A FACTOR ANALYSIS OF SMALL COMMUNITY DEVELOPMENT

by

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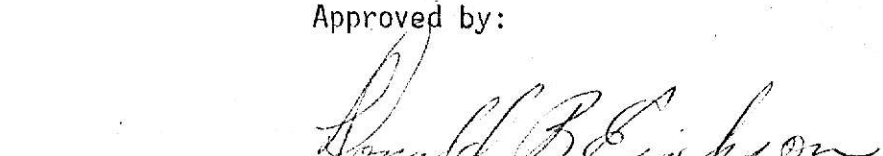

Major Professor

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INTRODUCTION

The Problem

Small communities in the plains have been characterized by differential growth in recent decades. This unequal growth has left many communities in a disadvantaged position with respect to their ability to compete for human and capital resources. This ability to attract and hold resources determines whether a community will grow or decline.[1]

Many forces have been instrumental in shaping and influencing these growth patterns. Transportation and communication trends such as the interstate highway systems, instant communication, and faster modes of transportation have lessened the dependence of the consumer upon his immediate trade area. Because of the improved highways and faster transportation, people can now travel greater distances to find employment and to satisfy their consumptive needs.[2] Trends such as the decline of the railroad system has also affected community growth. Agricultural technology has decreased the number of people needed in the production of primary products, which has resulted in out-migration patterns for

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[1] In this study, a community is defined as an area in which each social order in the community exhibits a common set of goals and interests and contains a focal point--a central place--for the expression of these goals and interests.

[2] The critical distance for commuting is a one-hour driving time. Greater distances can now be reached in one hour. See Karl A. Fox and T. Krishna Kumar, "Delineating Functional Economic Areas," in Research and Education for Regional and Area Development (Iowa State University, Center for Agricultural and Economic Development, 1966), pp. 17-23.

many communities.[3] Natural occurrences, such as whether or not oil or gas is present, or what geographic situation a community happens to be located in, greatly affects the growth or stagnation of the community.

Human and capital resources are relocating and being redistributed in Kansas. Capital investments are replacing labor in the agricultural sector and consequently this labor is being forced to seek other employment. Because agriculture is the major income producing industry in Kansas communities, other opportunities for employment often do not exist. Outmigration of the displaced agricultural laborers will result unless other employment opportunities can be created.

Many communities have suffered a population loss. In most cases, the first to leave are the young and more educated. Initially, many young people leave their communities to attend colleges and universities, and then do not return because employment opportunities are nonexistent or not adequate enough to meet their needs. For others, the initial reason for leaving is lack of employment opportunities. Often the educated leave first because they will be able to establish themselves elsewhere. Economic and social opportunities for betterment and advancement often do not exist in rural communities.

The small community problem of population losses and economic stagnation can be characterized as a decreasing spiral. Decreases in agricultural employment usually result in outmigration, and these population losses in turn generally lead to a further decline in the viability of

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[3]Census data shows that for the period 1960-1970, 76 of the 105 counties in Kansas lost population.

the economic base.[4] People support service industries, wholesale and retail; support institutions such as churches and schools; and provide a tax base for public services and local government. A subsequent decline in the economic base can then lead to further outmigration and the spiral process continues. This process will continue unless these communities can successfully organize and mobilize their resources and attract new resources to alter the population and/or economic trends.

Some community problems, such as water, waste disposal, or street lighting, do not have any impact beyond the city in which they occur. Others, such as low quality education, lack of purchasing power, or the lack of services can compound themselves and become area problems; and when summed, may become state problems. Community problems are usually the result of complex interaction between the economic, social, and geographic aspects of the community, and as such complicate the decision-making process for local and state leaders.

Challenges Facing Local Leadership

A fundamental question facing rural communities today is the extent that citizens can control their community's future development. Does the prior established and given economic and geographic situation determine future growth or decline, or can community actions effectively determine or alter this course? An analogy can be made here likening the community to a firm, with the community leaders acting as the board of directors. The directors decide on the overall policy direction

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[4]There is of course the possible alternative situation where a population decrease causes per capita income to increase which in turn stimulates consumer demand. In this case service industries, and therefore the economic base, could expand.

and the long-range development of the community. The stockholders, i.e., the citizens of the community, have the decision-making power with respect to issues involving major expenditures. The resources that are available to the community are human, capital, and natural. The product is a better place to live, or quality of living. But, the directors need correct and pertinent information about the type and quality of available resources in order to best plan the proper investment for balanced growth. Information and assistance available from area, state, and national groups and agencies should be utilized by the directors in planning and acting for community progress.

Community leaders require information about community strengths and weaknesses. This information is needed by local leaders to plan for balanced growth. Area and state leaders also need this information to facilitate program planning and policy implementation.

Needed Information

An analysis of the components of community growth could be used by local leaders to determine the existing situation, community deficiencies and strengths, what components were relevant or not relevant for their community, and for growth planning. Local leaders could also see how their community ranked with respect to other communities in the state in terms of development components studied.

Area and state leaders could utilize similar data to determine what areas of the state are falling behind in terms of competition for available resources. These data could also show what areas or cities are possible growth centers, and what community growth components are most important for certain areas of the state or are most important for the

state as a whole. Programs and policies implemented could then be aimed at deficient areas and existing programs and policies could be evaluated to see if they are relevant. Few studies analyzing community growth components have been available to state and local leaders.

Previous Research

Initial Background Study

One of the few studies that analyzed the components of community growth in Kansas was a Ph.D. dissertation by George D. Johnson.[5] This study has given the author of this thesis an opportunity to study Kansas community growth further, using additional data that is now available covering the 1960-1970 time period. Johnson's study covered the 1950-1960 time period and utilized the factor analysis technique to aggregate thirty-seven economic, social, and geographic variables into twelve factors for sixty-five Kansas communities. Factor scores were used as independent variables in some rather extensive regression analysis, with fourteen objectives of community growth as dependent variables. The communities studied were classified into viable and non-viable on the basis of the summed factor scores for each community and tested for significant differences in the regression coefficients between the viable and non-viable sets.

The statistical factor analysis model of community growth that Johnson developed was used in this study to analyze growth over the 1960-1970 time period. Thus, much of the direction and conceptual ideas for this study were derived from Johnson's dissertation. An attempt will

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[5]See George D. Johnson, "Short Run Determinants of Small Community Growth" (unpublished Ph.D. dissertation, Kansas State University, 1970).

not be made here to present any of the pertinent literature that he discussed.[6] However, there have been some recent studies that should be mentioned.

Additional Studies

A study by the Economic Research Service utilized factor analysis and component analysis to study twelve economic activity indicators for 489 multicounty trading areas encompassing the entire population of the continental United States.[7] The multicounty areas closely approximated the functional economic area concept of having a central city that influences both the immediate urban area and the surrounding rural area. The data used were taken from secondary sources and included measures of population, income, employment, income distribution, and rurality.

The twelve indicators were used in constructing indexes of general business activity, agglomeration, and economic development. Although the same twelve variables were used in all indexes, different weights were used in constructing them and they were interpreted differently in describing economic development. The 489 trading areas then were ranked for each of the twelve economic indicators and also for the economic development index, the general business activity index, the agglomeration index, and economic growth index, and an urban-orientation code.

Another application of the factor analysis technique was the construction of farm operator level-of-living indexes by the Economic

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[6] Ibid., see pages 2-27.

[7] See Robert Coltrane, Stan Daberkow, and Clark Edwards, Regional Variations in Economic Growth and Development (Washington, D. C.: U.S. Department of Agriculture, Agricultural Economic Report No. 205, 1971).

Research Service.[8] This index was constructed from five variables: average value of land and buildings per farm; average value of sales per farm; percentage of farms with automobiles; percentage of farms with home freezers; and percentage of farms with telephones. The index covers the entire United States by counties and allows for comparison of levels-of-living between different areas.

Objectives

All communities encounter problems, whether growth communities or declining communities. The state and local development leaders who initiate planning to help solve these problems need information about the different aspects of community growth. They need information about both the strengths and the weaknesses of communities. With these needs in mind, the objectives of this study are:

1) To analyze community growth during the 1960-1970 period; to determine the factors of Kansas communities which can be compared, and to provide guidelines for identifying community strengths and weaknesses in relation to other communities.

2) To test and refine the conceptual factor analysis model of community growth developed by George D. Johnson.

3) To compare the results of this 1960-1970 study with the results of Johnson's 1950-1960 study.

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[8]See John Zimmer and Elsie Manny, Farm Operator Level-of-Living Indexes for Counties of the United States, 1950, 1959, 1964 (Washington D.C.: U. S. Department of Agriculture, Statistical Bulletin No. 406, 1967).

CHAPER II

ANALYTICAL FRAMEWORK

Area of Study

The community is not a naturally defined area of study and so is constructed by the investigator using a priori considerations. The community concept being utilized in this study is that of a functionally integrated area consisting of a central place and a hinterland.[1] In this study, the area analyzed as the community was selected to include the county in which a city to be studied was located and all contiguous counties. The city of interest is the focal point, the central place of the community, and the hinterland of the community is the county which contains the city of interest plus all contiguous counties.

Data referred to as city data were gathered for the cities of interest only and reflect the central place function of the cities. Data referred to as community data were gathered on the total community, and incorporate data from the initial county and all contiguous counties.

The area of study is the state of Kansas and selected counties from the bordering states. All counties in Kansas are included in the study

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[1]The principle of functional integration provides a basis for delineating regions on homogeneity of production, marketing, or labor shed linkage to a central place. See John Heinrich Von Thunen, Der Isolierte Staat in Beziehung auf Landwirtschaft und National Okonomie (3rd ed.; Berlin; Schumacher-Zerchlin, 1875). More recently see Morris B. Ullman and Robert C. Klove, "The Geographic Area in Regional Economic Research," Regional Income, Vol. 21, Conference on Research in Income and Wealth, National Bureau of Economic Research (Princeton, N. J.: Princeton University Press, 1957), pp. 92-94.

except Hamilton County.[2] Counties in the bordering states that are contiguous to Kansas counties containing a city of interest are included. These counties and the geographic distribution of the cities of interest are indicated in figure 1.

Cities of Interest

The criteria for selection of the cities of interest was to include all cities in Kansas whose population was between 2,500 and 50,000 in both 1960 and 1970. Topeka, with a population of 125,011, was included because it was included in Johnson's study. The Greater Kansas City area and the Greater Wichita area were excluded from the study because of their large population size.

Several cities closely surrounding Kansas City and Wichita were also excluded because the proximity to the large metropolitan areas would bias their results.[3] Olathe, while close to Kansas City, was included because it was large enough to have an identity of its own.

The average size of the sixty-six cities studied was 11,507. The large standard deviation (16,678) associated with these cities illustrates the differences between the central cities studied (See Table 1).

Communities

The average land area of the communities constructed (including the initial county and all contiguous counties) was 3.660 million acres.

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[2]Hamilton County was excluded because it was not close enough to a city of interest to fit the community criterion.

[3]Cities which met the selection criterion but were excluded were: Bonner Springs, population 3,662; Mulvane, population 3,185; and Valley Center, population 2,551.

THIS BOOK CONTAINS NUMEROUS PAGES WITH DIAGRAMS THAT ARE CROOKED COMPARED TO THE REST OF THE INFORMATION ON THE PAGE.

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Fig. 1. -- Area of Study and Geographic Distribution of Cities of Interest.

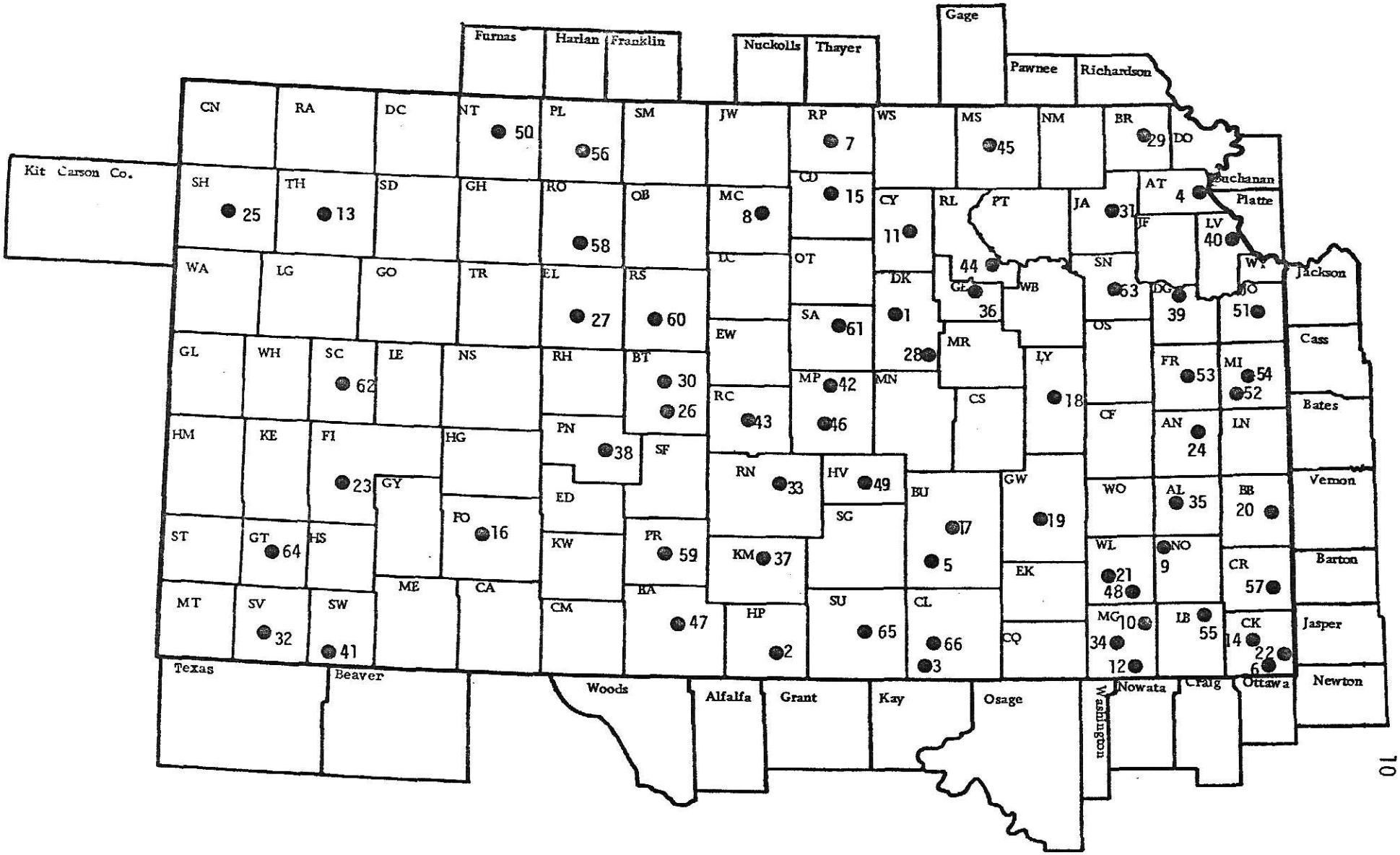

TABLE I

CITIES AND 1970 POPULATION

City	1970 Population	City	1970 Population
1. Abilene	6,661	34. Independence	10,347
2. Anthony	2,653	35. Iola	6,493
3. Arkansas City	13,216	36. Junction City	19,018
4. Atchison	12,565	37. Kingman	3,622
5. Augusta	5,977	38. Larned	4,567
6. Baxter Springs	4,489	39. Lawrence	45,698
7. Belleville	3,063	40. Leavenworth	25,147
8. Beloit	4,121	41. Liberal	13,471
9. Chanute	10,341	42. Lindsborg	2,764
10. Cherryvale	2,609	43. Lyons	4,355
11. Clay Center	4,963	44. Manhattan	27,575
12. Coffeyville	15,116	45. Marysville	3,588
13. Colby	4,658	46. McPherson	10,851
14. Columbus	3,356	47. Medicine Lodge	2,545
15. Concordia	7,221	48. Neodesha	3,295
16. Dodge City	14,127	49. Newton	15,439
17. El Dorado	12,308	50. Norton	3,627
18. Emporia	23,327	51. Olathe	17,917
19. Eureka	3,576	52. Osawatomie	4,294
20. Fort Scott	8,967	53. Ottawa	11,036
21. Fredonia	3,080	54. Paola	4,622
22. Galena	3,712	55. Parsons	13,015
23. Garden City	14,790	56. Phillipsburg	3,241
24. Garnett	3,169	57. Pittsburg	20,171
25. Goodland	5,510	58. Plainville	2,627
26. Great Bend	16,133	59. Pratt	6,736
27. Hays	15,396	60. Russell	5,371
28. Herington	3,165	61. Salina	37,714
29. Hiawatha	3,365	62. Scott City	4,001
30. Hoisington	3,710	63. Topeka	125,011
31. Holton	3,063	64. Ulysses	3,779
32. Hugoton	2,793	65. Wellington	8,072
33. Hutchinson	36,885	66. Winfield	11,405

Average City Size = 11,507
Standard Deviation = 16,678

Selection Criterion: All Cities of 2,500 population or more in both 1960 and 1970; Kansas City, Wichita, and their suburbs were excluded.

These communities were grouped rather closely around the mean with a standard deviation of .857 million acres. This average community size approximates the functional economic area concept and also the one-hour driving time--labor shed concept.[4] The smallest community contained 1.887 million acres and the largest community contained 5.942 million acres (See Table 2).

Driving distances are critical for community interaction, whether for employment or consumptive purposes. Figure 2 shows a hypothetical comparison of the smallest, average, and largest community sizes drawn to comparative scale, with the radial and diagonal distances shown in miles.[5]

Nine counties in the study region contained more than one city of interest. In these cases, the community data were allocated to each city according to its relative share of the total city population.

Variable Structure

A community's ability to attract short-run human and capital resources is a function of three different aspects of the community. These are the economic aspect, the social aspect, and the geographic aspect. The thirty-seven variables utilized in this study can be described in terms of these community aspects.[6]

Economic

The economic aspect is the monetary value-creating activities of

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[4]Fox and Kumar, "Functional Economic Areas," p. 18.

[5]Figure 2 represents community size as a square area to illustrate comparative distances for the smallest, average, and largest communities. Actual community configuration is not square, so distances will vary depending upon the shape of a particular community.

[6]The variables are the same as those used by Johnson. See Johnson, "Short Run Determinants," pp. 38-41.

TABLE 2

COMMUNITY SIZE
(Millions of Acres)

Community	Size	Community	Size
1. Abilene (1)*	3.786	34. Independence (5)	3.046
2. Anthony	3.750	35. Iola	2.974
3. Arkansas City (2)	5.942	36. Junction City	2.519
4. Atchison	2.478	37. Kingman	4.465
5. Augusta (3)	5.651	38. Larned	3.700
6. Baxter Springs (4)	2.774	39. Lawrence	2.811
7. Belleville	2.806	40. Leavenworth	1.887
8. Beloit	3.567	41. Liberal	4.334
9. Chanute	3.014	42. Lindsborg (8)	4.264
10. Cherryvale (5)	3.046	43. Lyons	3.420
11. Clay Center	3.111	44. Manhattan	3.279
12. Coffeyville (5)	3.046	45. Marysville	3.377
13. Colby	4.568	46. McPherson (8)	4.264
14. Columbus (4)	2.774	47. Medicine Lodge	4.607
15. Concordia	3.408	48. Neodesha (6)	3.372
16. Dodge City	3.907	49. Newton	3.903
17. El Dorado (3)	5.651	50. Norton	3.322
18. Emporia	3.616	51. Olathe	2.578
19. Eureka	4.233	52. Osawatomie (9)	3.093
20. Fort Scott	2.783	53. Ottawa	3.169
21. Fredonia (6)	3.372	54. Paola (9)	3.093
22. Galena (4)	2.774	55. Parsons	3.193
23. Garden City	4.835	56. Phillipsburg	4.040
24. Garnett	2.979	57. Pittsburg	3.289
25. Goodland	5.366	58. Plainville	4.591
26. Great Bend (7)	4.136	59. Pratt	3.919
27. Hays	4.595	60. Russell	3.727
28. Herington (1)	3.786	61. Salina	3.581
29. Hiawatha	2.106	62. Scott City	4.138
30. Hoisington (7)	4.136	63. Topeka	2.931
31. Holton	2.757	64. Ulysses	4.056
32. Hugoton	3.822	65. Wellington	5.356
33. Hutchinson	4.351	66. Winfield (2)	5.942

Average Community Size = 3.660
Standard Deviation = .857

Construction Criterion: The county which contains the city of interest plus all contiguous counties.

*(x) - Denotes cities in a county with two or more cities of interest. Cities in the same county have the same number in parenthesis.

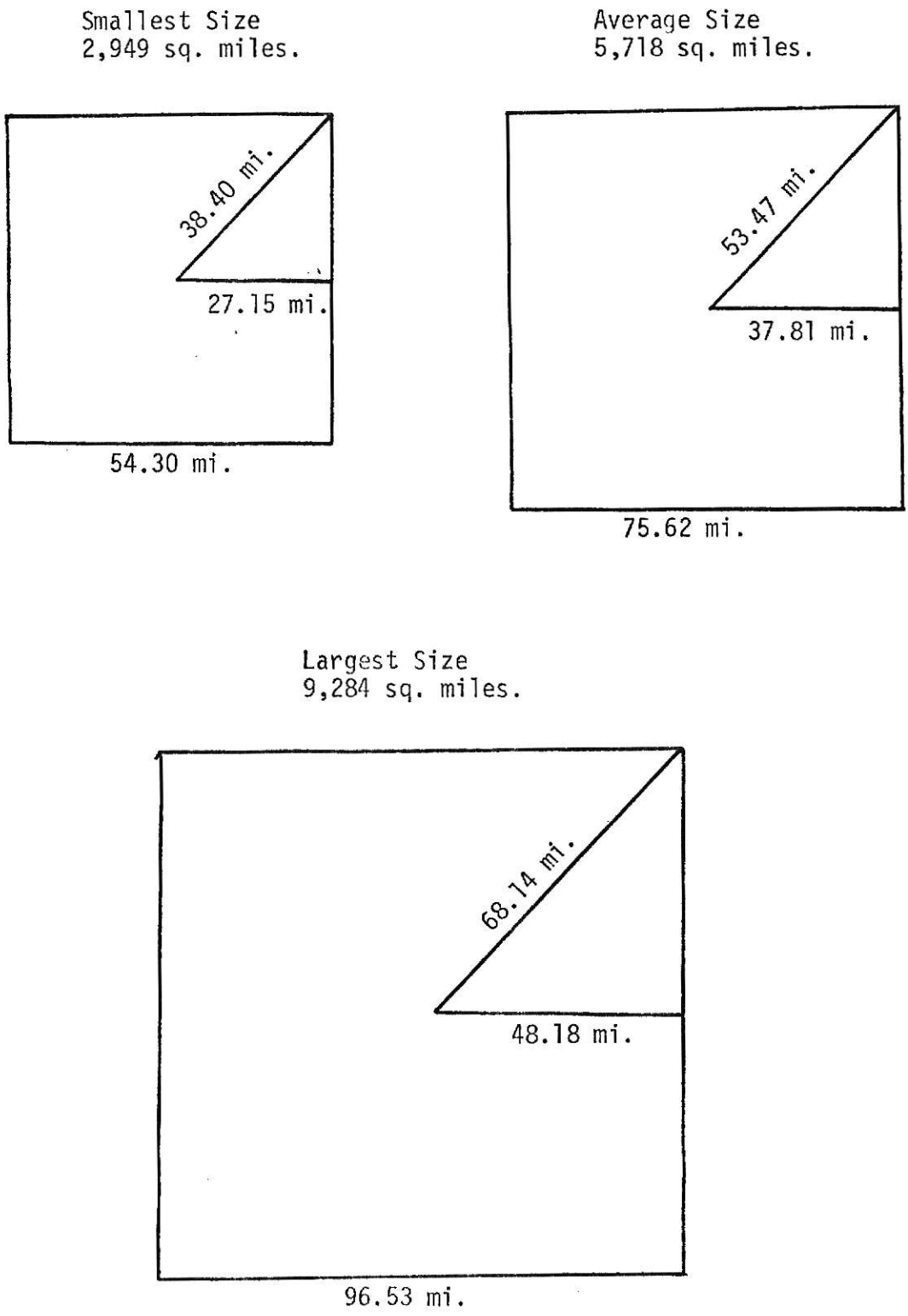

Fig. 2. -- Hypthetical community regions representing the Smallest, the Average, and the Largest areas and distances.

the community and draws primarily from four sources; manufacturing, agricultural, distributional, and performance of services. This aspect is considered a function of two basic dimensions of measurement of economic activity--size and structure. The size dimension is characterized by the gross product of the community and the structure dimension is characterized by the amount of employment and/or income generated in agriculture, manufacturing, retail trade, selected services, and government.

Variables that are denoted by "city" are measurements on the city of interest only. Variables that are denoted by "community" are measurements on the total community (the initial county and all contiguous counties) area. These codes apply to all thirty-seven variables. The data were gathered on the following variables for each community:

1. Size Dimension

   (a) Change in retail sales--city.
   (b) Change in total receipts in selected services--city.

2. Structure Dimension

   (a) Percentage change in real farm income--community.
   (b) Change in total real value of farm and livestock products sold--community.
   (c) Change in employees in manufacturing--city.
   (d) Change in employees in retail trade--city.
   (e) Percentage change in employees in selected services--city.
   (f) Change in real government income disbursements--community.
   (g) County seat or not a county seat.

Social

The social aspect is the interaction between the social orders of the community. Interaction occurs between rural and urban and also between urban and metropolitan. This aspect is considered a function of two basic dimensions of measurement of social interaction--quantity and quality. The quantity dimension is characterized by the size of the social change

reflected in observable quantitative variables. The quality dimension is characterized by the nature or direction of the social change as reflected by observable quantitative variables.

The data were gathered on the following variables for each community:

1. Quantity Dimension.

   (a) Change in the number of people living in towns of 10,000 population or more--city.
   (b) Change in newspaper circulation--city.
   (c) Number of years the city has had radio.
   (d) Change in the city library expenditures--city.

2. Quality Dimension.

   (a) Change in the number of school units--community.
   (b) Average yearly change in rural farm population--community.
   (c) Change in percentage of 16-17 year olds in school--community.
   (d) Change in percentage of 18-19 year olds in school--community.
   (e) Percentage change in enrollment in college--city.
   (f) Percentage change in population 65 years old and over--city.
   (g) Percentage change in the median age of the population--community.
   (h) Fire protection classification--city.
   (i) Change in the total school tax levy--city.
   (j) Percentage change in tax levy for general operations--city.
   (k) Number of times city had industrial levy--city.
   (l) Percentage change in the farm operator's level of living index--community.
   (m) Number of new manufacturers with 0-19 employees--community.
   (n) Number of new manufacturers with 20-99 employees--community.

Geographic

The geographic aspect is the physical relationships of the community and includes available water and mineral resources, climate and land use patterns, and the location of one community with respect to others. This aspect is considered a function of three basic dimensions of spatial order--location, transportation access, and land utilization. The location dimension is characterized by distance concepts, the access dimension

is characterized by measurements of physical network development with respect to highways and railroads, and the land utilization dimension is characterized by agricultural land use, mineral and water production, and climate indicators.

The data were gathered on the following variables for each community:

1. Location Dimension.
   (a) Distance to a complete shopping center--city. ($11 million retail trade)
   (b) Distance to a wholesale shopping center--city. ($40 million retail trade)
   (c) Linear Distance to the nearest city of 300,000 population or more--city.
2. Transportation Access.
   (a) Highway access index--city.
   (b) Number of intrastate carriers serving city--city.
   (c) Number of railroad lines--city.
3. Land Utilization Dimension.
   (a) Change in the number of acres irrigated--community.
   (b) Change in the number of firms producing oil and gas products--community.
   (c) Change in the number of firms producing all other mineral products--community.
   (d) Climate Index--city.

Methodology

The methodology used in this study is a factor analysis of the thirty-seven economic, social and geographic variables. The objective of factor analysis is to represent a variable z_j in terms of several underlying factors, or hypothetical constructs. The simplest form of representing a variable in terms of several others is a linear one, and the factor analysis model is represented linearly. Within this linear framework, several alternatives can be followed, depending upon the specific objective of the analysis.

Two well-known objectives are: 1) to extract the maximum variance; and 2) to "best" reproduce the observed correlations.[7]

The form of the factor analysis model is:

$$z_j = a_{j1}F_1 + a_{j2}F_2 + \ldots + a_{jm}F_m + d_jU_j$$
$$j = 1, 2, \ldots, n,$$

where each of the n observed variables is described linearly in terms of m common factors and a unique factor. The common factors account for the correlations among the variables, while each unique factor accounts for the remaining variance (including error) of that variable. The coefficients (a_j's) of the factors are referred to as "factor loadings".

The assumptions associated with the factor analysis model are:

1. The F's are normally and independently distributed with means of zero and unit variances.

2. The U's are normally and independently distributed with a mean of zero and unit variance.

3. The F's and U's are independently distributed.

The factor analysis model appears to bear a strong resemblance to that of regression analysis insofar as a variable is described in terms of a linear combination of another set of variables plus a residual. In regression analysis, however, the set of independent variables are observable while in factor analysis, they are hypothetical constructs which can only be estimated from the observed data.[8]

The factor analysis solution can be separated into three separate stages: 1) determination of a common factor space, 2) rotation of reference axes in a common factor space, and 3) estimation of factor scores.

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[7]See Harry H. Harmon, Modern Factor Analysis (2nd ed., rev.; Chicago: The University of Chicago Press, 1967), p. 14.

[8]Ibid., p. 16.

Common Factor Space

The method used in this study to determine the common factor space is the Principal Component - Factor Solution (PC-FS).[9] The objectives of this method is to extract the maximum variance of the system of variables with a given number of factors. The PC-FS model used has characteristics of both factor analysis and component analysis. Component analysis is theoretically different from factor analysis and has the form:

$$z_j = a_{j1}F_1 + a_{j2}F_2 + \ldots + a_{jn}F_n$$
$$j = 1, 2, \ldots, n,$$

where each of the n observed variables is described linearly in terms of n new uncorrelated components $F_1, F_2, \ldots, F_n$. Each component, in turn, makes a maximum contribution to the sum of the variances of the n variables. Theoretically, all n components are needed to explain an individual variable; but for a practical problem, only a few components may be retained, especially if they account for a large percentage of the total variance.

The distinction comes from the amount of variance that is analyzed--the numbers placed in the diagonal of the correlation matrix. Integer ones placed in the diagonal leads to principal components while communalities placed in the diagonal leads to principal factors.[10] The communality of a variable is given by the sum of the squares of the factor coefficients (factor loading). In this study, the procedure was to specify the number of factors a priori and the factor loading matrix was determined from

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[9]For a discussion of an alternative method, the Principal Factor Solution (PFS), see Johnson, "Short Run Determinants," p. 49.

[10]Harman, Modern Factor Analysis, p. 136.

the correlation matrix with integer ones in the diagonal. Because the number of factors specified was less than the number of variables, the PC-FS is actually a factor analysis which utilizes component analysis techniques.

Rotation

The second stage of the solution is the rotation of references axes in the common factor space.

There is a basic indeterminacy in factor analysis, in the sense that, given the correlation of a set of variables, the coefficients of a factor pattern are not uniquely determined. Systems of orthogonal, or uncorrelated, factors may be chosen, consistent with the observed correlations, in an infinite number of ways. A factor solution determines the m - dimensional space containing the common factors, but it does not determine the basis or frame of reference or the exact position of these factors. After a factor solution has been found that fits the empirical data, it may be transformed or "rotated" to another solution which may have greater meaning to investigators in a particular field.[11]

In this study, the technique used was an orthogonal Varimax rotation.[12]

Factor Scores

The third stage of the solution is the estimation of the factor scores. Each observation (community) has a score for each factor. Each

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[11] Ibid., p. 24.

[12] For a detailed discussion of the rotation problem and techniques, see Johnson, "Short Run Determinants," p. 51. Also see Appendix A in "Short Run Determinants" for a comparison of the PC-FS and PFS methods, and a comparison of various rotation techniques.

column (factor) in the factor score matrix is normally distributed with a zero mean and unit variance. Each individual community factor score is expressed in standard deviation terms of the factor variate. An individual score of 1 would mean that that particular community ranked one standard deviation above the mean for that factor.

These factor scores are produced in the following manner:[13]

$$F = (A'A)^{-1} A'Z,$$

where:

F = N x m matrix of factor scores

A = n x m factor loading matrix

Z = N x n standardized data matrix,

and:

N = number of observations

m = number of factors

n = number of variables.

Time Period

The time period utilized is an important consideration for any development study. This study concerns itself with the quasi-short run, or that length of time which allows private capital and labor to vary in supply yet be fixed as to functions performed.[14] Income, private capital, and labor movements are evaluated while public capital formation and land use practices are considered fixed. The actual time period covered by

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[13]Harmon, Modern Factor Analysis, pp. 346-348.

[14]For a complete discussion of the quasi-short run and other time periods, see Johnson, "Short Run Determinants," pp. 16-18.

this study is from 1960-1970. Development activities and programs do not have an instantaneous affect on community growth. Likewise, community stagnation does not have an immediately noticeable affect. A ten-year period allows the effect of development programs, or the absence of development programs, to be felt in the economic and social life of the community.

CHAPTER III

ANALYSIS AND RESULTS

Analysis

Factorization

This study utilized a sixteen factor solution. Originally a twelve factor solution was to be used to allow direct comparison between this study and Johnson's twelve factor study.

A twelve factor solution was derived, but correlations among variables in several of the factors prevented the solution from being usable. The factor loading matrix is determined from the correlation matrix and if original correlations between variables are such that the factor structure is not feasible, the solution will not provide logical answers. These original correlations are determined by the raw data and so cannot be altered.

Several other factorizations were tried and rejected; the original twelve factor solution, a nine factor solution, and a thirty-seven factor solution. The sixteen factor solution was usable because the structure of the factors was altered from that of the twelve factor grouping and all but one of the variables that were correlated illogically were included in different factors.[1]

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[1] A variable that is correlated illogically has the opposite effect on development as would be expected. Variables that should be correlated positively with development are correlated negatively. For a complete discussion of factor correlations and a comparison of the different factorizations, see Appendix A.

The nine factor solution was tried because, strictly in terms of the number of factors needed, nine was considered the optimum number as in the original factor matrix derived (before rotation) each of the nine factors explained more than three percent of the total variance. The cutoff level was arbitrary, but having each factor explain three percent or more was considered desirable.

The thirty-seven factor solution was tried in an attempt to reduce the number of significant variables in each factor. The solution was successful in this respect, but was discarded because with the large numbers of factors, individual factors lost their significance and made further computation unwieldy.[2]

Factor Loading Signs

A related problem that hindered derivation of a final solution was the way in which the signs for the factor loadings were determined.

Different computational procedures (computer programs) involving the same method of common factor space determination and the same rotation technique can produce factor loadings that have the same value but different signs. This is because different procedures might place the factor in a different area of the common factor space. Then when each factor is rotated it may be rotated to a different quadrant, producing a value that is a mirror image of the value produced under another procedure.

The end result is that the factor scores, which are dependent on the factor loadings, may have a positive sign with one procedure and a negative sign with another procedure. This of course is critical when interpreting the factor scores. This does not present a problem in itself because

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[2]See Appendix A.

each factor can be reflected without affecting the final results. The factor scores can be compared with the raw data to determine the direction of the signs, or the factor loadings can be compared with the variables to determine the direction.[3] However, when a factor has significant variables that do not correlate logically, the determination of the direction of the signs is complicated. Whatever way the factor is directed, one or more of the variables will have the opposite effect of what logically would be expected. A different factorization to minimize or eliminate the effect of the particular variable in question should then be tried.

Results

Factor Structure

The 16 x 37 factor loading matrix is the first step in the derivation of the factor scores in this study and is presented in Table 3. The values of the loadings show the contribution that each factor makes to the explanation of a single variable. In all but six cases, only one factor was significant in explaining each variable. For example, in the explanation of the first variable, factor one has a loading of .91 while the next highest loading is .25 for factor sixteen. Loadings are termed significant when a single loading explains most of the variation.

The column denoted by H^2 shows the communalities of the variables. The communality of a variable is the percentage of variance in the variable of interest explained by the factors of the factor analysis system.

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[3]For a detailed discussion of the methods of determining the direction of the signs, see Appendix A.

TABLE 3

ROTATED FACTOR LOADING MATRIX -- THIRTY SEVEN
VARIABLES -- FOR THE TOTAL DATA SET (SIXTY-SIX COMMUNITIES)

	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8	F_9	F_{10}	F_{11}	F_{12}	F_{13}	F_{14}	F_{15}	F_{16}	H^2
Economic																	
C RET S	[.91]	-.02	.11	-.01	-.03	.08	-.05	.08	-.03	-.12	.02	.02	-.10	.04	.04	.25	.946
C REC SS	[.87]	-.04	.01	.01	-.05	.19	.10	.13	.20	-.08	-.02	.08	-.02	-.01	-.03	.09	.878
PC FM INC	.02	.14	-.14	.12	[.83]	-.01	-.11	.05	.02	.07	-.03	.25	-.23	.17	.12	.03	.921
C VAL F&L P S	.04	[.66]	-.14	.10	.34	-.00	-.20	.01	.12	-.08	-.03	.22	-.23	.01	-.32	.07	.856
C EMP MFG	.16	-.07	.46	[-.62]	-.31	.02	.10	-.06	-.07	.05	-.05	-.04	-.12	.06	.02	.37	.897
C EMP R T	[.79]	-.06	.14	-.02	-.00	.09	-.04	-.09	.05	-.14	.02	-.00	-.12	.02	.06	.48	.939
PC EMP SS	.35	-.10	-.12	-.06	-.19	[.69]	.20	-.09	.19	-.13	.09	-.02	-.04	-.26	.11	-.01	.848
C GOV INC DSB	.32	.16	.56	-.42	-.01	.08	.23	-.17	-.10	-.09	.01	.02	.20	-.12	-.12	.34	.908
CO SEAT	.16	[.85]	.12	-.01	-.03	-.06	-.01	.08	.01	.01	.08	.25	-.01	-.01	.15	-.01	.860
Social																	
C P 10,0000	.44	.06	.21	-.18	.09	.08	.07	.03	-.06	-.08	.04	.01	-.10	.02	-.01	[.77]	.908
C NWS CIRC	.21	.04	.05	.03	.05	.03	-.01	[.91]	.09	.02	-.11	-.04	.02	.05	-.02	.02	.913
YRS RADIO	[.90]	.05	.02	.04	.08	-.02	-.01	.00	.07	-.02	.05	.03	-.04	.13	-.07	.03	.859
C LIB EX	.14	.11	-.06	[.86]	-.08	-.06	.10	.11	-.07	-.00	-.07	.24	.14	.02	-.10	.05	.900
C SCH UN	-.23	-.09	[-.76]	-.03	.05	.17	-.06	.08	-.06	.16	-.01	-.40	-.01	-.05	.14	-.03	.890
AV C R F PP	-.18	-.16	[-.79]	.06	-.06	.22	-.02	-.00	.00	.21	-.03	-.19	-.02	.08	.18	.02	.860
PC F LOL I	-.04	-.03	-.05	-.05	.09	.04	.01	-.02	-.00	.05	.03	-.15	.00	.15	[.91]	-.00	.889
CP 17 SCH	.04	.10	.06	.03	.14	.15	-.13	-.05	-.05	-.02	.06	[.87]	.01	.10	-.14	-.06	.882
CP 19 SCH	-.07	.30	.03	.23	.15	-.17	-.07	.02	.15	-.08	-.04	[.70]	-.11	-.18	-.08	.12	.796
PC ENR COL	.10	.07	-.12	-.10	.02	.01	-.08	.09	[.93]	.04	-.00	.04	.03	-.01	.01	-.04	.922
PC PP 65	.12	.18	-.40	[-.71]	-.17	-.05	.08	.18	.18	.04	-.13	.08	-.03	-.04	-.08	.16	.876
PC MED AGE	-.01	.11	[-.61]	.04	.14	-.46	-.09	-.16	.06	-.13	-.18	.23	.22	-.03	.24	.14	.875
FI PROT CL	[-.74]	.02	-.26	.05	.26	.11	-.02	.18	.02	-.17	-.01	.02	-.10	.22	-.03	.05	.819
C SCH TX LVY	-.10	-.13	.03	.15	-.17	-.05	.04	.01	.03	.03	.03	-.05	[.89]	-.05	.00	-.08	.896
PC TX LVY	.04	.03	.13	.01	-.04	.05	.01	-.09	-.00	-.04	[.95]	.03	.03	-.06	.04	.03	.946
NO. IND LVY	-.12	-.34	.37	.25	-.12	.06	-.28	-.11	.21	.30	.24	.19	-.02	.18	.33	-.11	.815
NEW MFG 19	.05	.01	-.10	.02	.13	-.02	-.03	.04	-.00	.02	-.06	-.01	-.05	[.94]	.15	.01	.941
NEW MFG 99	.17	.02	.39	-.03	-.26	-.13	.23	-.40	.03	-.46	-.31	-.07	.12	.04	.13	.19	.865
Geographic																	
DIST R S C	-.03	.59	-.13	.05	.19	.11	[-.64]	-.10	.02	.03	-.09	-.10	-.04	.02	-.09	.06	.878
DST W S C	-.11	.08	-.21	.02	.06	-.12	[-.83]	.08	.09	-.12	.03	.27	-.03	.03	.02	-.08	.879
DST 300,000	-.10	.08	[-.80]	-.02	.16	-.11	-.09	-.12	.19	.05	-.14	.14	-.06	.06	-.13	-.21	.859
H W IND	[.76]	.23	.01	-.29	.06	.01	.18	.19	-.07	-.12	-.00	-.02	-.01	-.06	.03	-.00	.817
NO. INT CR	[.91]	.11	.14	.12	.02	-.06	.04	.08	-.05	-.01	-.03	-.05	.05	.02	-.08	-.11	.918
NO. RR	.39	-.12	.33	.15	-.42	.00	.09	-.19	-.04	.43	.19	-.08	-.04	-.14	.05	-.31	.858
C OIL PROD	-.06	.16	-.10	-.00	.34	[.66]	-.13	.17	-.18	.23	-.01	.16	-.02	.27	.05	.25	.890
C OTHER MW PROD	-.32	.00	-.31	-.08	.04	.03	.16	.04	.08	[.78]	-.13	-.11	.08	.06	.10	-.04	.903
C IRR	-.01	.52	-.62	-.15	-.03	.15	-.11	-.07	.09	.01	.01	-.06	-.22	.13	-.29	.01	.879
CLM IND	-.10	-.35	[.59]	.06	-.21	.09	.20	-.13	.03	.09	.00	-.24	-.20	-.10	.34	.15	.848
VARIANCE	5.97	2.41	4.48	2.19	2.03	1.44	1.62	1.37	1.21	1.41	1.24	2.02	1.22	1.32	1.56	1.53	33.02
PER CENT	16.14	6.51	12.11	5.92	5.49	3.89	4.38	3.70	3.27	3.81	3.35	5.46	3.30	3.57	4.22	4.14	89.26

Factors 7, 11, 13 were reflected.

The bottom two rows of Table 3 show the variance that each factor explains and the percentage of the total variance. The variance of each factor was computed by summing the squares of the factor loadings. The total variance is thirty-seven and so each factor's variance is divided by thirty-seven to compute the percentage of variance explained. The six most significant factors explained 51.6% of the variance, the twelve most significant factors explained 75.8% of the variance, and all sixteen factors explained 89.3% of the variance.

Factor One (F_1). The first factor is Urban Position. Variables that have significant loadings with this factor are Change in Retail Sales (C RET S), Change in Total Receipts in Selected Services (C REC SS), and Change in Employees in Retail Trade (C EMP R T), from the economic aspect; Number of Years the City has had Radio (YRS RADIO), and Fire Protection Classification (FI PROT CL) from the social aspect; and Highway Access Index (H W IND) and Number of Interstate Carriers (NO. INT CR) from the geographic aspect.

Factor Two (F_2). The second factor is Agricultural Linkage. Variables that have significant loadings with this factor are Change in the Total Real Value of Farm and Livestock Products Sold (C VAL F&L P S) and County Seat or not a County Seat (CO SEAT) from the economic aspect.

Factor Three (F_3). The third factor is Social Structure Change. Variables that have significant loadings with this factor are Change in the Number of School Units (C SCH UN), Average Yearly Change in Rural Farm Population (AV C R F PP), and Percentage Change in the Median Age of the Population (PC MED AGE) from the social aspect; and Linear Dist-

ance to the Nearest City of 300,000 Population (DST 300,000) and Climate Index (CLM IND) from the geographic aspect.

Factor Four (F_4). The fourth factor is Manufacturing Base - Population Structure. Variables that have significant loadings with this factor are Change in Employees in Manufacturing (C EMP MFG) from the economic aspect; and Change in City Library Expenditures (C LIB EX) and Percentage Change in Population 65 Years and Over (PC PP 65) from the social aspect.

Factor Five (F_5). The fifth factor is Agricultural Base. The variable that has a significant loading with this factor is Percentage Change in Real Farm Income (PC FM INC) from the economic aspect.

Factor Six (F_6). The sixth factor is Service Base. Variables that have significant loading with this factor are Percentage Change in Employees in Selected Services (PC EMP SS) from the economic aspect and Change in the Number of Firms Producing Oil and Gas (C OIL PROD) from the geographic aspect.

Factor Seven (F_7). The seventh factor is Trade Availability. The variable that has a significant loading with this factor is Distance to a Wholesale Shopping Center (DST W S C) from the geographic aspect.

Factor Eight (F_8). The eighth factor is Newspaper Circulation Change. The variable that has a significant loading with this factor is Change in Newspaper Circulation (C NWS CIRC) from the social aspect.

Factor Nine (F_9). The ninth factor is Higher Education Change. The variable that has a significant loading with this factor is Percentage Change in Enrollment in College (PC ENR COL) from the social aspect.

Factor Ten (F_{10}). The tenth factor is Non Oil-Gas Mineral Base. The variable that has a significant loading with this factor is Change in the Number of Firms Producing All Other Mineral Products (C OTHER MIN PROD) from the geographic aspect.

Factor Eleven (F_{11}). The eleventh factor is General Tax Load. The variable that has a significant loading with this factor is Percentage Change in Tax Levy for General Operations (PC TX LVY) from the social aspect.

Factor Twelve (F_{12}). The twelfth factor is Education Participation. Variables that have significant loadings with this factor are Change in Percentage of 16-17 Year Olds in School (CP 17 SCH) and Change in Percentage of 18-19 Year Olds in School (CP 19 SCH) from the social aspect.

Factor Thirteen (F_{13}). The thirteenth factor is Educational Tax Load. The variable that has significant loading with this factor is Change in the Total School Tax Levy (C SCH TX LVY) from the social aspect.

Factor Fourteen (F_{14}). The fourteenth factor is Industrial Location Success. The variable that has a significant loading with this factor is Number of New Manufacturers with 0-19 Employees (NEW MFG 19) from the social aspect.

Factor Fifteen (F_{15}). The fifteenth factor is Level of Living. The variable that has a significant loading with this factor is Percentage Change in Farm Operators Level of Living Index (PC F LOL I) from the social aspect.

Factor Sixteen (F_{16}). The sixteenth factor is Urbanization. The variable that has a significant loading with this factor is Change in the Number of People Living in Towns of 10,000 Population or More (C PP 10,000) from the social aspect.

Factor four, Manufacturing Base - Population Age contains three significant variables, of which one was correlated illogically with the other two. The Number of Employees in Manufacturing was correlated positively with Percentage Change in Population 65 Years or Older, and correlated negatively with Change in City Library Expenditures. Higher levels of development are generally associated with a large number of manufacturing employees, with an increase in library expenditure, and with a decrease in the 65 or older age group. Whatever way this factor is directed, one or more of the variables will have the opposite effect of what would be expected.

In this solution, the factor was directed so that the Change in Employees in Manufacturing has a negative effect on the final results. In effect, the cities that had the largest positive change in manufacturing employees were rated as if they had the largest negative change.

This solution was accepted and utilized because the number of factors in the solution would have had to have been increased until this particular variable loaded on another factor. The results would have more meaning accepted this way than if the number of factors was increased.

Factor Scores

The factor scores are produced from the factor matrix and the data matrix and provide a score for each factor for each community.[4] Each factor has a zero mean and unit variance, so each individual community score is in standard deviation terms of the factor variate (see Table 4).

The factor scores are the final result of the factor analysis solution and reflect the performance of the sixty-six communities in the thirty-seven variables studied. All sixty-six communities are ranked within each factor according to the community's performance in the variables that are significant for that factor. The community that had the largest positive score in a factor performed the best in that factor and the community that had the largest negative score in that factor performed the worst. Rankings for each community for each factor are shown in Table 5. This table is identical to Table 4 except the factor scores have been replaced by their corresponding rank.

The "D" column (Table 4) shows a weighted factor score sum for each community. The weights for each factor are the percentage of variance shown in the last row of Table 3. Factor one has a weight of 16.14, factor two has a weight of 6.51, and so on. The weighted factor score sum provides a ranking of the communities in terms of which community had the best overall performance for all sixteen factors. Each community's score is shown in Table 4 and its corresponding rank is shown in Table 5. Figure 3 shows a geographic distribution of the sixty-six communities according to this ranking. Topeka ranked the

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[4] See above, p. 20.

TABLE 4

FACTOR SCORES FOR EACH FACTOR FOR EACH COMMUNITY,
WEIGHTED FACTOR SCORE SUM

Community	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8	F_9	F_{10}	F_{11}	F_{12}	F_{13}	F_{14}	F_{15}	F_{16}	"D"
1. Abilene	-.06	.09	.16	.44	-.45	-.42	.43	.23	-.13	.84	.90	-1.01	.05	.53	-.12	-.55	2.40
2. Anthony	-.91	.25	-.26	1.06	-1.70	-.37	-1.37	1.01	-.53	.85	-.01	.89	1.43	-.53	-.02	1.33	-8.44
3. Arkansas City	.33	-1.58	.15	1.02	-.68	-.92	.10	-.11	-.23	-.14	-.04	-.92	-.99	-4.32	-2.45	-.70	-42.72
4. Atchison	.10	.86	1.98	1.29	-.66	-1.62	-.02	-.46	.11	1.58	-.94	-.19	.58	-1.71	.26	-.44	36.88
5. Augusta	-.57	-1.33	-.26	-.44	.34	.04	.88	.22	.05	-.45	-.11	-1.28	1.66	-.11	-1.58	-.15	-28.08
6. Baxter Springs	.59	-1.53	-.14	-.39	.67	3.04	1.11	-.32	.35	-.55	-.45	-.56	-.90	.08	1.47	-1.05	-10.72
7. Belleville	-.80	.30	.15	-.01	1.45	-.17	.63	.57	-.51	.50	-.24	2.30	-.63	.03	1.08	-.15	16.83
8. Beloit	-.32	-.09	.27	.15	.38	.38	-.12	-.28	-.18	.46	-.60	.88	-.60	-.26	.28	-.12	2.16
9. Chanute	-.41	-1.73	.88	-.01	-.52	-1.15	-1.09	-.21	.86	-.29	-.25	.41	-1.04	.64	-.41	.25	-18.86
10. Cherryvale	-.78	-2.31	-.70	.23	-.06	.68	-.24	.06	.08	.63	.34	-.99	-.88	-.17	.05	.56	-35.72
11. Clay Center	-.39	.62	1.15	-.25	1.67	.66	-.26	-.76	-.05	1.88	-.43	-.21	2.29	.15	-.96	-.19	25.50
12. Coffeyville	.63	-1.58	-.66	.11	.07	-1.18	.14	-1.06	-.31	1.18	-.04	-.48	-.01	-.29	.22	-.31	-15.69
13. Colby	.13	.43	-1.24	-1.20	-.81	.49	-1.69	.88	.79	-.27	.07	.90	.61	.11	-.44	-.49	-18.85
14. Columbus	-.66	.06	.05	.19	.17	.28	.71	.40	-.61	.96	-.22	-.87	-1.05	.60	2.16	-.22	1.02
15. Concordia	-.22	.54	.93	1.27	.38	-.20	.26	-.46	.94	2.78	-.57	1.44	-.85	-.31	.05	.14	35.82
16. Dodge City	1.21	1.29	-1.06	.79	1.73	-1.12	-.16	-.37	-.61	.77	-.33	-1.10	-1.19	-.84	.64	.39	14.07
17. El Dorado	.14	.90	.47	-.86	.35	-1.93	1.59	.34	.63	-.99	-.22	-.92	1.92	.10	.32	-1.01	7.76
18. Emporia	1.03	.42	.55	.71	1.31	-.26	-2.39	.21	.16	-.52	.35	-1.55	-.29	-.57	1.24	1.66	27.21
19. Eureka	-.66	.75	.59	.58	.72	-2.59	.23	.15	.27	.23	.05	-.79	-.59	-.12	.12	.08	-3.59
20. Fort Scott	-.14	-.06	.27	-.08	-.37	-.60	-.08	-.14	.11	-.96	6.61	.41	-.44	.60	.50	-.26	17.68
21. Fredonia	-.61	-.19	-.05	.44	-.70	-1.56	-.70	.33	-.72	.99	-.46	-.44	-.76	.16	.03	.28	-23.98
22. Galena	-1.02	-1.85	.30	.38	.62	1.47	.95	.40	.02	.02	-.11	-1.15	-1.43	.57	-.45	-.17	-19.66
23. Garden City	.80	1.55	-1.55	-.07	1.00	.40	-.19	-.44	.14	.85	.25	-.55	-1.01	.89	-1.45	.51	5.57
24. Garnett	-.62	.30	.67	.01	-.09	-.58	.69	.76	-.32	-1.70	.68	.13	-2.29	-.06	.18	-.90	-12.00
25. Goodland	-.12	.56	-1.38	-.39	.17	1.08	.19	-.29	-1.05	-.24	.56	1.40	-.59	.40	-.26	-.30	-10.10
26. Great Bend	.77	-.36	-.36	-.62	-.17	.08	.16	.68	6.58	.20	-.16	1.09	.17	.21	.35	-.36	33.62
27. Hays	.27	-.35	-1.59	.97	-.86	-.57	.33	.65	.01	-.44	-.40	3.00	.16	-.79	-.09	1.81	3.67
28. Herrington	-.17	-1.52	-.74	-.05	.23	-.25	-.41	.24	-.76	.87	-.02	-1.32	-.25	.18	-.10	.17	-28.84
29. Hiawatha	-.81	.71	1.05	1.88	-.28	.98	.22	.50	-.09	-.18	-.26	.89	-.52	-.29	-.03	.46	22.37
30. Hoisington	-.54	-1.83	-1.60	-.27	.31	.94	1.68	.14	-.06	-.18	-.16	-.40	.31	-.06	-1.42	.30	-35.75
31. Holton	-.88	.69	1.76	.44	.95	1.41	.32	-.03	.11	-2.06	-.26	.06	.96	.80	-.47	-.26	20.98
32. Hugoton	-.61	1.50	-2.02	-.68	-.86	.32	.11	.42	-.24	.11	.45	-.60	-.77	.04	-.96	.39	-37.02
33. Hutchinson	2.28	-.05	-.30	-.63	-.77	.17	-.37	-5.22	-.07	-.31	-.34	.88	.09	.35	-.39	-1.43	.80
34. Independence	.02	.00	-.49	-.02	-.31	.66	.03	-.11	.16	.02	.13	-.59	.17	-.52	4.24	-.54	7.10
35. Iola	-.25	-.18	1.49	.18	-.65	-1.32	-1.07	1.60	.54	-.37	.14	.10	-1.09	.30	.37	-1.06	2.47
36. Junction City	.34	.23	.23	-1.12	2.26	.84	1.75	.35	-.58	.54	-.15	.33	.32	-.38	.13	-.97	25.47
37. Kingman	-.72	.97	.37	.72	-1.40	.43	.36	-1.08	-.05	-1.02	-1.10	.96	.61	.24	.02	.49	-2.48
38. Larned	-.29	.54	-.72	2.16	.35	-.02	1.50	-.41	-.34	.15	.21	.22	.24	.97	-.21	.19	15.50
39. Lawrence	2.25	-.14	.88	-.38	.42	-.88	.91	-1.94	-.17	-1.17	-.14	-.42	-.02	1.28	.14	4.44	55.05
40. Leavenworth	.22	.52	1.49	-.41	-.77	2.11	.32	-1.11	-.32	1.26	3.34	.10	1.91	-1.94	-.21	.63	40.36
41. Liberal	-.31	1.74	-1.07	-.17	.97	.52	-.90	.04	2.93	.01	.07	-2.44	.02	-.57	-.36	.37	-9.52
42. Lindsborg	-.22	-1.03	-1.69	-.95	.82	-.61	1.01	.36	-.54	.24	-.11	-.54	1.58	-.19	2.04	.32	-18.03
43. Lyons	-.39	.28	.13	.24	-.64	-1.09	.19	-.18	.28	.88	.15	.36	1.09	.76	-.19	-.23	2.19
44. Manhattan	1.05	.03	.59	.41	2.05	.20	.41	1.49	-.05	.39	.41	.59	.02	.03	-1.08	.74	53.55
45. Marysville	-.49	.78	1.83	-.13	3.33	-.93	-1.23	-.11	-.49	-.40	.14	.74	-.96	.17	-1.05	-.74	18.81
46. McPherson	.70	.09	-.07	.07	-1.69	-.05	.62	-.30	-.05	1.05	.00	-.21	-.98	-.27	-.57	-1.41	-6.12
47. Medicine Lodge	-.86	.49	-.85	.88	-.36	.77	-.39	.97	-.34	-.77	-.01	1.16	.82	-.68	.59	.96	-3.84
48. Neodesha	-.36	-1.69	-.44	-.01	.18	-.57	-.09	-.29	.09	.34	.11	-.22	.89	-.11	-.15	.37	-20.66
49. Newton	.37	.86	.26	-.21	-.64	-1.51	1.18	-.04	-.09	-1.26	-.35	-1.59	.42	-.21	-.49	-.32	-8.55
50. Norton	.07	.14	-.30	-.61	.71	1.04	-4.37	-.40	-.82	-.39	-.48	-.27	.59	-.39	.73	-.86	-25.04
51. Olathe	-.14	.08	2.16	-5.78	-1.28	.16	.24	1.09	-.59	1.22	-.68	.46	-1.30	-1.19	.02	2.22	-7.24
52. Osawatomie	-.80	-.97	.62	.18	-.52	.33	-1.31	.50	-.39	-.43	-.49	-1.30	2.49	1.72	-.32	.93	-10.95
53. Ottawa	-.26	.83	1.52	-.51	-.80	.40	1.11	-.08	-.26	-2.07	-.83	-.50	-.32	1.89	-.15	.67	6.33
54. Paola	-.89	.42	1.02	1.13	-1.98	.29	.12	.95	-.42	.63	-.24	-.85	.30	1.71	-.49	.52	4.54
55. Parsons	.20	-1.22	.50	.77	-1.03	.71	.90	-.85	.46	-1.32	-.54	-.16	-.30	.39	.16	-.47	-11.18
56. Phillipsburg	-.21	-.42	-.82	-.79	.67	.32	-1.54	.09	-.79	-1.54	-.20	1.14	-.45	.18	.03	-.74	-28.83
57. Pittsburg	.53	-1.26	1.32	.35	-.73	-.09	-.53	-1.15	.29	1.29	-.15	.47	-1.59	2.10	-.06	.08	17.80
58. Plainville	-.55	-1.84	-.72	-.50	1.06	-.90	-.95	-.14	-.14	-1.51	-.10	1.45	.67	-.06	-1.05	.19	-35.11
59. Pratt	-.17	1.01	-.65	-.20	-.14	.14	.47	-.34	-.36	-.35	-.54	-.52	-.22	-.25	.43	-.11	-16.16
60. Russell	-.49	-.02	-.52	-.26	.64	-1.03	.91	-.10	.12	.20	-.29	2.07	.81	.26	-.06	.12	2.57
61. Salina	1.28	.21	-.13	-1.09	-.95	-1.36	.35	1.12	-1.11	1.25	-.16	.38	1.67	1.06	-.29	-3.63	1.86
62. Scott City	-.40	1.16	-1.48	-.36	.07	.66	-.57	-.23	-.34	.31	-.06	.81	-1.02	.38	-.79	-.18	-16.12
63. Topeka	5.80	-.42	.15	1.02	-.42	1.47	-.29	3.30	-.79	-.67	-.26	.15	-.14	.26	-.12	-.12	109.86
64. Ulysses	.60	2.27	-1.97	-.74	-1.28	.80	.40	.09	-.22	-.02	-.23	-1.15	-.99	.85	-1.51	.42	-41.33
65. Wellington	-.34	.83	.64	.15	-.65	-.37	-.67	-.45	.05	-2.69	-.75	-.03	.12	-3.30	.10	-.44	-20.54
66. Winfield	.14	.28	-.76	.02	-.87	-1.29	-.65	-.69	-.40	-.21	-.48	-.08	.55	-.51	2.79	.20	-6.07

TABLE 5

COMMUNITY RANK, BY FACTORS, AND
WEIGHTED FACTOR SCORE SUM

Community	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8	F_9	F_{10}	F_{11}	F_{12}	F_{13}	F_{14}	F_{15}	F_{16}	"D"
1. Abilene	27	35	29	16	41	44	19	24	34	16	3	57	31	16	37	54	27
2. Anthony	65	31	39	6	66	42	62	6	54	14	21	12	8	56	31	5	39
3. Arkansas City	17	59	30	7	49	52	37	37	39	36	24	54	55	66	66	55	66
4. Atchison	24	10	2	3	48	64	39	56	17	3	65	35	19	63	17	50	5
5. Augusta	51	56	40	52	24	34	13	25	22	50	28	61	6	40	65	36	58
6. Baxter Springs	13	58	38	49	15	1	6	49	9	52	53	48	52	33	5	62	43
7. Belleville	60	27	31	33	6	38	16	13	53	21	41	2	47	35	7	37	16
8. Beloit	40	44	25	27	20	23	42	45	37	22	61	15	46	47	16	35	29
9. Chanute	46	62	13	34	42	57	59	43	4	42	43	21	59	12	49	24	52
10. Cherryvale	58	66	49	23	32	14	45	31	21	18	9	56	51	43	26	11	62
11. Clay Center	43	18	9	44	5	15	46	59	26	2	52	36	2	30	57	40	9
12. Coffeyville	11	60	48	29	30	58	34	61	42	8	25	43	33	49	18	46	47
13. Colby	23	24	58	65	55	19	64	9	5	41	18	11	16	31	50	52	51
14. Columbus	55	38	34	24	28	28	14	17	58	11	39	53	60	13	3	41	31
15. Concordia	35	20	12	4	21	39	27	57	3	1	60	5	50	51	25	29	6
16. Dodge City	5	5	56	11	4	56	43	51	59	17	48	58	62	61	9	17	18
17. El Dorado	22	9	22	61	22	65	3	21	6	56	38	55	3	32	15	60	19
18. Emporia	7	25	20	14	7	41	65	26	13	51	8	64	38	57	6	4	8
19. Eureka	56	15	18	15	13	66	29	27	12	27	19	51	44	42	23	31	34
20. Fort Scott	30	43	26	39	39	48	40	40	18	55	1	22	41	14	11	44	15
21. Fredonia	52	47	35	17	50	63	55	22	60	10	54	42	48	29	27	23	56
22. Galena	66	65	24	20	18	3	9	18	24	32	29	59	64	15	51	38	53
23. Garden City	8	3	61	38	9	21	44	54	15	15	10	47	57	8	63	13	22
24. Garnett	54	28	15	32	33	47	15	10	43	63	4	28	66	37	19	59	46
25. Goodland	28	19	59	50	29	6	31	46	65	40	5	6	45	17	44	45	42
26. Great Bend	9	49	43	56	35	33	33	11	1	28	34	9	26	25	14	48	7
27. Hays	18	48	62	9	56	45	24	12	25	49	51	1	28	60	35	3	24
28. Herington	31	57	52	37	26	40	50	23	61	13	23	63	37	27	36	28	60
29. Hiawatha	61	16	10	2	36	8	30	14	32	37	44	13	43	50	32	15	11
30. Hoisington	49	63	63	46	25	9	2	28	30	38	35	40	23	38	62	22	63
31. Holton	63	17	4	18	11	5	25	33	19	64	45	31	10	10	52	43	12
32. Hugoton	53	4	66	58	57	25	36	16	40	31	6	50	49	34	58	18	64
33. Hutchison	2	42	41	57	52	30	48	66	31	43	49	14	30	20	48	65	32
34. Independence	26	40	45	36	37	16	38	38	14	33	15	49	27	55	1	53	20
35. Iola	36	46	6	25	46	60	58	2	7	45	13	29	61	21	13	63	26
36. Junction City	16	32	28	64	2	10	1	20	56	20	33	25	22	52	22	61	10
37. Kingman	57	8	23	13	63	20	22	62	27	57	66	10	17	24	30	14	33
38. Larned	38	21	50	1	23	35	4	53	45	30	11	26	25	7	42	26	17
39. Lawrence	3	45	14	48	19	50	10	65	36	58	31	41	34	5	21	1	2
40. Leavenworth	19	22	7	51	53	2	26	63	44	5	2	30	4	64	43	10	4
41. Liberal	39	2	57	41	10	18	56	32	2	34	17	66	32	58	47	19	41
42. Lindsborg	34	53	64	62	12	49	8	19	55	26	30	46	7	44	4	21	50
43. Lyons	44	29	33	22	44	55	32	42	11	12	12	24	9	11	41	42	28
44. Manhattan	6	39	19	19	3	29	20	3	28	23	7	18	11	36	61	8	3
45. Marysville	47	14	3	40	1	53	60	39	52	47	14	17	53	28	59	57	13
46. McPherson	10	36	36	30	64	36	17	48	29	9	20	37	54	48	55	64	37
47. Medicene Lodge	62	23	55	10	38	12	49	7	47	54	22	7	13	59	10	6	35
48. Neodesha	42	61	44	35	27	46	41	47	20	24	16	38	12	41	39	20	55
49. Newton	15	11	27	43	45	62	5	34	33	59	50	65	21	45	53	47	40
50. Norton	25	34	42	55	14	7	66	52	64	46	55	39	18	53	8	58	57
51. Olathe	29	37	1	66	61	31	28	5	57	7	62	20	63	62	29	2	38
52. Osawatomie	59	52	17	26	43	24	61	15	49	48	57	62	1	3	46	7	44
53. Ottawa	37	12	5	54	54	22	7	35	41	65	64	44	40	2	40	9	21
54. Paola	64	26	11	5	65	27	35	8	51	19	42	52	24	4	54	12	23
55. Parsons	20	54	21	12	60	13	12	60	8	60	58	34	39	18	20	51	45
56. Phillipsburg	33	50	54	60	16	26	63	29	62	62	37	8	42	26	28	56	59
57. Pittsburg	14	55	8	21	51	37	51	64	10	4	32	19	65	1	33	32	14
58. Plainville	50	64	51	53	8	51	57	41	35	61	27	4	15	39	60	27	61
59. Pratt	32	7	47	42	34	32	18	50	48	44	59	45	36	46	12	33	49
60. Russell	48	41	46	45	17	54	11	36	16	29	47	3	14	23	34	30	25
61. Salina	4	33	37	63	59	61	23	4	66	6	36	23	5	6	45	66	30
62. Scott City	45	6	60	47	31	17	52	44	46	25	26	16	58	19	56	39	48
63. Topeka	1	51	32	8	40	4	47	1	63	53	46	27	35	22	38	34	1
64. Ulysses	12	1	65	59	62	11	21	30	38	35	40	60	56	9	64	16	65
65. Wellington	41	13	16	28	47	43	54	55	23	66	63	32	29	65	24	49	54
66. Winfield	21	30	53	31	58	59	53	58	50	39	56	33	20	54	2	25	36

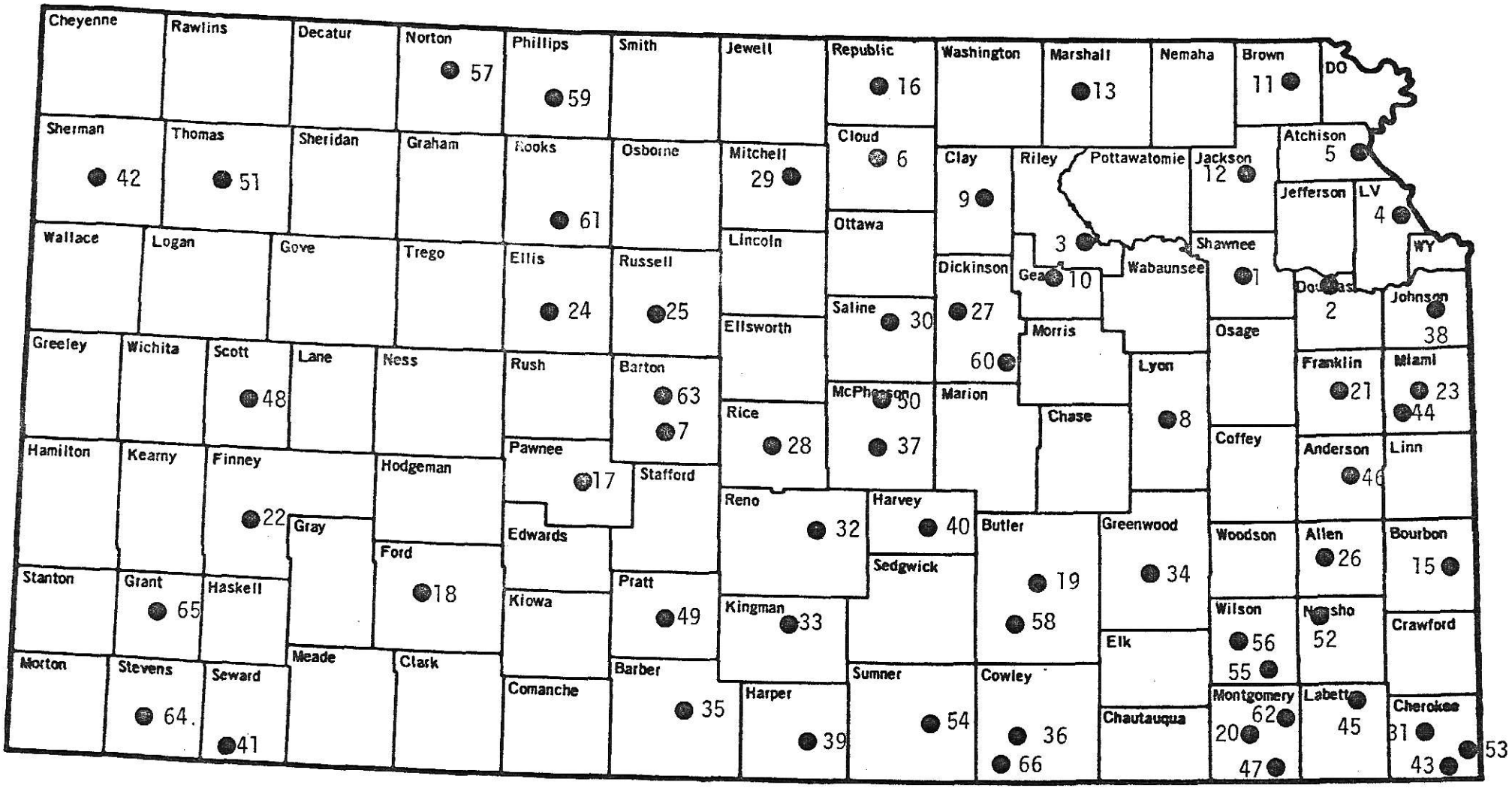

Fig. 3. -- A geographic distribution of the sixty-six communities, ranked from highest to lowest by weighted factor score sums.

highest so it is represented on the map by the number 1. Arkansas City ranked the lowest and is represented by the number 66.

Selected Community Structures. Figure 4 shows the factor structure of the three highest ranking communities, as ranked by the weighted factor score sum. Topeka has two outstanding factors which account for its high ranking. Factor one -- Urban Position --, which is the most heavily weighted factor, for Topeka is almost six standard deviations above the mean and factor eight -- Newspaper Circulation Change -- for Topeka is over three standard deviations above the mean. Although nine factors have negative scores, none are over one standard deviation below the mean. Lawrence is also characterized by having two factors which are quite high, but has two factors which are more than one standard deviation below the mean. Manhattan exhibits a very evenly balanced community structure. All but two factors are above the mean and of those two one is almost negligible.

Figure 5 shows the three lowest ranking communities. Each of these communities has a factor structure that is primarily negative. Arkansas City ranks above the mean in only four factors, of which only one -- Manufacturing Base - Population Structure -- has much significance. By contrast, factor fourteen -- Industrial Location Success -- is more than four standard deviations below the mean. Ulysses has ten negative factors, of which four are more than one standard deviation below the mean. As might be expected, the highest factor is factor two -- Agricultural Linkage -- with a score of 2.3. Surprisingly though, factor five -- Agricultural Base -- has a score of -1.3. Hugoton also has a

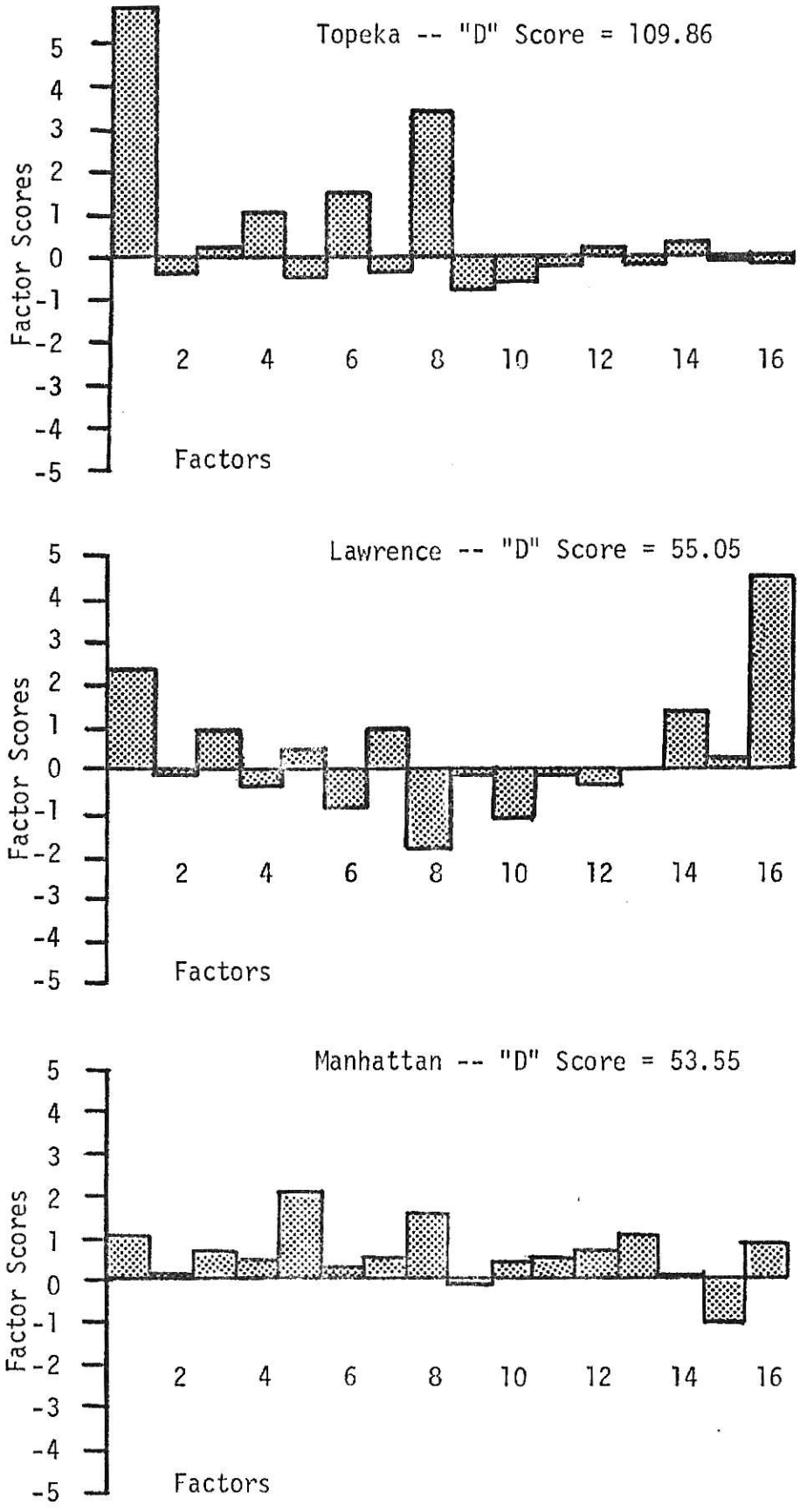

Fig. 4.-- Selected Community Structures.

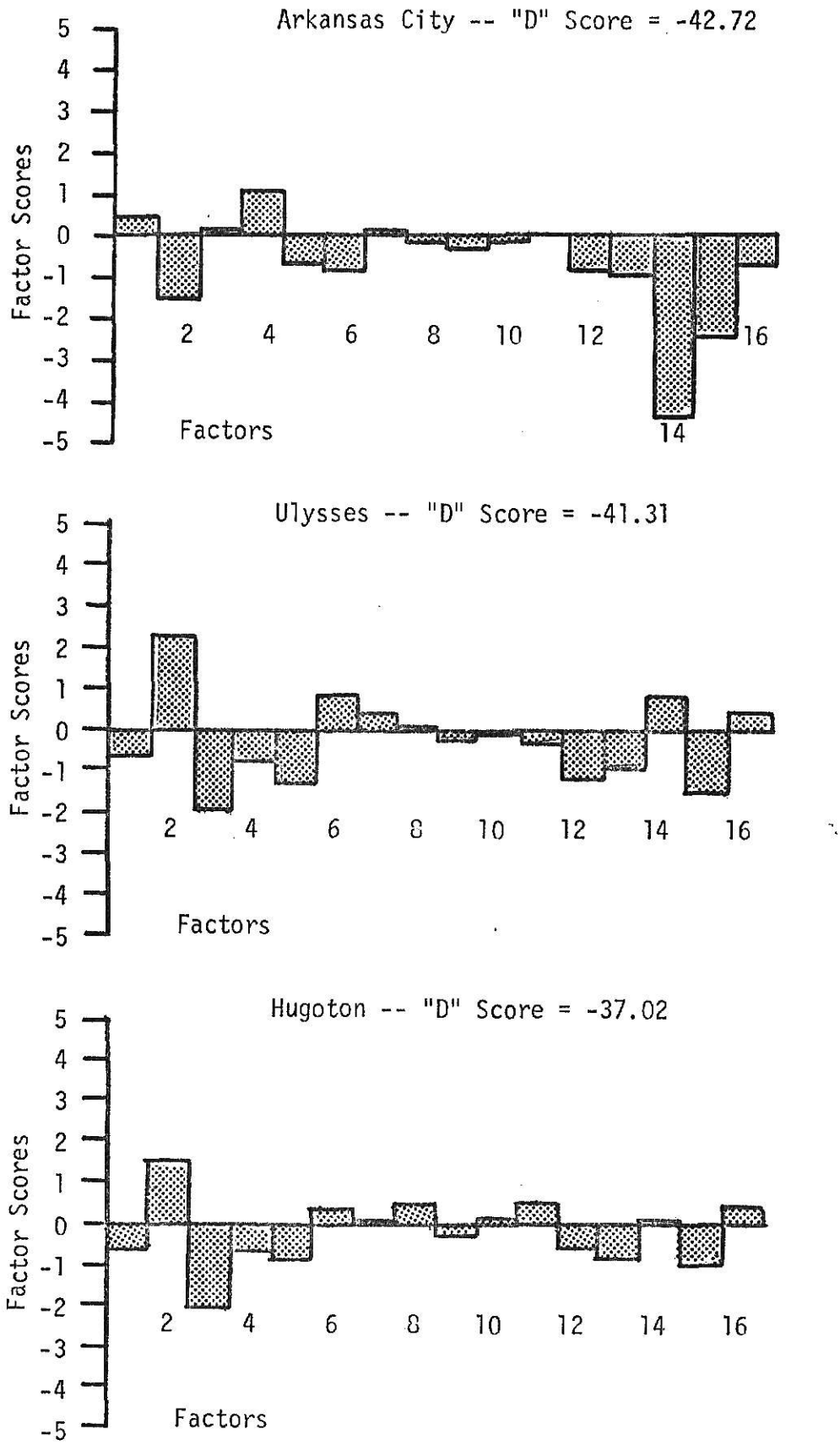

Fig. 5.-- Selected Community Structures.

high score in factor two, but all other positive scores are considerably less than one standard deviation above the mean.

Regression Analysis

Two multiple regressions were run using the raw factor scores of the sixteen factors as independent variables. The analysis was done once with Percentage Change in Per Capita Income (1960-1970) as the dependent variable and again with Percentage Change in City Population (1960-1970) as the dependent variable.

These two dependent variables are considered indicators of community development. Per capita income reflects an individual's state or welfare and whether or not he is able to satisfy his wants and needs more competely. In this sense, per capita income changes reflect private betterment or loss. Income increases can be important in increasing consumer demand which can stimulate private goods and services produced and sold within the community. Much of the effect of an increase in per capita income on a community depends upon the consumption habits of the citizens of that community.

Changes in population most generally reflect public improvement or betterment. More people provide economic support for public and private services and institutions. Sparsely populated areas and relatively small cities, such as in Kansas, for the most part do not suffer from the social problems that are characteristic of large metropolitan areas. Because of this need for numbers of people and an absence of large metropolitan areas, population increases are often development goals.

These two variables were regressed on the sixteen factor scores for each community to determine which of the two was explained more

completely by the factor analysis results. A multiple variable independent regression model of the following form was used.

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots + \beta_k X_{ki} + e_i,$$

The assumptions underlying this model are:

$E(e_i) = 0$,

$E(e_i^2) = \sigma^2$,

$E(e_i e_j) = 0$, $i \neq j$,

e_i's are independent,

β's are unknown,

X's are known.

The complete regression results for both dependent variables are presented in Table 6.

The R^2 for the regression with Percentage Change in Per Capita Income as the dependent variable was .2438. This R^2 indicates that the sixteen factors explained very little of the changes in per capita income. Only one factor -- F_5, Agricultural Base -- had a significant "t" value.[5] With a unit change in any of the factor scores, all others being held constant, the percentage increase or decrease in the dependent variable would be equal to the magnitude of the coefficient for that factor. The factors are measured in standard deviation units, so in the regression with population change as the dependent variable, a one deviation increase in Agricultural Base (F_5) would cause a 6.057 percent increase in the per capita income. All of the other regression coefficients can be interpreted in the same manner.

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[5] A significant "t" value would be greater (absolute value) than 2.011 at the 5% level.

TABLE 6

COMPLETE REGRESSION RESULTS

Dependent Variable, Percentage Change in Per Capita Income

Variable (Factor) No.	Regression Coefficients	Std. Error of Reg. Coff.	Computed "t" Value
1	3.0979	2.8025	1.1054
2	3.6646	2.8026	1.3076
3	1.9863	2.8025	.7089
4	- .1030	2.8026	- .0367
5	6.0569	2.8026	2.1612
6	2.6128	2.8027	.9323
7	1.6867	2.8027	.6018
8	1.1877	2.8027	.4238
9	-2.4059	2.8026	- .8585
10	.3546	2.8027	.1265
11	2.5898	2.8027	.9240
12	3.3858	2.8027	1.2081
13	.2726	2.8026	.0973
14	-1.1377	2.8026	- .4059
15	-1.3575	2.8027	- .4844
16	4.6936	2.8027	1.6749

Dependent Variable, Percentage Change in Population

Variable (Factor) No.	Regression Coefficients	Std. Error of Reg. Coff.	Computed "t" Value
1	3.6570	1.1178	3.2715
2	3.5071	1.1179	3.1372
3	1.6178	1.1179	1.4473
4	-6.1194	1.1179	-5.4741
5	- .4654	1.1179	- .4163
6	2.3889	1.1179	2.1369
7	- .0262	1.1179	- .0234
8	.0246	1.1179	.0220
9	-1.0533	1.1179	- .9422
10	1.4244	1.1179	1.2742
11	- .1279	1.1179	- .1160
12	.1550	1.1179	1.3865
13	-2.5084	1.1179	-2.2438
14	- .0234	1.1179	- .0209
15	- .2356	1.1179	- .2107
16	7.0042	1.1179	6.2653

The R^2 for the regression with Percentage Change in Population as the dependent variable was .6841. This indicates that the sixteen factors explained 68 percent of the variation in population changes. Six of the factors; Urban Position (F_1), Agricultural Linkage (F_2), Manufacturing Base - Population Structure (F_4), Service Base (F_6), Educational Tax Load (F_{13}), and Urbanization (F_{16}), had significant "t" values in this regression. Again, the coefficients can be interpreted in the manner described above. A one deviation increase in Urban Position (F_1) would cause a 3.657 percent increase in city population.

Comparison

A direct comparison between the results of this 1960-1970 study and Johnson's 1950-1960 study was not possible because this study utilized a sixteen factor solution rather than a twelve factor solution. The reasons for utilizing the sixteen factor solution have been discussed in a previous section.[7]

A weighted factor score sum was constructed from Johnson's results and this can be directly compared with the weighted sum found in Table 4. The twelve factors in Johnson's study explained 83.46% of the total variation in the rotated factor loading matrix.[8] The ranking that is provided by this weighted sum indicates where the communities are in relation to each other in total development. The comparison between the 1970 ranking identified by this study and the 1960 ranking identified by Johnson's study will determine whether or not a community has progressed or declined in the past decade (See Tables 7 and 8).

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[7]See above, p. 22.

[8]See Johnson, "Short Run Determinants," p. 60.

TABLE 7

WEIGHTED FACTOR SCORE SUMS
FOR THE TOTAL DATA SET, 1960-1970

Community	Factor Sum	Community	Factor Sum
1. Topeka	109.86	34. Eureka	-3.59
2. Lawrence	55.05	35. Medicine Lodge	-3.84
3. Manhattan	53.55	36. Winfield	-6.07
4. Leavenworth	40.36	37. McPherson	-6.12
5. Atchison	36.88	38. Olathe	-7.24
6. Concordia	35.82	39. Anthony	-8.44
7. Great Bend	33.62	40. Newton	-8.55
8. Emporia	27.21	41. Liberal	-9.52
9. Clay Center	25.50	42. Goodland	-10.10
10. Junction City	25.48	43. Baxter Springs	-10.72
11. Hiawatha	22.37	44. Osawatomie	-10.95
12. Holton	20.98	45. Parsons	-11.18
13. Marysville	18.81	46. Garnett	-12.00
14. Pittsburg	17.80	47. Coffeyville	-15.69
15. Fort Scott	17.68	48. Scott City	-16.12
16. Belleville	16.83	49. Pratt	-16.16
17. Larned	15.50	50. Lindsborg	-18.02
18. Dodge City	14.07	51. Colby	-18.85
19. El Dorado	7.76	52. Chanute	-18.86
20. Independence	7.10	53. Galena	-19.66
21. Ottawa	6.33	54. Wellington	-20.54
22. Garden City	5.57	55. Neodesha	-20.66
23. Paola	4.54	56. Fredonia	-23.98
24. Hays	3.67	57. Norton	-25.04
25. Russell	2.57	58. Augusta	-28.08
26. Iola	2.47	59. Phillipsburg	-28.83
27. Abilene	2.40	60. Herington	-28.84
28. Lyons	2.19	61. Plainville	-35.11
29. Beloit	2.16	62. Cherryvale	-35.72
30. Salina	1.82	63. Hoisington	-35.75
31. Columbus	1.02	64. Hugoton	-37.02
32. Hutchinson	.80	65. Ulysses	-41.33
33. Kingman	-2.48	66. Arkansas City	-42.72

Communities were ranked from highest to the lowest by the weighted factor score sums.

Factor scores were taken from Table 4, page 31. Weights for each factor were taken from the bottom row of Table 3, page 25.

TABLE 8

WEIGHTED FACTOR SCORE SUMS
FOR THE TOTAL DATA SET*, 1950-1960

Community	Factor Sum	Community	Factor Sum
1. Wellington	100.65	34. Atchison	-3.65
2. Hutchinson	57.53	35. Salina	-3.85
3. Garden City	56.63	36. Liberal	-6.22
4. Scott City	53.53	37. Parsons	-6.43
5. Marysville	49.42	38. Independence	-8.21
6. Dodge City	46.48	39. Russell	-9.36
7. Osawatomie	45.12	40. Abilene	-10.28
8. Lawrence	32.96	41. Eureka	-10.28
9. Leavenworth	25.77	42. Chanute	-10.76
10. Lyons	23.87	43. Arkansas City	-10.94
11. Hays	21.90	44. Junction City	-11.14
12. Topeka	20.94	45. Manhattan	-11.17
13. Winfield	20.26	46. Phillipsburg	-11.26
14. Emporia	17.14	47. Garnett	-12.77
15. Great Bend	16.15	48. Clay Center	-13.34
16. Neodesha	14.82	49. Fredonia	-15.35
17. Iola	14.79	50. Hiawatha	-16.32
18. Kingman	13.70	51. Larned	-16.86
19. Colby	9.78	52. Beloit	-18.24
20. Norton	8.16	53. Council Grove	-18.44
21. Belleville	8.02	54. Columbus	-21.82
22. Hugoton	7.64	55. Augusta	-25.67
23. Paola	7.54	56. Ottawa	-31.82
24. Concordia	5.87	57. Hoisington	-32.14
25. El Dorado	4.39	58. Ellinwood	-36.28
26. Fort Scott	4.12	59. Coffeyville	-36.33
27. McPherson	1.82	60. Herington	-36.48
28. Goodland	1.24	61. Galena	-38.66
29. Anthony	-.17	62. Baxter Springs	-39.63
30. Holton	-.28	63. Newton	-40.65
31. Pratt	-1.33	64. Cherryvale	-40.82
32. Olathe	-2.87	65. Caney	-62.91
33. Pittsburg	-3.82		

Communities were ranked from highest to the lowest by the weighted factor score sums.

For these data, see Johnson, "Short Run Determinants". Factor scores were taken from Table 3, page 66. Weights for each factor were taken from the bottom row of Table 2, page 60.

*This data set differs from the 1960-1970 data set in that three of the above communities were excluded, and four communities were added.

It should be remembered that the scores for each community indicate relative and not absolute levels. In a comparative analysis between this study and Johnson's study, a community may have a lower summed score because of an absolute decline in the thirty-seven variables, or because other communities increased relatively more in the thirty-seven variables. The actual reason for a lower or higher score can not be detected from this analysis.

Topeka ranked the highest in the 1960-1970 study with a score of 109.86, whereas it only ranked twelfth in the 1950-1960 study with a score of 20.94. A look at the individual factors for each time period shows that seven of the sixteen factors were positive in the 1960-1970 study and only four of the twelve factors were positive in the 1950-1960 study.[9] This shows that Topeka's community structure has improved over the last decade, in comparison to all the other communities studied.

Arkansas City ranked the lowest in the 1960-1970 with a score of -42.72 and had negative scores for eleven of the sixteen factors, whereas it ranked forty-third in the 1950-1960 study with six of the twelve factors being negative. This shows that Arkansas City's community structure has declined over the last decade.

The structure and factor results for each community for each study can be compared to determine if the community has improved or declined in relation to the other communities studied. Individual factors can not be compared directly because the structures are different for this

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[9]For data on individual factor scores, see Ibid., p. 66, and above, pp. 31, 32.

study than for Johnson's study, but whether or not the community's relative position and overall structure has improved can easily be determined.

CHAPTER IV

CONCLUSIONS

Methodology

Factor Analysis

Factor analysis techniques allow a large amount of data to be aggregated into a lesser number of factors which facilitates interpretation and evaluation of results. This is a desirable technique with respect to development studies because of the large number of variables needed to fully analyze important community characteristics. Factor analysis determines correlations among the variables and groups the factors according to these correlations. This technique is quite flexible and could be utilized with different variables and different geographic study areas.

The use of factor analysis and secondary data has provided detailed analysis of sixty-six communities in Kansas. Not only does this technique provide individual community analysis, but also allows comparisons for each factor to be made between all of the communities studied. A case study approach would provide a more detailed and thorough analysis of individual communities, but would not be able to provide a comparative analysis of a large number of communities for a comparable cost. A community does not exist in isolation, but is influenced by and competes with other communities, areas, and states for available resources. The comparative study is quite valuable in this respect.

The factor scores allow easy evaluation of community performance in the variables studied as reflected by the factor groupings and provide rankings for comparison of performance between communities. Each factor has a zero mean and unit variance, so a positive score indicates above average performance and a negative score indicates below average performance

The number of factors derived can be specified by the investigator to suit the needs of the problem.[1] As the number of factors is increased, a greater percentage of the total variance is explained, but each factor explains less of the total. Thus the larger the number of factors used the less significant each factor will be.[2] Too few factors used would result in less of the total variance being explained. A nine factor solution of the thirty-seven variables explained 72.43 percent of the total variance whereas a thirty-seven factor solution explained 99.999 percent of the total variance.[3]

Each variable is explained linearly in this study in terms of sixteen factors. The communality (H^2) shows how much of the variation in the variable is explained by the sixteen factors. Thus each variable can be analyzed to determine how well it is explained, with respect to all other variables. As the number of factors is increased, the communality of a variable will approach one.

The factor loadings for each variable show which factors explain a significant portion of that variable. Only one high loading means that

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[1] See above, p. 20.

[2] If, as the number of factors is increased, the composition of individual factors remains the same, these factors will explain the same percentage of the total variation as they did before.

[3] See Appendix A.

one factor explained most of the variation, whereas two or more loadings of almost equal magnitude mean that two or more factors jointly explain most of the variation. In the latter situation the variable would be omitted from the explanation of any of any one factor because it explained more than one.[3]

Limitations. The factor analysis technique involves some operational difficulties that should be recognized. The factors are constructed from correlations among the variables which are determined from the data matrix. These original correlations are critical to the success of the analysis and for logical interpretation of the factors.

Variables that strongly correlate with each other are loaded on the same factor. Negative correlations in the original data will produce negatively correlated variables in the factor structure. As the number of factors in the analysis is increased, fewer variables will be loaded on each factor.[4] Increasing the number of factors may enable the investigator to work around the problem of illogical correlations, because troublesome variables might be loaded seperately on different factors.

Caution should be exercised in deciding how many factors to add to the analysis. Increasing the number of factors decreases the significance of each factor and also makes interpretation and description of factor results difficult.

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[3]For example, Number of New Manufacturers with 20-99 Employees (NEW MFG 99) was not included in the explanation of any of the factors. This variable had a loading of .39 on F_3, - .40 on F_8, and - .46 on F_{10}. See Table 3, above, p. 25.

[4]See Appendix A.

Recognizing that individual factors can be reflected if the signs do not conform to the original data is important to the success of any factor analysis study. Determination of the direction of the factor signs is relatively easy unless variables within individual factors have illogical correlations.

The descriptive names that have been given the factors were derived from the variables that had significant loadings on that factor. These names were arbitrarily chosen by the author and as such may be disagreed with. All of the information that was utilized by the author in selecting these names is presented in Table 3.

Additional Research

The factor analysis technique is well suited to analysis of community, area, or state development characteristics. This particular study analyzed small community development, but the methods could be applied to different studies involving other geographic and economic units. Whatever the variables or study units analyzed, the technique will provide the same type of comparative results.

Essentially the same study has now been made over the 1950-1960 period and the 1960-1970 period. Ideally the study would be continued at intervals sufficient to allow for data availability and community change. These studies would provide development leaders with current information about community strengths and weaknesses.

As with any study involving many variables, questions could be raised about which variables should be excluded or included. The variable structure should be evaluated to determine if some present variables

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[5] See above, p. 23 and Appendix A.

should be excluded in future studies and new and more relevant variables included. A community's economic and social structure will change over time and some variables may become outdated or irrelevant.

Community Structure

Each community's structure is defined by the sixteen factors and the weighted factor score sum. Individual communities are placed on a continuum for each factor, and their position, or rank, on this continuum determines their performance in relation to all other communities studied.

The weighted factor sum is an aggregate ranking of all sixteen factors for each community. By weighting each factor, rather than simply summing the factor scores, highly significant factors are allowed to add more to the total than less significant factors. A simple algebraic sum would weight each factor equally.

This weighted sum could be of more importance to area and state development leaders than it is to individual communities. All factors are not of equal importance to a community. A factor that is highly important to one community's development may not be nearly as important to another community, so the individual factor scores might give more meaningful results. On an area or state level this sum could illustrate disadvantaged areas, and when compared to the weighted sum for the 1950-1960 study could show which communities have progressed or declined in the past decade.

Results indicate that size, while certainly important, is not the sole determining factor in a community's development. If size alone was important, the larger cities would all have been ranked high in terms of the weighted sum. This then suggests that individual communities

do have some control over their future development. Community leaders should analyze their respective communities to determine the strengths and weaknesses as measured by the factor scores. Factors relevant to their particular area and to their particular community resources should be stressed and programs implemented to improve community weaknesses and take advantage of community strengths.

Development goals should be determined for each community and the community structure analyzed with these goals in mind. As there are many development objectives and these may vary greatly with individual communities, the factor structure should have unique implications for each community.[6]

The concept of a functionally integrated area consisting of a central city and a hinterland becomes important in relation to small community development possibilities. Factor one -- Urban Position -- is essentially a measure of commercial strength and correlates highly with city size. The significant factors that comprise this factor are all measurements on the city of interest alone.[7] Cities of small size that rank high in other factors do so primarily because of measurements on the total community area. This would suggest that smaller communities should be able to promote more effective development efforts on a multicounty or area basis. Often small communities in isolation do not have the resources or are not able to attract the resources needed to survive and grow. Multicounty or area cooperation could provide small communities with the needed economic, social, and geographic resources.

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[6]For an analysis of two possible development objectives, see above, p. 37.

[7]See above, p. 12 and p. 26.

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APPENDIXES

APPENDIX A

FACTORIZATIONS AND METHODOLOGICAL PROBLEMS

Alternative Factorizations

Four different factorizations were derived during this study; a nine factor solution, a twelve factor solution, a sixteen factor solution, and a thirty-seven factor solution. The nine factor matrix is presented in Table A-2, the twelve factor matrix is presented in Table A-1, and the sixteen factor matrix is presented above in Table 3. The thirty-seven factor matrix is not presented here because of the obvious difficulties associated with presenting a matrix that large.

The thirty-seven factor solution had twenty-seven factors that had significant loadings. The first factor had five significant loadings, the second had two significant loadings, and the third had four significant loadings. All other factors had only one significant loading, except for ten factors, which had none. A solution with this many factors is unweildy to work with, difficult to present understandably, and is relatively meaningless in terms of factor significance.

Factor Signs

The procedure followed in this study to determine whether or not a factor needed reflecting was to closely analyze each variable and determine whether or not increases in this variable would lead to a higher level, or state of development within a community. If this

occurred the variable was said to be correlated positively with development. If not, it was said to be correlated negatively. For example, increases in variable one -- Change in Retail Sales -- would be positively correlated. By contrast, increases in variable twenty-one -- Percentage Change in the Median Age of the Population -- would be negatively correlated. An increasing median age generally represents declining areas because the youth have been moving away.

The next step is to look at the rotated factor loading matrix and select the significant loadings (see F_3, Table A-1) for each factor. If the signs on these significant loadings are opposite those established for the variables the loadings represent, the factor should be reflected. If the signs are the same, the factor is correct.

Another method is to compare the factor scores with the raw data. The highest and lowest scores for a factor are selected and the communities that these scores represent are selected. Those particular communities' raw data values for the variables that are significant for the factor in question are compared to the factor scores. If high values in the raw data correspond to high factor scores the factor is generally correct. This method is much more difficult because more than one community has to be compared. This method is also more susceptible to error.

Each factor will have to be analyzed by one of the above methods to determine if the signs are correct or not.

TABLE A-1

TWELVE FACTOR ROTATED FACTOR LOADING MATRIX

	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8	F_9	F_{10}	F_{11}	F_{12}	H^2
Economic													
C RET S	.94	-.00	-.15	.02	.05	.10	.05	.04	.01	.11	-.05	-.01	.933
C REC SS	.88	-.08	-.02	.01	-.03	.03	.20	.13	-.15	-.01	.03	.07	.871
PC FM INC	.03	.23	.21	-.17	.31	.38	-.22	.19	.05	.18	.08	.48	.722
C VAL F&L P S	.06	.72	.12	-.07	-.20	.26	-.04	.07	-.04	.14	.10	.37	.833
C EMP MFG	.18	-.14	-.54	.67	.06	.13	.06	-.07	.09	-.04	.00	-.14	.846
C EMP R T	.84	-.03	-.22	.07	.15	.17	.17	-.09	.01	.22	-.03	-.00	.891
PC EMP SS	.35	-.14	.11	.06	.02	.08	.73	.01	-.10	-.01	-.17	-.08	.751
C GOV INC DSB	.33	.07	**-.63**	.45	-.06	-.11	.21	-.09	.25	.03	.00	.05	.847
CO SEAT	.17	.75	-.18	.07	.09	-.16	.02	.03	-.01	-.16	.04	.30	.787
Social													
C P 10,000	.52	.07	-.34	.30	.17	.16	.23	.06	.22	.34	.04	.07	.755
C NWS CIRC	.25	.02	-.05	-.03	-.06	-.12	-.09	.83	-.18	.09	.19	-.07	.858
YRS RADIO	.91	.04	.00	-.04	-.01	.08	-.08	.02	-.03	-.06	-.03	.06	.846
C LIB EX	.16	.07	.03	-.77	-.08	-.22	.06	.07	.10	-.04	.17	.26	.798
C SCH UN	-.24	.00	**.78**	.04	.16	.01	.14	.10	.06	.06	.02	-.38	.874
AV C R F PP	-.18	-.10	**.81**	-.00	.25	.03	.17	.04	.03	.01	.02	-.20	.831
PC F LOL I	-.04	-.05	.04	.02	.85	-.08	-.00	-.08	-.07	-.01	-.03	-.17	.765
CP 17 SCH	.04	.07	-.04	-.04	-.10	.07	-.06	.03	.02	.03	-.19	.85	.789
CP 19 SCH	-.06	.29	.11	-.18	-.13	-.01	.01	-.08	-.19	.11	.11	.73	.749
PC ENR COL	.09	.09	.13	.14	.06	.00	.14	.11	-.83	-.03	.06	.10	.793
PC PP 65	.15	.12	.31	.79	-.10	-.08	.07	.09	-.17	.04	.21	.04	.857
PC MED AGE	.01	.13	**.49**	.01	.20	-.35	-.22	-.36	-.12	.28	.28	.25	.831
FI PROT CL	-.68	.04	.26	-.04	.09	.16	-.05	.23	.06	.35	.08	.10	.770
C SCH TX LVY	-.12	-.18	-.02	-.15	.02	-.80	.00	.04	.02	-.03	-.09	-.09	.736
PC TX LVY	.05	.02	-.12	.01	.01	-.11	.15	-.06	.07	-.06	-.80	.09	.714
NO. IND LVY	-.15	-.24	-.25	-.29	.40	.13	-.13	.01	-.27	-.26	-.40	-.25	.784
NEW MFG 19	.11	-.05	.16	.01	.47	.24	-.51	.18	.15	.05	.10	.06	.653
NEW MFG 99	.21	-.09	**-.52**	.04	.05	-.13	.09	-.52	.04	.19	.32	-.13	.787
Geographic													
DST R S C	-.03	.80	.16	-.08	.03	.18	-.14	.02	-.08	.17	-.12	-.06	.786
DST W S C	-.12	.32	.23	-.06	-.03	.05	-.41	.00	-.39	.34	-.32	.16	.739
DST 300,000	-.11	.13	**.82**	.04	-.10	.05	-.12	-.14	-.18	.04	.18	.20	.853
H W IND	.77	.15	-.05	.28	-.06	-.08	.06	.12	.07	-.04	.09	.00	.740
NO. INT CR	.89	.08	-.11	-.15	-.11	-.07	-.09	.06	.03	-.18	.04	-.04	.904
NO. RR	.30	-.17	-.23	-.16	-.06	-.04	.08	-.16	-.04	-.71	-.26	-.19	.837
C OIL PROD	-.03	.21	.18	.03	.35	.31	.22	.49	.33	.12	-.14	.25	.791
C OTHER MW PROD	-.37	-.03	.41	.17	.29	-.02	.04	.22	.03	-.54	.18	-.04	.796
C IRR	.02	.55	**.60**	.23	-.18	.22	.08	-.01	.01	.03	.05	.01	.809
CLM IND	.08	-.39	**-.59**	-.06	.28	.18	.24	-.12	-.03	-.19	-.03	-.31	.832
VARIANCE	6.18	2.76	4.78	2.40	1.85	1.55	1.54	1.68	1.39	1.63	1.50	2.49	29.75
PERCENT	16.70	7.45	12.93	6.48	5.00	4.18	4.17	4.55	3.76	4.40	4.06	6.73	80.41

Factor Correlations

The procedure described in the preceeding section will easily determine the correct direction of the signs for each factor, unless correlations between the variables within a factor are illogical. If this is the case it is often impossible to determine the correct sign direction.

For example, F_2 in Table A-2 has four significant loadings. Variable four (C VAL F&L P S) is correlated positively and has a positive sign on the loading. Variable nine (CO SEAT) is correlated positively and has a positive loading. Variable twenty-eight (DST R S C) has a negative correlation and has a positive loading. Variable thirty-seven (CLM IND) has a positive correlation and a negative loading. Thus it can be seen that two of the variables have illogical correlations. Either way this factor is directed, two of the variables will have the opposite effect of what would be expected.

The different factorizations initially examined in this thesis were attempted to avoid problems such as the one described above. By increasing the number of factors in the solution, the variables that load on one factor may be split up and loaded separately on other factors. If two variables have a strong, but illogical correlation, they may not be split up until the number of factors is so high as to be relatively meaningless to the study. In this case the illogical correlation may have to be accepted and directed in a way that will have the least possible adverse effect.

TABLE A-2

NINE FACTOR ROTATED FACTOR LOADING MATRIX

	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8	F_9	H^2
Economic										
C RET S	.94	-.00	.15	-.04	.09	.04	-.02	.00	.07	.917
C REC SS	.90	-.10	.03	.01	.05	.04	.16	.11	-.09	.869
PC FM INC	.01	.34	-.02	.26	.61	-.19	.13	.07	.27	.688
C VAL F&L P S	.06	.76	.05	.12	.32	-.16	.10	.01	-.23	.788
C EMP MFG	.19	-.17	.39	-.76	-.03	.09	-.14	-.00	.03	.824
C EMP R T	.86	-.07	.20	-.14	.18	.03	-.01	-.18	.11	.880
PC EMP SS	.44	-.31	-.29	-.17	.17	.35	.09	-.17	-.28	.681
C GOV INC DSB	.35	-.05	.56	-.49	.01	.06	-.25	-.08	-.22	.797
CO SEAT	.18	.66	.24	-.03	.02	.01	.04	.07	-.10	.544
Social										
C P 10,000	.55	-.04	.30	-.37	.40	-.08	-.18	-.10	.00	.733
C NWS CIRC	.24	-.05	.02	.04	.12	-.14	.11	.80	-.00	.757
YRS RADIO	.88	.13	.06	.09	-.01	.02	.05	.05	.06	.819
C LIB EX	.16	-.00	.09	.81	.01	-.07	-.10	.06	-.13	.731
C SCH UN	-.20	-.03	-.88	-.04	.03	-.12	-.06	-.01	.09	.851
AV C R F PP	-.14	-.11	-.86	.04	.11	-.11	.04	-.07	.12	.827
PC F LOL I	-.01	-.16	-.16	-.12	.06	.03	.05	-.13	.70	.576
CP 17 SCH	.00	.22	.32	.28	.45	.02	.33	-.05	-.27	.620
CP 19 SCH	-.06	.31	.38	.32	.30	-.16	.38	-.10	-.29	.682
PC ENR COL	.13	.05	-.12	-.16	-.08	.01	.78	.15	.01	.690
PC PP 65	.16	.13	-.28	-.65	-.01	-.36	.28	.13	-.26	.825
PC MED AGE	-.01	.16	-.23	.20	-.08	-.64	.30	-.34	.09	.757
FI PROT CL	-.67	.04	-.21	.05	.43	-.23	.03	.06	.05	.738
C SCH TX LVY	-.14	-.32	.03	.26	-.41	-.06	.01	.07	-.10	.373
PC TX LVY	.04	-.05	.08	.02	.08	.63	.09	-.23	-.09	.485
NO. IND LVY	-.16	-.21	.08	.11	-.14	.57	.13	.03	.57	.781
NEW MFG 19	.06	.11	-.08	.06	.26	-.24	-.06	.18	.61	.567
NEW MFG 99	.23	-.23	.50	.17	-.26	-.24	-.18	-.43	.06	.727
Geographic										
DST R S C	-.03	.80	-.13	.01	.12	.00	.03	-.06	.10	.683
DST W S C	-.18	.48	-.02	.15	.10	-.07	.50	-.08	.16	.575
DST 300,000	-.12	.28	-.62	.17	.03	-.40	.34	-.11	-.11	.799
H W IND	.77	.13	.05	-.22	-.03	-.10	-.05	.16	-.13	.720
NO. INT CR	.87	.12	.14	.18	-.20	.04	-.09	.17	-.00	.897
NO. RR	.30	-.13	.07	.09	-.49	.61	-.10	.05	.02	.735
C OIL PROD	.01	.15	-.22	-.12	.76	.13	-.16	.22	.08	.743
C OTHER MN PROD	-.35	-.03	-.51	-.10	-.06	.03	-.02	.34	.13	.530
C IRR	.04	.60	-.55	-.16	.14	-.16	.04	-.06	-.24	.799
CLM IND	.13	-.51	.33	-.21	-.11	.41	-.19	-.08	.31	.746
VARIANCE	6.27	3.38	4.17	2.78	2.48	2.48	1.75	1.47	2.02	26.80
PERCENT	16.95	9.13	11.27	7.50	6.70	6.70	4.74	3.97	5.45	72.43

APPENDIX B

DATA SOURCES

The variables that were used and the sources for each are given below.

1) Change in Retail Sales, 1963-1967 (000) -- City.
   Source: Census of Business, Retail Trade, Kansas.

2) Change in Total Receipts in Selected Services, 1963-1967 (000) -- City.
   Source: Census of Business, Selected Services, Kansas.

3) Percentage Change in Real Farm Income, 1964-1969, CPI - 1957-1959 = 100, 1964 = 108.1, 1969 = 127.7 -- Community.
   Source: Annual Economic Report of the Governor, Kansas.

4) Change in the Total Real Value of Farm and Livestock Products Sold, 1964-1969, WPI - 1957-1959 = 100, 1964 = 100.5, 1969 = 113.0 -- Community.
   Source: Farm Facts, Kansas State Board of Agriculture.

5) Change in Employees in Manufacturing, 1963-1970 -- City.
   Source: Kansas Statistical Abstract and Census of Manufacturers.

6) Change in the Number of Employees in Retail Trade, 1963-1967 -- City.
   Source: Census of Business, Retail Trade, Kansas.

7) Percentage Change in the Number of Employees in Selected Services, 1963-1967 -- City.
   Source: Census of Business, Selected Services, Kansas.

8) Change in Real Government Income Disbursements, 1964-1969 (000), CPI - 1957-1959 = 100, 1964 = 108.1, 1969 = 127.7 -- Community.
   Source: Annual Economic Report of the Governor, Kansas.

9) Is the City a County Seat Town in 1970?
   Source: Primary.

10) Change in the Number of People Living in Towns of 10,000 Population or More, 1960-1970 -- City.
    Source: Census of Population.

11) Change in the Daily and Weekly Newspaper Circulation, 1966-1971 -- City.
    Source: Kansas Newspaper Directory.

12) Number of Years the City has had Radio Prior to 1970 -- City.
Source: KSAC Radio Station, Kansas State University.

13) Change in the City Library Expenditures, 1965-1970 -- City.
Source: Kansas Government Journal, Tax Rate Book.

14) Change in the Number of School Units, 1962-1967 -- Community.
Source: Census of Governments, Kansas.

15) Average Yearly Change in Rural Farm Population, 1959-1964 -- Community.
Source: Census of Population, General Population Characteristics.
Census of Agriculture.

16) Percentage Change in the Farm Operators Level-of-Living Index, 1959-1964 -- Community.
Source: U. S. Department of Agriculture, Statistical Bulletin Number 406.

17) Change in the Percentage of 16 and 17 Year Olds in School, 1950-1960 -- Community.
Source: Census of Population, General Social and Economic Characteristics, Kansas.

18) Change in the Percentage of 18 and 19 Year Olds in School, 1950-1960 -- Community.
Source: Census of Population, General Social and Economic Characteristics, Kansas.

19) Percentage Change in Enrollment in College (2 or 4 Year), 1965-1970 -- City.
Source: Kansas Educational Directory.

20) Percentage Change in Population 65 Years Old or Over, 1960-1970 -- City.
Source: Census of Population, General Population Characteristics.

21) Percentage Change in the Median Age of the Population, 1960-1970 -- Community.
Source: Census of Population, General Population Characteristics, 1970 estimated from Census of Population, Advance Reports.

22) Fire Protection Classification, 1970, Low Number is Best Rate -- City.
Source: State Fire Marshall.

23) Change in the Total School Tax Levy, 1965-1970 -- City.
Source: Kansas Government Journal, Tax Rate Book.

24) Percentage Change in Tax Levy for General Operations, 1965-1970 -- City.
Source: Kansas Government Journal, Tax Rate Book.

25) Number of Times the City had Industrial Levy Prior to 1970 -- City.
Source: Kansas Government Journal, Tax Rate Book.

26) Number of New Manufacturers with 0-19 Employees, 1963-1967 -- Community.
Source: Census of Manufacturers, Kansas.

27) Number of New Manufacturers with 20-99 Employees, 1963-1967 -- Community.
Source: Census of Manufacturers, Kansas.

28) Distance to a Complete Shopping Center ($11 Million Retail Trade), 1970 -- City.
Source: Primary and Census of Business, Retail Trade, Kansas.

29) Distance to a Wholesale Shopping Center ($40 Million Retail Trade), 1970 -- City.
Source: Primary and Census of Business, Retail Trade, Kansas.

30) Linear Distance (hundreds of miles) to the Nearest City of 300,000 Population or More in 1970 (Denver, Omaha, Kansas City, and Oklahoma City) -- City.
Source: Primary.

31) Highway Access Index (weighted -- interstate 3, federal 2, state 1), 1970 -- City.
Source: Primary.

32) Number of Intrastate Carriers Serving City, 1970 -- City.
Source: State Corporation Commission, Motor Carriers Division (unpublished)

33) Number of Railroad Lines, 1970 -- City.
Source: Primary.

34) Change in the Number of Firms Producing Oil and Gas Products, Excluding Processing and Service Firms (SIC 131 and 132), 1963-1967 -- Community.
Source: Census of Mineral Industries, Kansas,
Census of Mineral Industries, unpublished data.

35) Change in the Number of Firms Producing All Other Mineral Products, Excluding Processing and Service Firms, 1963-1967 -- Community.
Source: Census of Mineral Industries, Kansas,
Census of Mineral Industries, unpublished data.

36) Change in the Number of Acres Irrigated, 1964-1968 -- Community.
Source: Census of Agriculture,
KSU Extension Engineer, Irrigation Summary.

37) Climate Index -- City.
Source: "Climatography of the United States", Kansas.

A FACTOR ANALYSIS OF SMALL COMMUNITY DEVELOPMENT

by

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ABSTRACT

Small communities in Kansas are finding it increasingly difficult to compete with urban areas for human and capital resources. This is of critical importance because the ability to attract and hold these resources determines whether a community will grow and prosper or decline and die.

Kansas communities are faced with an economic structural problem. Agriculture, the major income generating industry in Kansas, has been part of a technological revolution that has resulted in large quantities of capital being substituted for labor. This displaced labor has not been absorbed within the community because other employment opportunities have not existed. Outmigration, as evidenced by the fact that 76 of the 105 counties in Kansas lost population in the past decade, is the inevitable result of a lack of alternative employment opportunities.

Community outmigration is accompanied by a loss of economic and social viability, for people support public and private services and institutions. This process of population losses and economic stagnation becomes spiral in nature unless planning and action is initiated by local development leaders with assistance from state and federal leaders and agencies.

Community leaders require information about community strengths and weaknesses. This information is needed by local leaders to plan for balanced growth. Area and state leaders also need this information to facilitate program planning and policy implementation.

Data were gathered on thirty-seven economic, social, and geographic

variables for sixty-six Kansas communities. The community concept utilized in this study is that of a functionally integrated area with a central place and a hinterland. The factor analysis technique was utilized to aggregate the thirty-seven variables into sixteen factors. Factor scores were produced for each of the sixteen factors for each community. The factor scores reflect the communities' performance in the thirty-seven variables and allow each community to be ranked for each factor with respect to all other communities.

The sixteen factors provide community profiles for each community which local and state leaders can utilize to determine a community's strengths and weaknesses. With these profiles as guidelines, community leaders can plan for a balanced community structure and long range development.

The community concept of a central place and a hinterland becomes important with respect to small community development possibilities. The smaller communities that ranked high did so primarily because of measurements taken on the central city and the hinterland, rather than the central city alone. This would indicate that multicounty or area efforts might provide more effective development for the smaller communities. Multicounty or area cooperation could provide small communities with the needed economic, social, and geographic resources to retain or restore their economic and social viability.

Results indicate that size is not the sole determining factor in a communities development. If size alone was important, the larger communities would have all had high factor rankings, which they did not. This then suggests that small communities do have some control over their future development.