	3.0	7
Burlington	247	262	- 5.7	- 15
Butte	193	257	-24.9	- 64
Buxton	235	321	-26.8	- 86
Calio	75	101	-25.7	- 26
Calvin	78	104	-25.0	- 26
Cando	1512	1566	- 3.4	- 54
Canton	81	130	-37.7	- 49
Carpio	215	199	8.8	16
Carrington	2438	2491	2.2	53
Carson	501	466	- 7.0	- 35
Casselton	1394	1485	6.5	91
Cathay	110	110	0.0	0
Cavalier	1423	1381	- 3.0	- 42
Cayuga	195	116	-40.5	- 79
Center	476	619	30.0	143

RURAL TRADE CENTER POPULATION STATISTICS (Continued)

Place Name	1960 Population	1970 Population	Percentage Change 1960-1970	Absolute Change 1960-1970
Churchs Ferry	161	139	-13.7	- 22
Cleveland	169	128	-24.3	- 41
Clifford	109	84	-22.9	- 25
Cogswell	305	203	-33.4	-102
Coleharbor	210	78	-62.9	-132
Colfax	98	70	-28.6	- 28
Columbus	672	465	-30.8	-207
Conway	67	57	-14.9	- 10
Cooperstown	1424	1485	4.3	61
Courtenay	169	125	-25.6	- 43
Crary	195	150	-23.1	- 45
Crosby	1795	1545	-12.2	-250
Crystal	372	272	-26.9	-100
Davenport	143	147	2.8	4
Dawson	206	131	-36.4	- 75
Dazey	226	128	-43.4	- 98
Deering	117	75	-35.9	- 42
Des Lacs	185	197	6.5	12
Dickey	143	118	-17.5	- 25
Dodge	226	121	-46.5	-105
Donneybrook	196	163	-16.8	- 33
Douglas	210	144	-31.4	- 66
Drake	752	636	-15.4	-116
Drayton	940	1095	16.5	155
Dunn Center	250	107	-57.2	-143
Dunseith	1017	811	-20.3	-206
Dwight	101	93	- 7.9	- 8
Eckman	5	9	80.0	4
Edgeley	992	888	-10.5	-104
Edinburg	330	315	- 4.5	- 15
Edmore	405	398	- 1.7	- 7

RURAL TRADE CENTER POPULATION STATISTICS (Continued)

Place Name	1960 Population	1970 Population	Percentage Change 1960-1970	Absolute Change 1960-1970
Egeland	190	96	-49.5	- 94
Elgin	944	839	-11.1	-105
Ellendale	1800	1517	-15.7	-283
Ellicott	62	50	-19.4	- 12
Emerado	328	515	57.0	187
Enderlin	1596	1343	-15.9	-253
Epping	151	140	- 7.3	- 11
Esmond	420	416	- 1.0	- 4
Fairdale	126	102	-19.0	- 24
Fairmount	503	412	-18.1	- 91
Fessenden	920	815	-11.4	-105
Fingal	190	166	-12.6	- 24
Finley	808	809	.1	1
Flasher	515	467	- 9.3	- 48
Flaxton	375	286	-23.7	- 89
Forbes	138	88	-36.2	- 50
Fordville	367	361	- 1.6	- 6
Forest River	191	169	-11.5	- 22
Forman	530	596	12.5	66
Fortuna	185	216	16.8	31
Fredonia	141	100	-29.1	- 41
Fullerton	181	110	-39.2	- 71
Gackle	523	470	-10.1	- 53
Galesburg	166	134	-19.3	- 34
Gardena	113	84	-25.7	- 29
Gardner	107	96	-10.3	- 11
Garrison	1794	1614	-10.0	-180
Gascoyne	50	34	-32.0	- 16
Gilby	281	268	- 4.6	- 13
Gladstone	185	222	20.0	37
Glenburn	363	381	5.0	18

RURAL TRADE CENTER POPULATION STATISTICS (Continued)

Place Name	1960 Population	1970 Population	Percentage Change 1960-1970	Absolute Change 1960-1970
Glenfield	129	127	- 1.6	- 2
Glen Ullin	1210	1070	-11.6	-140
Golden Valley	286	235	-17.8	- 51
Golva	162	104	-35.8	- 58
Goodrich	392	300	-23.5	- 92
Grandin	147	187	27.2	40
Grane	14	4	-71.4	- 10
Granville	400	282	-29.5	-118
Great Bend	164	86	-47.6	- 78
Grenora	448	401	-10.5	- 47
Gwinner	242	623	157.4	381
Hague	197	146	-25.9	- 51
Halliday	509	413	-18.9	- 96
Hamberg	64	51	-20.3	- 13
Hamilton	217	110	-49.3	-107
Hampden	159	114	-28.3	- 45
Hankinson	1285	1125	-12.5	-160
Hanks	78	13	-83.3	- 65
Hannaford	277	244	-11.9	- 33
Hannah	253	145	-42.7	-108
Hansboro	143	49	-65.7	- 96
Harvey	2365	2361	- .2	- 4
Hatton	856	808	- 5.6	- 46
Havana	206	156	-24.3	- 50
Haynes	111	53	-52.3	- 58
Hazelton	451	374	-17.1	- 77
Hazen	1222	1240	1.5	18
Hebron	1340	1103	17.7	237
Hettinger	1769	1655	- 6.4	-114
Hillsboro	1278	1309	2.4	31
Hoople	334	330	- 1.2	- 34

RURAL TRADE CENTER POPULATION STATISTICS (Continued)

Place Name	1960 Population	1970 Population	Percentage Change 1960-1970	Absolute Change 1960-1970
Hope	390	364	- 6.7	- 26
Horace	178	276	55.1	98
Hunter	446	362	-18.8	- 84
Hurdsfield	183	139	-24.0	- 44
Inkster	284	198	-29.8	- 86
Jud	156	110	-29.5	- 46
Karlsruhe	221	172	-22.2	- 49
Kathryn	142	109	-23.2	- 33
Kenmare	1696	1515	-10.7	-181
Kensal	334	263	-21.3	- 71
Kief	97	46	-52.6	- 51
Kildeer	765	615	-19.6	-150
Kindred	580	495	-14.7	- 85
Knox	122	104	-14.8	- 18
Kramer	175	125	-28.6	- 50
Kulm	664	625	- 5.6	- 39
Lakota	1066	964	- 9.6	-102
LaMoure	1068	951	-11.0	-117
Landa	110	61	-44.5	- 49
Langdon	2151	2182	1.4	31
Lankin	303	221	-27.1	-118
Lansford	382	296	-22.5	- 86
Larimore	1714	1469	-14.3	-245
Larson	62	35	-43.5	- 27
Lawton	159	123	-22.6	- 36
Leal	70	41	-41.4	- 29
Leeds	797	626	-21.5	-171
Lehr	381	287	-24.7	- 94
Leith	100	92	- 8.1	- 8
Leonard	232	221	- 4.7	- 11
Lidgerwood	1081	1000	- 7.5	- 81

RURAL TRADE CENTER POPULATION STATISTICS (Continued)

Place Name	1960 Population	1970 Population	Percentage Change 1960-1970	Absolute Change 1960-1970
Lignite	355	354	- .3	- 1
Linton	1826	1695	- 7.2	-131
Lisbon	2093	2090	- .1	- 3
Litchville	345	294	-14.3	- 51
Loma	20	85	325.0	65
Lorraine	54	33	-38.9	- 21
Ludden	59	44	-25.4	- 15
Luverne	109	84	-22.9	- 25
McCluskey	751	664	-11.6	- 87
McHenry	155	152	- 1.9	- 3
McVille	551	583	5.8	32
Maddock	740	708	- 4.3	- 32
Makoti	214	159	-25.7	- 55
Mantador	98	95	- 3.1	- 3
Manvel	313	265	-15.3	- 48
Mapleton	180	219	21.7	39
Mation	309	215	-30.4	- 94
Marmarth	319	247	-22.6	- 72
Martin	146	120	-17.8	- 26
Max	410	301	-26.6	-109
Maxbass	218	174	-20.2	- 44
Maya	31	20	-35.5	- 11
Medina	545	488	-10.5	- 57
Medora	133	129	- 3.0	- 4
Mercer	154	132	-14.3	- 22
Merricourt	66	22	-66.7	- 44
Michigan City	451	478	6.0	37
Milnor	658	645	- 2.0	- 13
Milton	264	198	-25.0	- 66
Minnewauken	420	496	18.1	76
Minto	642	636	- .9	- 6

RURAL TRADE CENTER POPULATION STATISTICS (Continued)

Place Name	1960 Population	1970 Population	Percentage Change 1960-1970	Absolute Change 1960-1970
Mohall	956	950	- .6	- 6
Monango	133	112	-15.8	- 21
Montpelier	97	116	19.6	19
Mooreton	164	158	- 3.7	- 6
Mott	1463	1368	- 6.5	- 95
Mountain	218	146	-33.0	- 72
Munich	213	249	16.9	36
Mylo	103	51	-50.5	- 52
Napoleon	1078	1036	- 3.9	- 42
Nече	545	451	-17.2	- 6
Nekoma	143	84	-41.3	- 59
Newburg	158	125	-20.9	- 33
New England	1095	906	-17.3	-189
New Leipzig	390	354	- 9.2	-208
New Salem	986	943	- 4.4	- 43
New Town	1586	1428	-10.0	-158
Niagara	157	115	-26.8	- 42
Nome	145	103	-29.0	- 42
Noonan	625	403	-35.5	-222
Northwood	1195	1189	- .5	- 6
Oakes	1650	1742	5.6	92
Oberon	248	151	-39.1	- 97
Omeme	11	5	-54.5	- 6
Oriska	148	128	-13.5	- 20
Osnabrock	289	255	-11.8	- 34
Overly	65	28	-56.9	- 37
Page	432	367	-15.0	- 65
Palermo	188	146	-22.3	- 42
Park River	1813	1680	- 7.3	-133
Parshall	1216	1246	2.5	30
Pekin	180	120	-33.3	- 60

RURAL TRADE CENTER POPULATION STATISTICS (Continued)

Place Name	1960 Population	1970 Population	Percentage Change 1960-1970	Absolute Change 1960-1970
Pembina	625	741	18.6	116
Perth	73	44	-39.7	- 29
Petersburg	272	266	- 2.2	- 6
Pettibone	205	173	-15.6	- 32
Pick City	101	119	17.8	18
Pillsbury	76	50	-34.2	- 26
Pingree	151	76	-49.7	- 75
Pisek	176	154	-12.5	- 22
Plaza	385	291	-24.4	- 94
Portal	351	251	-28.5	-100
Portland	606	534	-11.9	- 72
Powers Lake	633	523	-17.4	-110
Rawson	28	10	-64.3	- 18
Ray	1049	776	-26.0	-273
Reeder	321	306	- 4.7	- 15
Regan	104	74	-28.8	- 30
Regent	388	344	-11.3	- 44
Reynolds	269	236	-12.3	- 33
Rhame	254	206	-18.9	- 48
Richardton	792	799	.9	7
Robinson	155	125	-19.4	- 30
Rock Lake	350	270	-22.9	- 80
Rogers	119	96	-19.3	- 23
Rolette	524	579	10.5	55
Rolla	1398	1458	4.3	60
Ross	167	125	-25.1	- 42
Ruso	31	15	-51.6	- 16
Russell	25	14	-44.0	- 11
Rutland	308	225	-26.9	- 83
Ryder	264	211	-20.1	- 53
St. John	420	367	-12.6	- 53

RURAL TRADE CENTER POPULATION STATISTICS (Continued)

Place Name	1960 Population	1970 Population	Percentage Change 1960-1970	Absolute Change 1960-1970
St. Thomas	660	508	-23.0	-152
Sanborn	263	255	- 3.0	- 8
Sanish	63	25	-60.3	- 38
Sarles	225	148	-34.2	- 77
Sawyer	390	373	- 4.4	- 17
Scranton	358	360	.6	2
Selfridge	371	346	- 6.7	- 25
Sentinel Butte	160	125	-21.9	- 35
Sharon	251	201	-19.9	- 50
Sheldon	221	192	-13.1	- 29
Sherwood	360	369	2.5	9
Sheyenne	423	362	-14.4	- 61
Sibley	22	20	- 9.1	- 2
Souris	213	151	-29.1	- 62
Spring Brook	35	27	-22.9	- 8
Stanley	1795	1581	-11.9	-214
Stanton	409	517	26.4	108
Starkweather	223	193	-13.5	- 30
Steele	847	696	-17.8	-151
Strasburg	612	642	4.9	30
Streeter	491	324	-34.0	-167
Surrey	309	361	16.8	52
Sykeston	236	232	- 1.7	- 4
Tagus	72	14	-80.6	- 58
Tappen	326	294	- 9.8	- 32
Taylor	215	162	-24.7	- 53
Thompson	211	291	37.9	80
Tioga	2087	1667	-20.1	-420
Tolley	189	163	-13.8	- 26
Tolna	291	247	-15.1	- 44
Tower City	300	289	- 3.7	- 11

RURAL TRADE CENTER POPULATION STATISTICS (Continued)

Place Name	1960 Population	1970 Population	Percentage Change 1960-1970	Absolute Change 1960-1970
Towner	948	870	- 8.2	- 78
Turtle Lake	792	712	-10.1	- 80
Tuttle	255	216	-15.3	- 39
Underwood	819	781	- 4.6	- 38
Upham	333	272	-18.3	- 61
Velva	1330	1241	- 6.7	- 89
Venturia	148	77	-48.0	- 71
Verona	162	140	-13.6	- 22
Voltaire	70	54	-22.9	- 16
Wales	151	116	-23.2	- 35
Walhalla	1432	1471	2.7	39
Warwick	204	168	-17.6	- 36
Washburn	993	804	-19.0	-189
Watford City	1865	1768	- 5.2	- 97
Werner	59	21	-64.4	- 38
West Fargo Ind. Park	93	104	11.6	11
Westhope	824	705	-14.4	-119
Wheelock	82	21	-74.4	- 61
White Earth	208	128	-38.5	- 80
Wildrose	361	235	-34.9	-126
Willow City	494	403	-18.4	- 91
Wilton	739	695	- 6.0	- 41
Wimbledon	402	337	-16.2	- 65
Wing	303	223	-26.4	- 80
Wishek	1290	1272	- 1.2	- 18
Wolford	136	81	-40.4	- 55
Woodworth	221	139	-37.1	- 82
Wyndmere	644	516	-19.9	-128
York	148	102	-31.1	- 46
Zap	339	271	-20.1	- 68
Zeeland	427	313	-26.7	-114

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