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THE RELATIONSHIP BETWEEN DISTANCE, AND POPULATION  
CHANGE IN RURAL TRADE CENTERS OF KANSAS

by

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## CHAPTER I

### INTRODUCTION

It has been almost forty years since Walter Christaller wrote, Central Places in Southern Germany, establishing the foundations of central place theory.<sup>1</sup> Since that time, many researchers have expanded certain portions of this original theory and have discovered that some of Christaller's findings are still applicable today. The importance of this study is that it was the first attempt to explain the size, spacing, and number of population centers in a spatial context.

The basic assumptions of Christaller's work are still used today in central place theory. These assumptions are: 1) a homogeneous plain with a uniform rural population; 2) a system of f.o.b. pricing, i.e., the consumer pays the price at the point of production plus the cost of transportation to his location; 3) an identical demand by all consumers at any real price; and 4) no institutional or legal restriction on the entry of producers into the market.<sup>2</sup>

These assumptions may not be useful when considering

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<sup>1</sup>C. W. Baskin, (trans.) Central Places in Southern Germany, by Walter Christaller (New Jersey: Prentice-Hall, 1966).

<sup>2</sup>J. B. Barr and K. G. Denike, "Theoretical Problems of Central Place Analysis," Economic Geography, XLVI (October, 1970), 569+.

a study of the real distribution of central places but they are helpful in developing some of the relationships that may lead to the distribution of central places in a rural area. Utilizing these assumptions, researchers have developed theories explaining the theoretical size, number, and distribution of central places in a rural setting. Much of this work has been done by geographers interested in the spatial aspects of central place theory. Work has also been done by economists, sociologists, and other social scientists.

Christaller saw the centrality of a place as the relative importance of a place with regard to the region surrounding it.<sup>3</sup> This is a relationship that was recognized early by others. The first expression of this concept was by Auroussear.<sup>4</sup> This concept was later identified and expanded into the Basic/Non-Basic dualism of urban economic functions. In this research, city functions are divided into those that service the residents of the city, or Non-Basic, and those that service the city's complimentary region bringing income into the city, or Basic.

A survey of the entries of the Bibliography by Berry and Pred on the theory and applications in central place studies, will give an indication of the apparent concern and

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<sup>3</sup>Baskin, op. cit., p. 33.

<sup>4</sup>M. Aurousseau, "The Distribution of Population: A Constructive Problem," Geographical Review, XI (1921), p. 574.

importance of the functional consideration in central place analysis.<sup>5</sup> Population statistics are used to develop threshold populations which establish the population necessary for the existence of functions in a central place. This does not mean, however, that all centers of a given size will offer the same functions.

In a review of the articles for this study, an article by Ross L. Davies raised a point that makes population a more defensible surrogate for centrality of a place.<sup>6</sup> In this article, Mr. Davies found that there was little difference in the ratings of cities as central places, whether the data used was an economic indicator or population figure.

The economic indicators used in Mr. Davies analysis were those hierarchic classifications of urban places found in the City Rating Guide by Rand McNally and Company. These indices were edited by Richard L. Forstall. The lower levels of this hierarchy are determined from assessments of total retail sales, shopping goods sales, and daily newspaper circulations. For larger centers of 50,000 population or

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<sup>5</sup>Brian J. L. Berry and Allen Pred, Central Place Studies: A Bibliography of Theory and Applications, supplemented 1965 by H. G. Barnum, R. Kasperson and S. Kenchi (Philadelphia: Regional Science Institute, 1961).

<sup>6</sup>Ross L. Davies, "A Note on Centrality and Population Size," Professional Geographer, XXI (March, 1969), pp. 108-112.

more, the indices used are more complex. They are differentiated according to subjective appraisals of the rank sequences for seven business indices and, particularly, a composite median index taken from five of them. The seven business indices utilized include: total retail sales and shopping goods sales, merchant wholesale sales, other wholesale sales, business service receipts, demand deposits of banks, and total bank deposits. The five indices contributing to the composite index omit total retail sales and total deposits of banks. These indices reflect less than the others on the true central importance of places. Mr. Davies then ran a multiple correlation for these indices and included population for the centers considered. From his analysis, Mr. Davies concluded that population levels correlated as highly with all the other indices as they correlated with each other.<sup>7</sup> This is not to say that population is the best indicator of the centrality but rather that due to the high correlation between population and these economic indicators, population is a strong indicator of centrality.

The treatment of population as a less than adequate indicator of the general centrality of a place may be a superficial judgment. One primary concept of much central place research is that of threshold population for the

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<sup>7</sup>Ibid.

existence of a given function. These functions are classed according to their importance in the ranking of places in which these functions may be found.<sup>8</sup> If the concept of threshold population is a valid one, as research leads us to believe, then the importance of a central place or the centrality of a place may be directly related to its size. For the purpose of this paper, it will be assumed that such a relationship does exist.

To the operator of a given function, however, the existence or non-existence of a homogeneous plain, or urban hierarchy is not as critical as the success or failure of his enterprise. This may be directly related to his ability or inability to maintain a sufficient market to make normal profits. Thus, the dynamic factors of population change in an area may be of greatest concern to the entrepreneur and those who live in a central place.

Only in an ideal sense can individual population centers be conceived of as isolated and with their hinterlands self-sufficient.<sup>9</sup> As transportation improves, competition between complementary neighboring centers will increase. When controlling for natural increase of an area's population,

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<sup>8</sup>Brian J. L. Berry and William L. Garrison, "The Functional Bases of the Central Place Hierarchy," Economic Geography, XXXIV (1958).

<sup>9</sup>Edward Hassinger, Factors Associated with Population Changes in Agricultural Trade Centers of Southern Minnesota, 1940-1950, (Minneapolis: unpublished Ph.D. dissertation, University of Minnesota, 1956), p. 32.

differences in migration affect the population of a center's complementary region and may cause it to expand or contract.

The impact of this expansion or contraction upon not only business operation but also public services such as utilities, schools, etc., may be important to the officials of a central place. Considering the relative importance of a center at a given point in time may be useful in determining the relative position of a place in an urban hierarchy, but it does not indicate the trends that may be acting upon the center which will affect the future of that center. This is not to say that past trends alone are an indication of what will happen in the future but they may give some indication of the forces that must be considered when planning for the future.

If a center's geographical location places it in an inferior competitive situation with one of its neighbors, any future expenditures must be considered carefully for they may result in a wasteful and unwarranted expense. Businessmen and public officials must be concerned with the impact of neighboring communities on not only their business but also on the future existence of their community. With the combination of improved methods of transportation and the increased willingness of a consumer to travel greater distances for purchases, the creation or maintenance of a given function may depend on the existence of a neighboring larger community.<sup>10</sup>

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<sup>10</sup>Hassinger, op. cit., p. 12.



## PROBLEM STATEMENT AND JUSTIFICATION

The hypothesis for this study is that smaller places in proximity to larger places are at a disadvantage in maintaining population growth in an agricultural area. The present study will be an adaptation of a study done by Edward Hassinger in an agricultural area of Minnesota in 1956.<sup>11</sup> With the time that has elapsed since the Hassinger study and the observed population redistribution occurring since then, further testing and refinement of his thesis is warranted. In this paper, the analysis shifts to a different agricultural area in a new time frame.

The study by Hassinger was conducted on the southern portion of Minnesota where agricultural occupations predominate. Hassinger's study was conducted on the population change in the trade centers in that area between 1940 and 1950. The area consisted of 43 counties and 351 incorporated places. He surveyed these incorporated places and found that there were few manufacturing firms located in centers of less than 2,500 population and that all these centers could be considered agricultural service centers, as this was their primary function.<sup>12</sup>

Hassinger also found a number of these smaller centers in close proximity to larger centers with their primary

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<sup>11</sup>Ibid.

<sup>12</sup>Hassinger, op. cit., p. 117.

function being that of a suburb rather than an agricultural service center. For this reason, these centers were excluded from the analysis that was run. Hassinger utilized a concentric zone construct enabling them to be completed. He selected, arbitrarily, to draw his zones at intervals of 7, 10, and 15 miles around those centers which for this study would be considered "large."<sup>13</sup> The construct involves the assumption that movement to the larger centers is equally unobstructed physically. This was generally the case in his study area.

Hassinger then classed the smaller places according to the zone in which they were located. This was done to simplify the distance factor for the tests employed. Hassinger constructed contingency tables to test the hypothesis that, "smaller places in proximity to larger ones are at a disadvantage in maintaining population growth."<sup>14</sup> For this reason, the zones formed by the concentric-circle construct were combined into two groups for the initial tests. These zones represented that area inside the second circle, less than 10 miles away, and that area outside the second circle, 10 miles or more away from the larger center.

The first test computed the percentage distribution of the small centers by the 1940 to 1950 population change

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<sup>13</sup>"Large," for the purpose of Hassinger's study were those incorporated centers whose 1940 population was more than 2,000.

<sup>14</sup>Hassinger, op. cit., p. 115.

and the distance to the nearest large center. In this test, Hassinger found that there was a significant relationship between distance and growth of the smaller centers in the direction hypothesized. He found that 38 percent of the smaller centers within 10 miles of a larger center gained 5 percent in population while 53 percent of the smaller centers more than 10 miles away gained as much.<sup>15</sup> With this indicated relationship, Hassinger then classified the smaller centers according to the size of the larger center they were nearest. One group consisted of those smaller centers nearest a larger center whose 1940 population was between 2,000 and 4,999. A second group was made up of those places nearest to larger centers whose 1940 population was 5,000 or more.

The same test was then conducted on this new grouping of smaller centers with the following results. Those smaller places in the complementary region of the smaller class of larger centers, population of 2,000 to 4,999, showed an intensified relationship between growth and distance to larger centers. The study found 29 percent of the places within 10 miles had gained 5 percent or more, while 53 percent of the smaller places more than 10 miles from their larger center had gained as much. The chi square analysis of this difference found it significant at the

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<sup>15</sup>Ibid., p. 131.

.01 level of probability and in the direction hypothesized.<sup>16</sup>

For those smaller places nearest larger centers (those centers with a population of 5,000 or greater) the relationship was apparently reversed. Hassinger found that 70 percent of the smaller places within 10 miles of these larger centers had gained 5 percent or more in population between 1940 and 1950 while only 30 percent of those small places more than 10 miles away gained as much.<sup>17</sup> Hassinger speculated that the reason for this apparent reversal could be the more dominant nature of the larger urban center (5,000 population or more) over their complementary region and that the smaller places within its influence take on more of a suburban role than a service center for a rural population. They provide housing and certain nonbasic services and the larger center provides employment and more specialized services.<sup>18</sup>

When considering the average size of the smaller places by the zone in which they were located, Hassinger found that the sizes of the smaller places increased as the distance from larger centers increased. This relationship was still evident when the smaller places were grouped by the size of the larger center they were nearest--2,000 to 4,999 or 5,000 or larger. Hassinger also ran a zero-order

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<sup>16</sup>Hassinger, op. cit., p. 131.

<sup>17</sup>Ibid., p. 132.

<sup>18</sup>Ibid., p. 133.

correlation between size of the rural trade centers and their growth over the study period. The correlation coefficient for size to growth of the small places was .25 and significant at the .05 level of probability.<sup>19</sup> With these two relationships indicated, Hassinger felt that a test of the relationship hypothesized, with the size of the trade centers controlled, was warranted.

To conduct this test, Hassinger grouped the small places by their population as of 1940 into three sub-groups. These were: [those small places with a [1940] population of] less than 400; [those with a 1940 population] between 400 and 999; and [those centers with a 1940 population] between 1,000 and 2,000. The small places were again grouped by those nearest larger centers of 2,000 to 4,999 population and those nearest larger centers with a 1940 population of greater than or equal to 5,000.

Hassinger's study area did not have sufficient numbers in the contingency tables for the smaller places with a 1940 population of 1,000 to 1,999 to run the statistical test on the differences in the table. Nor were there sufficient numbers in the table of the small places, of the sub-group 400 to 999 population, nearest the large centers of the size 5,000 or more to run the statistical analysis.

In the remaining three contingency tables, Hassinger

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<sup>19</sup>Hassinger, op. cit., p. 135.

found a significant difference at the .05 level of probability in the smaller sub-group (400 to 999) in the region of the larger centers of the 2,000 to 4,999 size class.<sup>20</sup> In the tables for the smaller places in proximity to the larger centers with a population of 5,000 or larger, the figures indicated that in all cases the reverse of the hypothesized relationship existed. Though not significant, and in some cases not of sufficient size to run the statistical test, the apparent indication is that the urbanization indicated in the second test was evident in all the sub-groups of the larger class of larger centers--5,000 or larger population.

The final test run on the study area by Hassinger was that of examining zero-order correlation between size of a small place and growth of that center over the 10 year period, by zones and by the size of the larger center it was nearest. This was done to control distance as a factor of growth. In the interpretation of the findings, it should be remembered that the size range and average size of places were not alike for all zones. Although the zero-order correlation coefficient of size and growth for all small places was  $r = .25$ , the breakdown by zone and size of nearest large center disclosed that the relationship was somewhat stronger for small places around larger centers of 2,000 to 4,999 population ( $r = .33$ ) but practically non-existent for places

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<sup>20</sup>Hassinger, op. cit., p. 136.

around the larger centers of 5,000 or more population (  $r = -.05$  ).<sup>21</sup>

When Hassinger considered this relationship by the zone in which the small places were located, the difference between the larger and smaller classes of larger centers-- 2,000 to 4,999 or 5,000 or larger--was further developed. In Zone I, (less than 7 miles away) neither class of larger centers showed a correlation between size and growth. There was a negative correlation found in those small places in the area of the smaller class of larger centers, though not significant. In Zone II, (7 to 10 miles away) the correlation was significant for those small places in the area of the smaller class of larger centers, and not significant and negative, in the area of the larger class of large centers. In Zone III, the small places in the area of the smaller size large centers again showed a significant correlation between size and growth. Again, the small places in the region of the larger class of large centers did not show a significant correlation but the correlation indicated was in a positive direction. In Zone IV, the correlation of the small places in the regions of both size groups of large centers showed an identical correlation coefficient ( $r = .43$ ) but was only significant in the region of the smaller class of large centers.<sup>22</sup>

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<sup>21</sup>Hassinger, op. cit., p. 139.

<sup>22</sup>Ibid., p. 140+.

The findings of the Hassinger study were generally consistant with the hypothesis. In general, the departures from the hypothesized relationships were found among those small places in the area of large centers of 5,000 or more. These differences were attributed to the development of urbanization around the larger centers whose size enabled them to more clearly dominate the surrounding market area. Hassinger felt this study might give some indication of areas where continued research could further clarify the relationship between size, growth and distance in rural trade centers in an agricultural area. With the time that has elapsed since the Hassinger study, it is felt by this researcher that there is a need for further testing of the relationship between growth of small towns and location with respect to larger central places in agricultural areas. The remainder of this paper will pursue this objective and will test this relationship on the rural trade centers in the state of Kansas. Certain refinements will bring the study into better perspective considering the 20 years that have elapsed since the Hassinger study.

#### RESEARCH STRATEGY

Following the Hassinger study, the same basic considerations will be surveyed in this study. The following changes will be made in the analysis. The study will consider all incorporated places in the state of Kansas. Small



places in the Hassinger study will be referred to as rural trade centers in this study. Rural trade centers will be those with a 1960 population, according to the 1960 Bureau of Census Report, of less than 2,500 inhabitants.<sup>23</sup> All incorporated centers with a 1960 population of greater than or equal to 2,500 will be considered large centers and be referred to as urban centers.<sup>24</sup> These large or urban centers will be further classified as those with a 1960 population between 2,500 and 5,000 and those with a 1960 population of 5,000 or more.

The concentric-circle construct will be utilized to enable an analysis similar to that done by Hassinger. The basic difference will be that the distances of the circles from the urban center will be increased. This change is being made in recognition of the passage of time since the Hassinger study and this researcher's belief that improvements in the mode of transportation and routes of travel have increased the willingness of consumers to travel greater distances in search of goods and services.

This analysis will use the following circle radii: 10, 15, and 25 miles respectively. This technique is graphically represented in Figure I. The corresponding Zones

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<sup>23</sup>United States Department of Commerce, Number of Inhabitants-Kansas 1970, Bureau of Census Publication No. PC (1)-A18 (Washington: Government Printing Office, 1970) p. iv-vii.

<sup>24</sup>Ibid.

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FIGURE I

## SCHEMATIC DIAGRAM - CONCENTRIC CIRCLE ZONES

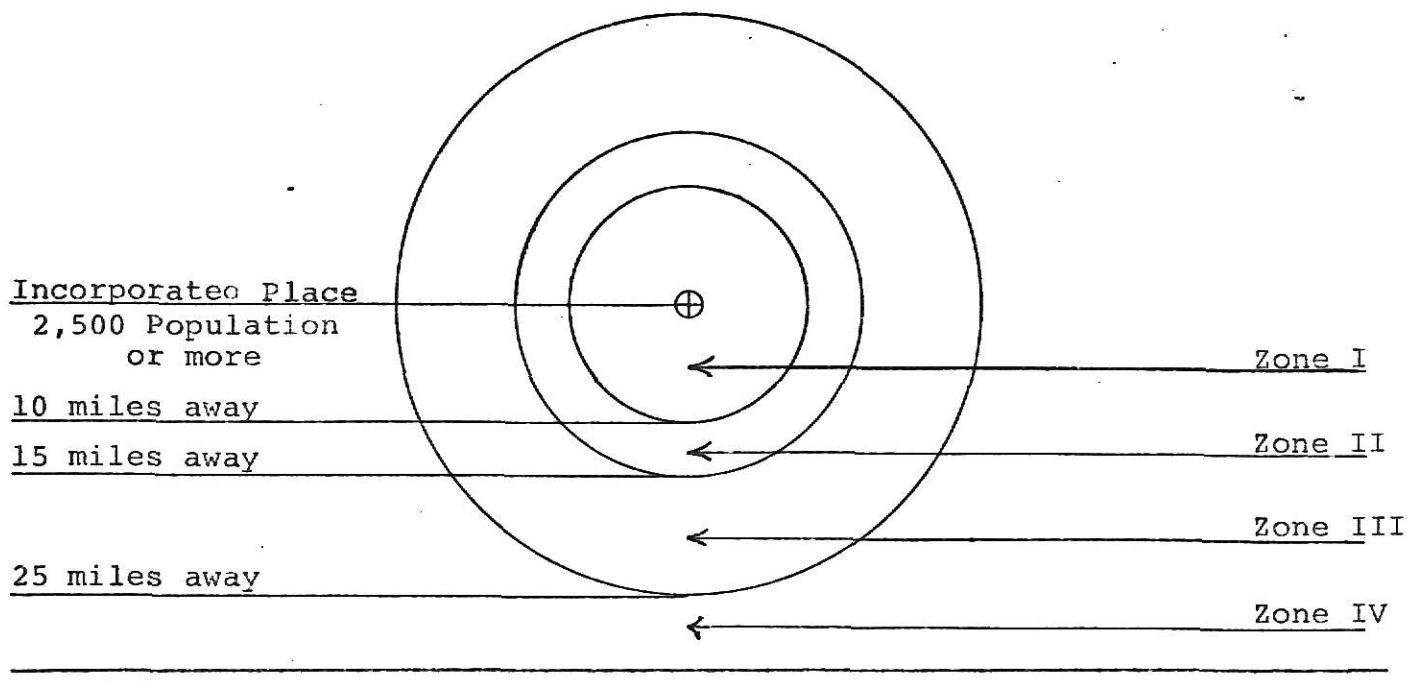
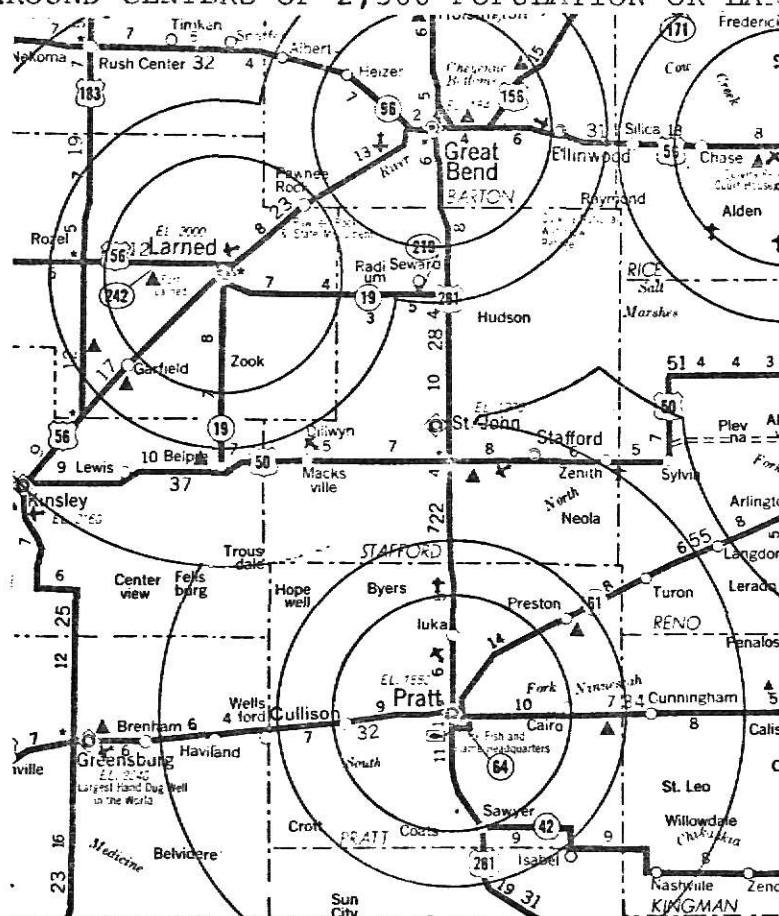


FIGURE II

## SECTION OF A MAP OF THE STUDY AREA SHOWING CONCENTRIC CIRCLE ZONES CONSTRUCTED AROUND CENTERS OF 2,500 POPULATION OR LARGER



will be: Zone I, that area inside the 10 mile circle; Zone II, that area between the 10 mile circle and the 15 mile circle; Zone III, that area between the 15 mile circle and the 25 mile circle; Zone IV, that area outside the 25 mile circle to the point where the Zone of another urban center is encountered.

The current analysis will consider similar assumptions found in the study by Hassinger.<sup>25</sup> These are: movement to the larger centers from the smaller centers is equally unobstructed physically (by lakes, rivers, hills, etc.) for all places within the larger or urban centers' territory; that the only physical variable is radial distance between the smaller and larger centers; and that each urban center commands an economic impact on those rural centers within its concentric zones. A survey of a map of Kansas will indicate that unobstructed movement is generally the case and that where obstructions do occur, alternative routes are provided.

This analysis will be in three general areas. The first test will be an analysis of the general relationship between population growth of rural centers and their distance from the nearest urban center. This test will also be conducted with the urban centers grouped according to those with a 1960 population of 2,500 to 4,999 and those with a

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<sup>25</sup>Hassinger, op. cit., p. 112+.

1960 population of 5,000 or greater. The second test will be an analysis of the relationship of population growth of the rural centers and their distance from the nearest urban center with size of the rural centers controlled by grouping the rural centers into three sub-groups. The analysis will again group the urban centers according to their size in 1960. The third test will be an analysis of the relationship between the 1960 population of the rural centers and the percent change in population between 1960 and 1970, with a grouping of the rural centers by the zone in which they were located and the size of the urban center they were nearest.

The classification of the urban centers into the two sub-groups, those with a 1960 population of 2,500 to 4,999 and those with a population of 5,000 or greater, was done to test the impact, if any, of the larger urban centers upon their corresponding rural centers in comparison to the smaller size urban centers. The division between rural and urban is arbitrary. It would be difficult to discern any great difference between a rural center with a population of 2,450 and an urban center with a population of 2,550. In the Hassinger study, it was speculated that the larger urban centers more clearly dominated the rural centers within their zones while the smaller urban centers were more in competition with the rural centers in their zones. An attempt to identify such a relationship will also be

undertaken in this study.

A survey of the location of the rural centers in the state of Kansas, indicates twelve centers, classified as being rural, are in close proximity or contiguous to their neighboring urban center. The classification of these centers as rural is by population alone. In a few of these cases, the rural center is located within the boundaries of its urban center and thus this division is political rather than physical. For this reason, the following rural centers will be eliminated from this study.

Countryside--Kansas City suburb  
 Westwood Hills--Kansas City suburb  
 Westwood--Kansas City suburb  
 Mission Woods--Kansas City suburb  
 Lenexa--Kansas City suburb  
 Edwardsville--Kansas City suburb  
 Lansing--Leavenworth suburb  
 Grandview Plaza--Junction City suburb  
 North Newton--Newton suburb  
 South Hutchinson--Hutchinson suburb  
 Eastborough--Wichita suburb  
 Frontenac--Pittsburg suburb

Considering the distribution of the rural centers in the state of Kansas (shown on Maps I-III) one can readily see the wide distribution of centers, both rural and urban, in the western section (Map I) while in the eastern section (Map III) the centers are more congested. It will be assumed that this distribution is representative of the distribution of the dispersed rural population, thus reflecting a compliance with general central place theory.

For the purpose of this study, the statistical test

will be the same one used in the Hassinger study.<sup>26</sup> For the first two analyses, the statistical test will be Chi-square. It will be run on a two by two contingency table that will be constructed from the data compiled for this study. This test is used, primarily, as a result of the general nature of this study and because all of the samples in the study area are being considered. Also, movement into and out of the study area is unrestricted making impossible the assumption of a closed system. It is hoped that this study, though general in its consideration, will indicate areas where further analysis and clarification are warranted.

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<sup>26</sup>Hassinger, op. cit., p. 123.



## CHAPTER II

### RELATIONSHIP BETWEEN GROWTH AND DISTANCE IN THE RURAL TRADE CENTERS OF KANSAS

After classifying the rural trade centers as to the Zone in which each was located, using the concentric-circle construct represented in Diagram I, the centers were then grouped according to those that were less than 15 miles from their corresponding urban center and those centers that were 15 miles or more away. The centers were then classified according to those that gained 5 percent in population between 1960 and 1970 and those that gained less. These compiled figures were then placed in a contingency table, Table I, and a Chi-square test was run on the differences in the tabled values. As can be seen in Table I, 34 percent of those rural trade centers less than 15 miles from their corresponding urban center gained 5 percent in population or more, while 27 percent of those rural centers 15 miles or more away gained as much. This relationship is in the opposite direction hypothesized and was significant at the .05 level of probability [ $\chi^2 = 2.7323$ ,  $p < .05$ ].

Because of the observed reversal of the hypothesized relationship, a further breakdown of the data may clarify the relationship. In this case, as in the Hassinger study, the rural trade centers were then classified according to

TABLE I

DISTANCE OF INCORPORATED PLACES UNDER 2,500 POPULATION  
FROM CENTERS 2,500 OR LARGER ACCORDING TO  
PERCENT GAIN IN POPULATION

Percent gain in population of places under 2,500	Distance from centers 2,500 or larger Zones I and II (less than 15 miles)		Zones III and IV (15 miles or more)	
	Number	Percent	Number	Percent
Gain 5 percent or more	94	34.12	68	27.39
Gain less than 5 percent	181	65.88	182	72.61
Total	275	100.00	250	100.00

Chi square = 2.7323  
d.f. = 1  
Significant at .05 level

Source: US Census of Population  
1970; Number of Inhabit-  
ants.  
Highway Map. Kansas 1970

those nearest urban centers with a 1960 population of 2,500 to 4,999 and those rural centers nearest urban centers with a 1960 population of 5,000 or more. The corresponding contingency tables were then constructed (Table II and III) and the Chi-square analysis was run. As can be seen in Table II, the hypothesized relationship was evident in those rural centers nearest the smaller sized urban centers. This relationship was not significant [ $\chi^2 = .1914$ ,  $p. > .05$ ] with 18 percent of the rural centers less than 15 miles from their urban center gaining 5 percent in population over the study period, and 20 percent of those rural centers 15 miles or more away gaining as much.

When considering the rural centers within the zones of urban centers with a 1960 population of 5,000 or more (Table III) the relationship indicated in Table I becomes more intensified. Fifty percent of rural centers within 15 miles of their corresponding urban centers gained 5 percent or more in population (Table III) while only 34 percent of those rural centers 15 miles or more away gained as much. This intensification is reflected in the  $\chi^2$  value computed on the difference in this contingency table [ $\chi^2 = 6.6774$ ,  $p. < .05$ ]. This relationship is in the opposite direction hypothesized. This is also an indication of the urbanizing tendency found around the larger urban centers indicated in the Hassinger study.<sup>27</sup>

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<sup>27</sup>Hassinger, op. cit., p. 133.

TABLE II

DISTANCE OF INCORPORATED PLACES UNDER 2,500 POPULATION  
FROM CENTERS 2,500 to 4,999\* POPULATION ACCORDING  
TO PERCENT GAIN IN POPULATION

Percent gain in population of places under 2,500	Distance from centers 2,500 to 4,999 Zones I and II (less than 15 miles)		Zones III and IV (15 miles or more)	
	Number	Percent	Number	Percent
Gain 5 percent or more	26	17.93	26	20.00
Gain less than 5 percent	119	82.07	104	80.00
Total	145	100.00	130	100.00

Chi square = .1914  
d.f. = 1  
Not significant at .05  
level

Source: US Census of Popula-  
tion 1970; Number of  
Inhabitants.  
Highway Map. Kansas  
1970

\* And not closer to a center  
5,000 or larger.

TABLE III

DISTANCE OF INCORPORATED PLACES UNDER 2,500 POPULATION  
FROM CENTERS 5,000 OR LARGER\*\* POPULATION ACCORDING  
TO PERCENT GAIN IN POPULATION

Percent gain in population of places under 2,500	Distance from centers Zones I and II (less than 15 miles)		5,000 or larger Zones III and IV (15 miles or more)	
	Number	Percent	Number	Percent
Gain 5 percent or more	75	49.66	33	33.63
Gain less than 5 percent	76	50.34	66	63.37
Total	151	100.00	99	100.00
Chi square = 6.6774		Source: US Census of Population 1970; Number of Inhabitants. Highway Map. Kansas 1970		
d.f. = 1				
Significant at .05 level				

\*\* And not closer to a center  
2,500 to 4,999.

Following these initial considerations, the average size of the rural trade centers was computed for the Zone in which they were located and according to the size of the nearest urban trade center. These results can be found in Table IV. In this table, there is further indication of the tendency of rural trade center population to change in relation to their location from urban centers. As can be seen in this table, the average size of the rural centers in the region of the smaller class of urban trade centers (2,500 to 5,999) increases with distance. This tendency is reversed in the rural trade centers nearest the larger size urban trade centers. Here, the average size of the rural centers decreases with distance in Zone I through Zone III. In Zone IV, there was an increase in the average size. The average size of the rural trade centers indicates that there is a difference in the growth pattern for centers nearest urban centers of various sizes. The next two tests should also help to develop this observed relationship.

The fourth analysis to be conducted was a test of the hypothesized relationship with size of the rural trade centers controlled. The size sub-groups of the rural trade centers were the same as those used in the Hassinger study. These were: those rural trade centers with a 1960 population of less than 400; those rural trade centers with a 1960 population of between 400 and 999; and those rural trade centers with a 1960 population of between 1,000 and 2,499. As

TABLE IV

AVERAGE SIZE OF INCORPORATED PLACES UNDER 2,500 POPULATION (1960)  
 ACCORDING TO DISTANCE FROM CENTERS OVER 2,500 POPULATION

Distance from centers over 2,500	Around all centers over 2,500 Number	Size	Around centers 2,500 to 4,999* Number	Size	Around centers 5,000 or over** Number	Size
Zone I (under 10 miles)	148	526	73	367	75	657
Zone II (10 to 15 miles)	151	516	75	449	76	582
Zone III (15 to 25 miles)	163	568	82	567	81	560
Zone IV (over 25 miles)	63	793	45	850	18	651

Source: US Census of Population

1970; Number of Inhabitants  
 Highway Map. Kansas 1970

\* And not closer to a center 5,000  
 or larger

\*\* And not closer to a center 2,500  
 to 4,999.

indicated in Table V, none of the Chi-square values were significant at the .05 level of probability. However, a survey of the tables does indicate some interesting relationships.

In the rural centers nearest the urban centers of the smaller size group, we find that the hypothesized relationship is only supported, in a general way, in the rural trade centers in the largest sub-class (1,000 to 2,499). Although there were an insufficient number of cases in this group to conduct a Chi-square analysis, the general percentages do indicate a support of the original hypothesis. In the other two sub-groups of rural trade centers, the relationships were in the opposite direction hypothesized. Neither sub-group was significant in the Chi-square analysis. This supports the weak relationship found in Table II.

When considering this relationship in the region of the larger size urban centers (Table VI) a more consistent relationship is found. Again, as in the earlier tests, the relationship between growth and distance from the nearest urban trade center is in the opposite direction hypothesized. This was true in all of the rural trade center sub-groups. This relationship was not significant in any of the tables at the .05 level of probability but was significant at the .01 level of probability in the sub-groups for the rural centers of population less than 400 and population of 1,000



TABLE V

DISTANCE OF INCORPORATED PLACES FROM CENTERS 2,500  
TO 4,999\* POPULATION ACCORDING TO PERCENT GAIN  
IN POPULATION AND CONTROLLED BY SIZE

Percent gain in population of places under 400	Distance from centers 2,500 to 4,999*		Zones III and IV	
	Zones I and II		(15 miles or more)	
	(less than 15 miles)			
	Number	Percent	Number	Percent
Gain 5 percent or more	17	17.00	8	12.50
Gain less than 5 percent	83	83.00	56	87.50
Total	100	100.00	64	100.00

Chi square = .6116

d.f. = 1

Not significant at .05 level

Percent gain in population of places 400 to 999	Distance from centers 2,500 to 4,999*		Zones III and IV	
	Zones I and II		(15 miles or more)	
	(less than 15 miles)			
	Number	Percent	Number	Percent
Gain 5 percent or more	7	20.58	6	18.75
Gain less than 5 percent	27	79.42	26	81.25
Total	34	100.00	32	100.00

Chi square = .0352

d.f. = 1

Not significant at .05 level

TABLE V  
(Cont.)

Percent gain in population of places 1,000 to 2,499	Distance from centers 2,500 to 4,999*		Zones III and IV	
	Zones I and II (less than 15 miles)		(15 miles or more)	
	Number	Percent	Number	Percent
Gain 5 percent or more	2	18.18	12	35.30
Gain less than 5 percent	9	81.92	22	64.70
Total	11	100.00	34	100.00

Chi square = Not sufficient cases  
for test.

Source: US Census of Pop-  
ulation 1970; Number  
of Inhabitants.  
Highway Map. Kansas  
1970.

\* And not closer to a center  
5,000 or larger.

TABLE VI

DISTANCE OF INCORPORATED PLACES FROM CENTERS 5,000  
OR LARGER\*\* POPULATION ACCORDING TO PERCENT GAIN  
IN POPULATION AND CONTROLLED BY SIZE

Percent gain in population of places under 400	Distance from centers 5,000 or larger** Zones I and II (less than 15 miles)		Zones III and IV (15 miles or more)	
	Number	Percent	Number	Percent
Gain 5 percent or more	28	38.88	14	27.27
Gain less than 5 percent	44	61.12	40	72.73
Total	72	100.00	54	100.00

Chi square = 1.8788

d.f. = 1

Significant at the .10 level

Percent gain in population of places 400 to 999	Distance from centers 5,000 or larger** Zones I and II (less than 15 miles)		Zones III and IV (15 miles or more)	
	Number	Percent	Number	Percent
Gain 5 percent or more	32	61.53	16	57.14
Gain less than 5 percent	20	38.47	12	42.86
Total	52	100.00	28	100.00

Chi square = .1465

d.f. = 1

Not significant at the .05 level

TABLE VI  
(Cont.)

Percent gain in population of places 1,000 to 2,499	Distance from centers 5,000 or larger**			
	Zones I and II (less than 15 miles)		Zones III and IV (15 miles or more)	
	Number	Percent	Number	Percent
Gain 5 percent or more	15	55.55	6	35.29
Gain less than 5 percent	12	44.45	11	64.71
Total	27	100.00	17	100.00

Chi square = 1.7166  
d.f. = 1  
Significant at the .10 level

Source: US Census of Popula-  
tion 1970; Number of  
Inhabitants  
Highway Map. Kansas  
1970.

\*\* And not close to a center  
2,500 to 4,999

to 2,499. In the sub-group of rural trade centers with populations of 400 to 999, the highest percentage of centers, in both distance factors, gained 5 percent population or more during the study period. Although not significant, this is the strongest growth pattern indicated in this table. Table VI clearly gives strong support to the speculation of a tendency toward urbanization occurring around the larger urban centers.

The last analysis to be conducted in the present study is a correlation of the 1960 population of the rural trade centers to the percent change in population in these centers between 1960 and 1970. It should be remembered that in the interpretation of Table VII, the size range and the average size of the rural centers was not the same for all zones. This analysis also breaks the data down into those centers nearest urban centers with a population of 2,500 to 4,999 and those urban centers with a population of 5,000 or greater. When considering all rural centers in each Zone, it was found that only in Zone II was there a significant relationship.

Those rural centers nearest the smaller urban centers, indicated a stronger tendency toward correlation than those rural centers nearest the larger urban centers. As seen in Table V, Zone II and Zone IV had significant correlations. Zone III indicated almost no correlation and Zone I, a slight correlation. For all rural centers nearest the

TABLE VII

CORRELATION BETWEEN SIZE OF INCORPORATED PLACES  
UNDER 2,500 AND INCREASE IN SIZE BY ZONES  
SURROUNDING CENTERS OVER 2,500

Distance from nearest urban center by zone	Distance measured from all centers over 2,500		Distance measured from centers 2,500-4,999*		Distance measured from centers 5,000 or larger**	
	r	Number	r	Number	r	Number
Zone I (under 10 miles)	-.00945	148	.19724	73	.19394	75
Zone II (10 to 15 miles)	.26019	151 <sup>#</sup>	.27887 <sup>@</sup>	75	-.09196	76
Zone III (15 to 25 miles)	.07704	163	.10885 <sup>#</sup>	82	.04427	81
Zone IV (over 25 miles)	.29220	63	.37642 <sup>#</sup>	45	-.04070	18
All Zones	.06524	525	.18744	275	.01549	250

# Indicates correlation statistically significant at 5 percent level.

@ Indicates correlation statistically significant at 10 percent level.

Source: US Census of Population; 1970 Number of Inhabitants.  
Highway Map. Kansas 1970.

\* And not closer to a center 5,000 or larger.

\*\* And not closer to a center 2,500 to 4,999.

smaller urban centers, the correlation between size and change in population was significant. This may support the possibility of more direct competition in these urban centers than around the larger urban centers.

For the rural centers nearest larger urban centers, there was practically no correlation in any zone. There were negative correlation coefficients in Zone II and Zone IV, ( $-.09196$  and  $-.04070$ ) though neither was significant. The strongest correlation coefficient was found in Zone I. The correlation coefficients do give an indication of the general need for rural trade centers in the region of the smaller size urban centers depend more on their own growth capabilities than is evident in the rural centers in the region of larger urban centers. This follows the observed relationships that have been indicated in the earlier tables. The rural centers nearest the larger urban centers may gain a certain amount of spin-off population growth from the growth of the urban center. This spin-off population may be composed of dissident urban dwellers seeking the amenities of rural living. The rural centers nearest the smaller urban centers must sustain themselves and cannot depend on this degree of urbanization to occur in their areas. This may be strongest in the rural center coefficient for Zone IV. The rural centers nearest the smallest urban centers recorded the largest coefficient of correlation. In the rural centers nearest the larger urban centers, the coefficient

was negative and small.

The above analysis follows closely the analysis conducted by Hassinger in 1956. There was an apparent intensification of the tendency for rural centers near large urban centers to take on the role of satellite cities rather than a rural trade center. The relationship needs further clarification.



## CHAPTER III

### CONCLUSIONS AND IMPLICATIONS

Within the frame of reference of a secular society, characterized by good transportation and a demand for a great variety of goods and services, it was reasoned that distance of smaller places from larger centers might be related to the growth of the smaller center. The hypothesis was that smaller places which were in proximity to larger ones would be at a disadvantage in maintaining population growth. A concentric zone construct drawn around centers, 2,500 population or larger, was used as a device to test this hypothesis. It was found that a reversal of the hypothesized relationship existed when all rural centers and all urban centers were studied (Table I). With further breakdown of the data, the hypothesized relationship was suggested among those rural centers nearest the urban centers with a population of 2,500 to 4,999 (Table II). This relationship was not, however, significant at the .05 level of probability. The second analysis (Table III) was to test the hypothesized relationship among those rural centers nearest the urban centers with a population of 5,000 or more. In this case the reversal observed in Table I was more intensified. It was significant at the .005 level of probability.

This suggested two tentative conclusions: 1) urban centers, 2,500 to 4,999 population, were more in competition with rural centers in their area than were urban centers 5,000 population or larger and this competition was more destructive to the growth of the rural centers nearer these smaller urban centers; and 2) an adjustment had occurred, identified in the Hassinger study, for some rural places close to urban centers 5,000 population or larger which may be characteristic of a tendency toward suburbanization. This tendency was indicated in all tests with the urban centers grouped by size (Table II to Table VI). The urbanization tendency is apparent in Table VI with the reversal of the hypothesized relationship found in all size sub-groups. This reversal was significant at the .10 level of probability in two sub-groups--those rural centers with less than 400 population and those with a population 1,000 to 2,499. Among the rural centers nearest the smaller urban centers, those with a population of 2,500 to 4,999, the reversal of the hypothesized relationship was suggested in the two smaller sub-groups (Table V). Neither of these sub-groups was statistically significant. In the third and largest size sub-group the hypothesized relationship was indicated, however, there were an insufficient number of cases in each cell of the table to conduct the chi-square analysis.

Considering the stronger tendency toward suburbanization found in the present study compared to that found in

the Hassinger study, the future of many of the rural centers is questionable. Distance is not the only variable acting upon the population change of a rural center. Size of the rural center may also affect the population growth of a rural center as indicated in Table V and VI. The distribution of the rural centers by their size and the percent change in their population is seen in Tables VIII and IX. Again, as in the earlier tests, the rural centers nearest the smaller size urban centers (Table IX) showed a tendency to lose population more readily than those rural centers nearest the larger size urban centers (Table VIII).

In this paper, attention was directed toward spatial relations among trade centers. Physical isolation of trade areas was never a reality in this area, but the secularization of rural life manifest by changes in the value system, social organization, and technology has permitted greater freedom of movement and extended the area of local contacts since the Hassinger study. Roads and railroads are the means by which space is traversed by goods and consumers, and in some ways offers a key to the location and interrelationship among trade centers. Almost all incorporated places were located on a major federal, state, or county road as seen on Maps IV to VI. The relationship between location on railroads or major roads and the growth of a center is indicated on Tables X and XI. The relationship between location on a railroad and the growth of these

TABLE VIII

DISTRIBUTION OF RURAL TRADE CENTERS NEAREST LARGER URBAN CENTERS  
BY 1960 POPULATION AND 1960-1970 PERCENT POPULATION CHANGE

1960 Population	-40.0	-39.9 -30.0	-29.9 -20.0	-19.9 -10.0	-9.9 -5.0	-4.9 0.0	-0.1 4.9	5.0 9.9	10.0 19.9	20.0 29.9	30.0 39.9	40.0
0-199	2	6	3	9	8	4	8	4	4	4	4	4
200-399	-	1	7	6	8	7	8	4	5	2	7	6
400-599	-	1	2	7	2	3	4	7	10	4	1	2
600-799	-	1	1	3	1	2	2	3	5	4	-	1
800-999	-	-	1	2	-	1	2	1	4	1	2	-
1000-1199	-	-	-	2	2	2	2	4	2	1	1	1
1200-1399	-	-	-	-	1	-	2	1	-	1	-	1
1400-1599	-	-	-	-	1	-	-	2	-	-	1	-
1600-1799	-	-	-	4	-	-	-	-	1	-	-	-
1800-1999	-	-	-	-	-	1	3	-	-	1	-	-
2000-2199	-	-	-	-	2	1	-	1	-	-	-	-
2200-2399	-	-	-	1	-	3	-	1	2	-	-	-
2400-2499	-	-	-	-	-	-	-	-	1	-	-	-
Total	2	9	14	34	25	24	31	28	34	18	16	15
[ Lost Population 33.4 ] [ Stable ] [ Gained Population 43.0 ]												

Source: US Census of Population 1970; Number of Inhabitants

TABLE IX

DISTRIBUTION OF RURAL TRADE CENTERS NEAREST SMALLER URBAN CENTERS  
BY 1960 POPULATION AND 1960-1970 PERCENT POPULATION CHANGE

1960 Population	-40.0	-39.9	-29.9	-19.9	-9.9	-4.9	0.0	5.0	10.0	20.0	30.0	40.0
	-40.0	-30.0	-20.0	-10.0	-5.0	-0.1	4.9	9.9	19.9	29.9	39.9	
0-199	6	12	21	15	6	9	6	2	4	-	1	2
200-399	-	5	16	24	11	6	4	8	5	2	1	-
400-599	-	1	5	8	6	7	2	2	1	1	-	-
600-799	-	-	3	3	2	6	2	2	3	-	-	1
800-999	-	-	1	3	1	1	1	-	1	2	-	-
1000-1199	-	-	-	2	1	4	-	2	1	-	-	-
1200-1399	-	-	-	-	-	-	1	1	2	-	-	-
1400-1599	-	-	-	1	-	1	2	2	-	-	1	-
1600-1799	-	-	-	1	2	-	-	1	1	-	-	-
1800-1999	-	-	1	2	1	1	-	-	-	-	1	-
2000-2199	-	-	-	1	1	2	-	2	-	-	-	-
2200-2399	-	-	-	-	1	1	3	-	-	-	-	-
2400-2499	-	-	-	1	-	-	-	-	-	-	-	-
Total	6	18	47	61	32	38	21	22	18	5	4	3
[ Lost Population 59.6 ] [ Stable ] [ Gained Population 18.9 ]												

Source: US Census of Population 1970; Number of Inhabitants

centers is shown on Map VII. This relationship is opposite to that found in the highway analysis. It is suggested that physical isolation may work in two directions, contributing to the maintenance of population in some cases and to loss in others, but considering the trends in social relationships, it is increasingly difficult to maintain population on the basis of physical isolation. The relationship of trade center population change to transportation facilities is an area where further consideration may be needed.

The complexity of the relationship between rural trade centers and their nearest urban trade centers is not fully defined in this study. The general relationship is clarified to a degree in this study indicating that size of the nearest urban center had an impact upon the ability of a rural center to maintain population growth. The future of rural centers is important to the rural resident and entrepreneur. Many rural centers are experiencing a loss in population which makes their future existence questionable. On the other hand, those rural centers which are experiencing population growth may encounter problems similar to expanding urban centers. In either case further study and clarification of variables is needed. Hopefully, this study will lead to further research in this area.

TABLE X  
DISTRIBUTION OF INCORPORATED PLACES UNDER 2,500  
POPULATION ACCORDING TO RAILROAD ACCESS  
AND PERCENT GAIN IN POPULATION

Percent gain in population of places under 2,500	Type of railroad access			
	Centers on railroad		Centers not on railroad	
	Number	Percent	Number	Percent
Gain 5 percent or more	34	24.29	128	33.25
Gain less than 5 percent	106	75.71	257	66.75
Total	140	100.00	385	100.00

Chi square = 3.8640  
d.f. = 1  
Significant at .05 level

Source: 1971 Commercial Atlas  
and Marketing Guide, 102nd  
Ed., Rand McNally and Co.  
US Census of Population,  
1970: Number of Inhabitants

TABLE XI

DISTRIBUTION OF INCORPORATED PLACES UNDER 2,500 POPULATION  
BY TYPE OF HIGHWAY ACCESS AND PERCENT GAIN IN POPULATION

Percent gain in population of places under 2,500	Centers on U. S. Highway		Type of Highway Access Centers on major State or County Highways		Centers on minor roads	
	Number	Percent	Number	Percent	Number	Percent
Gain 5 percent or more	82	36.77	54	25.47	24	26.67
Gain less than 5 percent	141	63.23	158	74.53	66	73.33
Total	223	100.00	212	100.00	90	100.00

Chi square = 6.2952

d. f. = 2

Significant at .05 level

Source: Kansas Highway Map, 1970.

US Census of Population, 1970;  
Number of Inhabitants.



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## SELECTED BIBLIOGRAPHY

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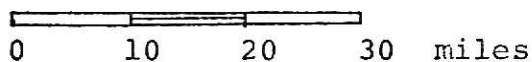
## MAP APPENDIX

## MAPS I - VI

## LEGEND

- ⊕ Urban Centers-2,500 or more population 1960
- Rural Centers-Gained 5% or more population 1960-1970
- Rural Centers-Did not gain 5% in population 1960-1970
- Interstate Highway
- U. S. Highway
- Major County & State Highways
- County Boundry

## SCALE



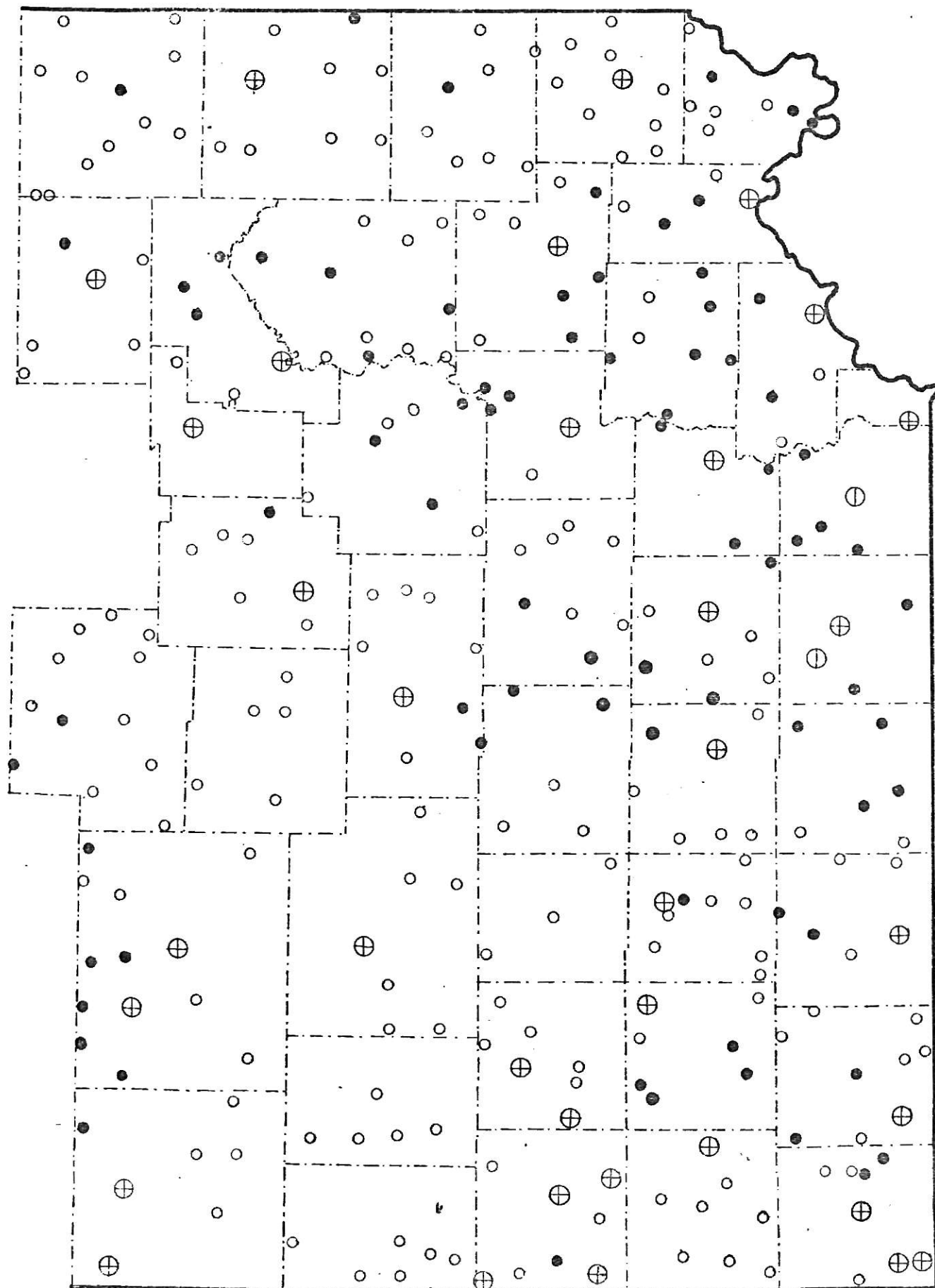
## SOURCE

US Census of Population 1970; Number of Inhabitants  
U.S. Government Printing Office, Washington, D.C.

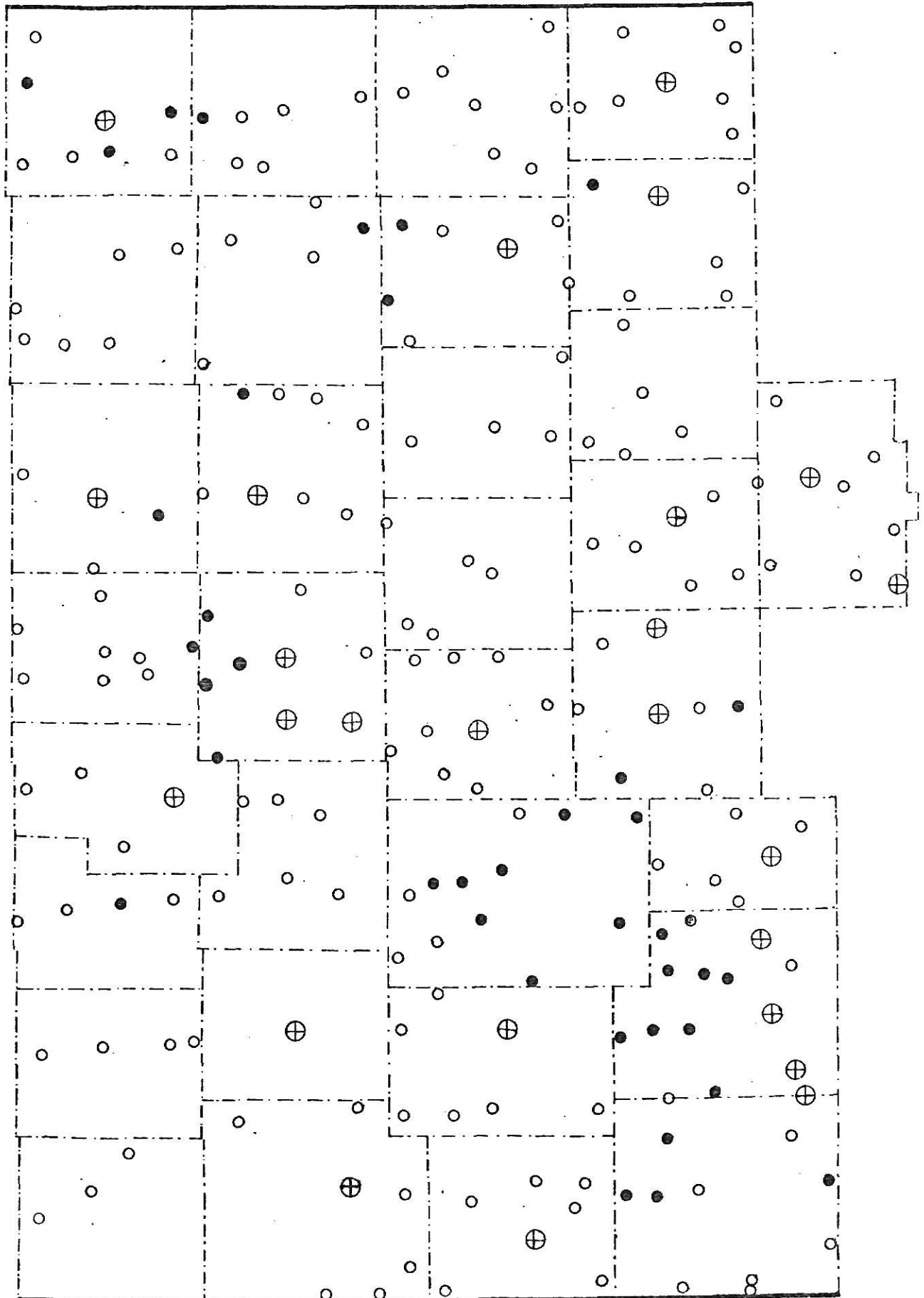
Highway Map. Kansas 1970.

## MAP I

## KANSAS - RURAL AND URBAN CENTERS - EASTERN SECTION

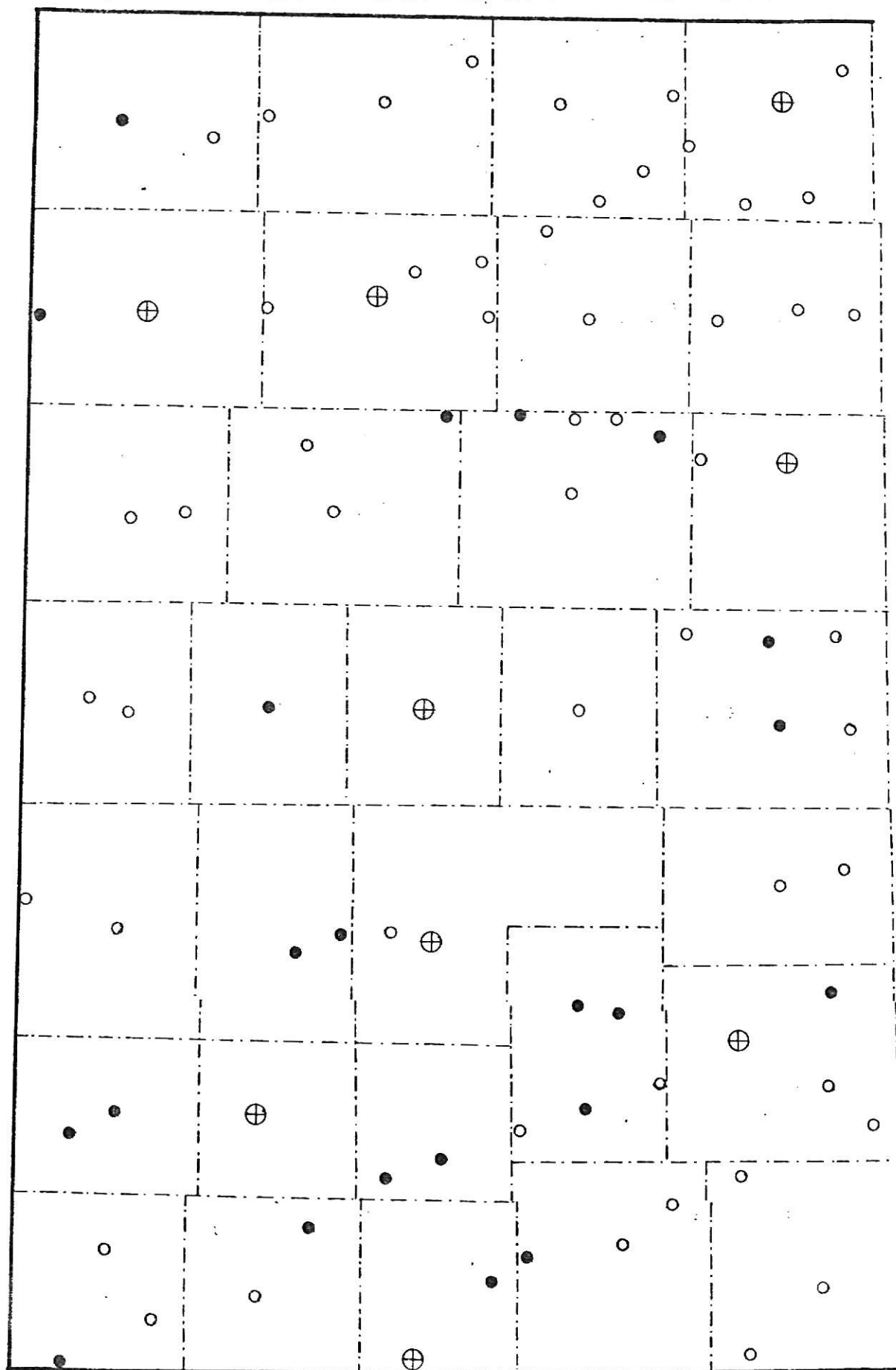


KANSAS - RURAL AND URBAN CENTERS - CENTRAL SECTION

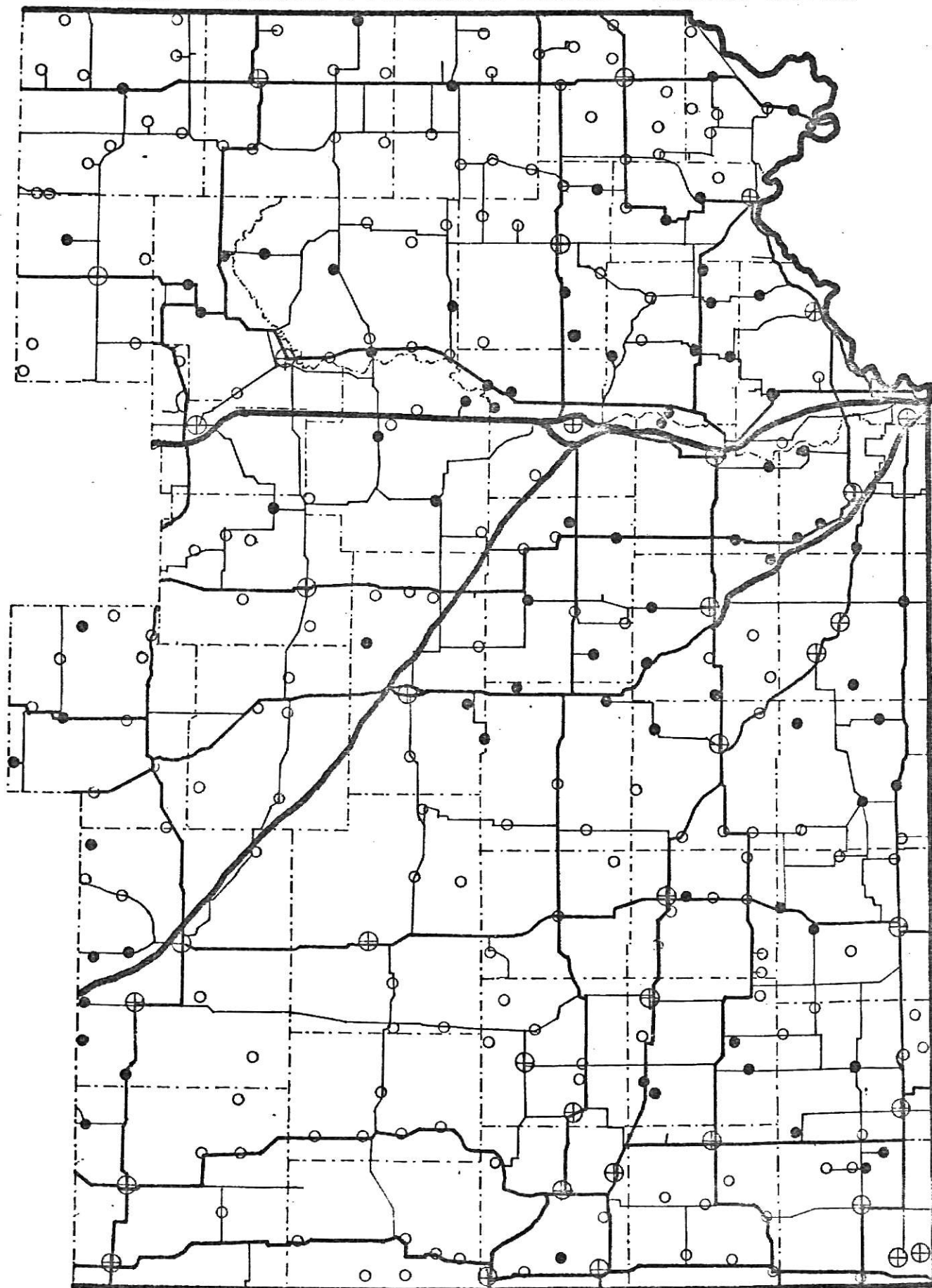


## MAP III

KANSAS - RURAL AND URBAN CENTERS - WESTERN SECTION



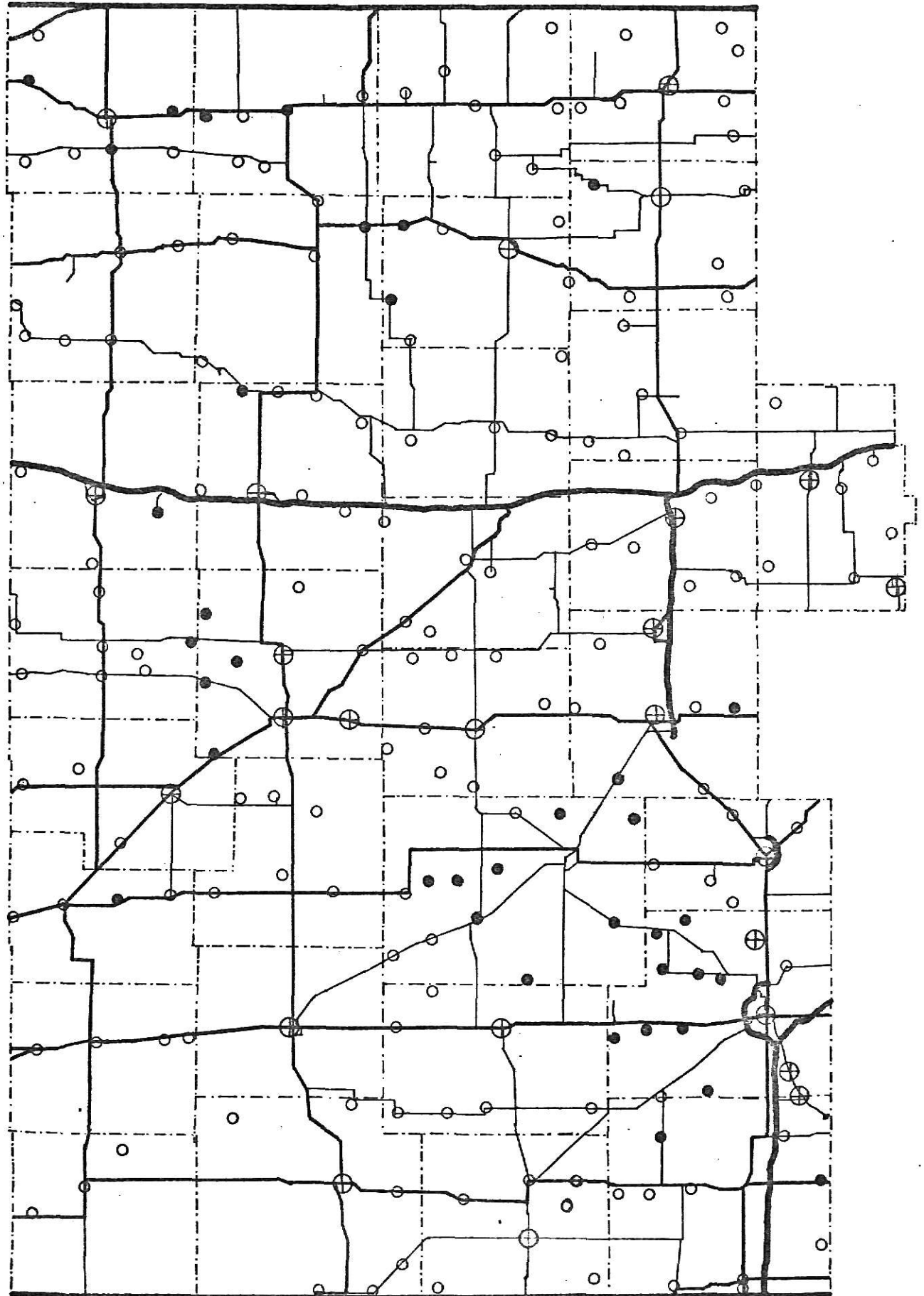
MAP IV  
KANSAS - HIGHWAYS & POPULATION CENTERS - EASTERN SECTION





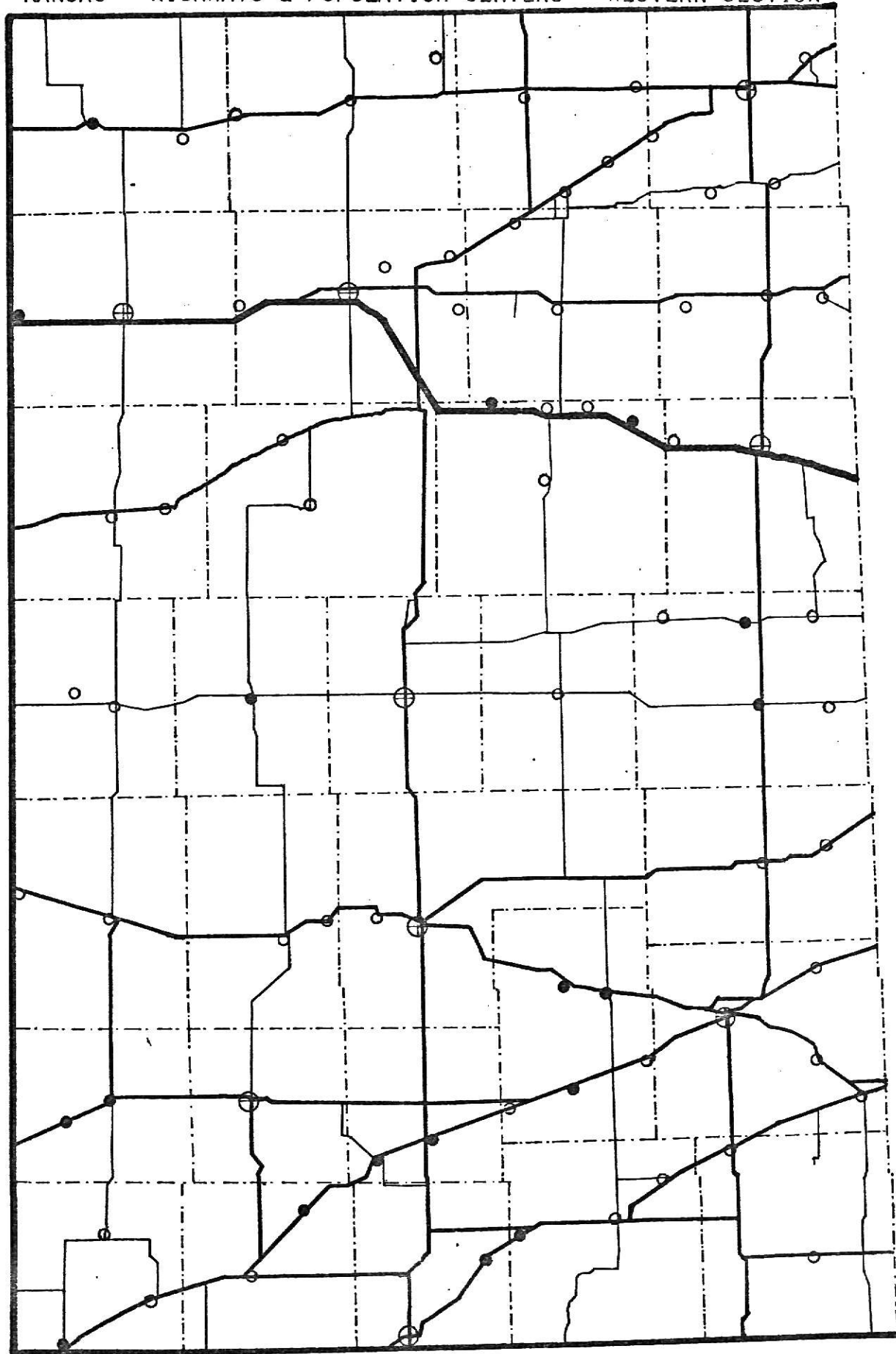
## MAP V

## KANSAS - HIGHWAYS &amp; POPULATION CENTERS - CENTRAL SECTION



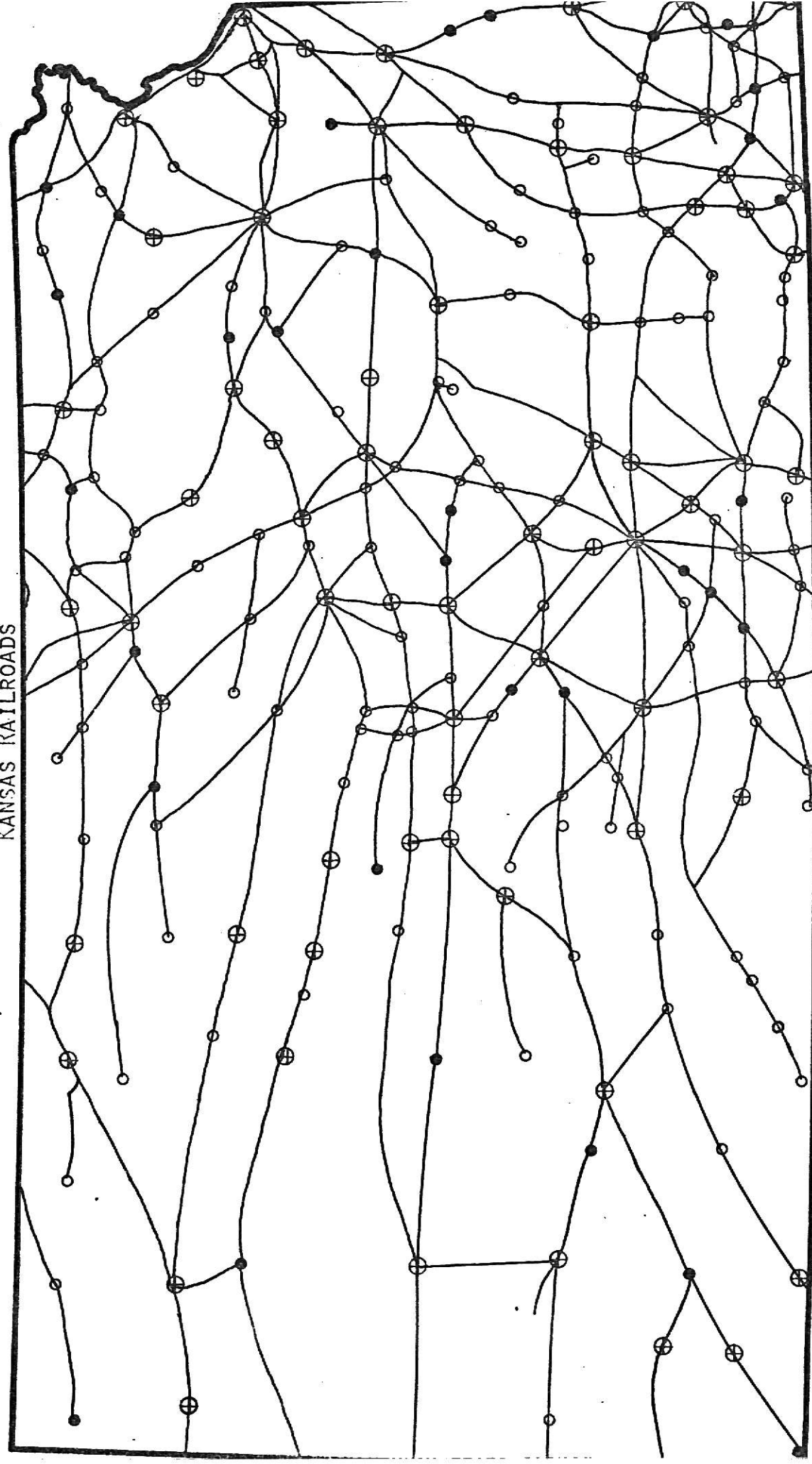
## MAP VI

## KANSAS - HIGHWAYS &amp; POPULATION CENTERS - WESTERN SECTION



MAP VII

KANSAS RAILROADS



Legend

- ⊕ Urban Centers
- Rural Centers-Gained 5% or more in population 1960-70.
- Rural Centers-Did not gain 5% in population 1960-70.
- Railroads

Scale



Source: 1971 Commercial Atlas & Marketing Guide, 102nd Ed., Rand McNally & Company.

THE RELATIONSHIP BETWEEN DISTANCE AND POPULATION  
CHANGE IN RURAL TRADE CENTERS OF KANSAS

by

JACK DONALD CROCKER

B.S. Kansas State University, 1970

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AN ABSTRACT OF A MASTER'S REPORT

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requirements for the degree

MASTER OF ARTS

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Within the frame of reference of a secular society, characterized by good transportation and a demand for a great variety of goods and services, it was reasoned that distance of small places from large centers might be related to the growth of small places. The hypothesis for this study was that small places which were in proximity to large centers would be at a disadvantage in experiencing population growth over time compared to those small places more distant from the large centers. This study was conducted in the state of Kansas on the relationship between the 1960-1970 population changes of small places and the distance of these small places from large centers by means of a spatial construct. Small places are those incorporated agricultural trade centers with a 1960 population of less than 2,500, while large centers have a 1960 population of 2,500 or more. The spatial construct located small places in zones according to their distance from large centers.

The findings of this study were that small places in proximity to large centers with a population of 2,500 to 4,999 showed no statistical significance between the small place's ability to experience population growth and the distance of this place from its large center. In the case of small places in proximity to large centers of 5,000 or more population, statistical significance existed but in the opposite direction hypothesized. Small places nearest large centers with a population of 5,000 or more were more likely to experience

population growth the nearer they were located to their respective large center. The findings of this study were somewhat different from a similar study done in Minnesota by Edward Hassinger between 1940 and 1950. In his study, the hypothesized relationship was found to be significant among the small places nearest the large centers with populations of 2,500 to 4,999. The reverse relationship indicated in the present study between those small places nearest large centers with a population of 5,000 or more, was also indicated in the Minnesota study but was less significant statistically.

The complexity of the relationship between rural trade centers and their nearest urban trade center has not been fully defined. The general relationship is clarified to a degree in this study. In a comparison of the Minnesota study and the Kansas study, both indicated that size of the nearest large center had an impact upon the ability of a small rural trade center to experience population growth. The future of rural centers is important to the rural resident and entrepreneur. Many rural centers are experiencing a loss in population which makes their future existence questionable. However, even those rural centers which are experiencing population growth may encounter problems similar to expanding urban centers. In either case, further study and clarification of variables is needed.