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AN EXPLORATORY ANALYSIS OF NONMETROPOLITAN COMMUNITY GROWTH: THE OLD WEST REGION, 1960-1970

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It is well known that national economic growth is characterized by significant variation in growth at the subnational level. To express it somewhat differently, it is commonly known that communities do not all grow at the same rate.

Considerable effort has been devoted to measuring this variation, to observing it over time, and finally, to developing theories, such as stages of growth, export base, cumulative causation, central place, and the like, to explain it. While the various theories of regional growth have made a significant contribution to our basic understanding of subnational growth phenomenon, they can best be described as *ex post* rather than *ex ante* theories. Consequently, we have very little theoretical basis for predicting accurately the growth rate at the subnational level, particularly at the community level. While exploratory work in this area is still warranted, numerous other works have been completed.

The South, and the North Central states have largely benefited from a turnaround in nonmetropolitan growth as a result of industrial development. Not only has the size of the population changed, but also its age composition chiefly due to migration patterns associated with the onset of rural industrialization as Summers [7] has demonstrated. Further substantiation of the nonmetropolitan industrialization is provided by Lonsdale and Seyler [4] who point out that nationally, these areas have accounted for over half of all new industrial jobs since 1960.

In another study, Debertin and Bradford [2] sampled 59 Indiana towns and cities in order to provide empirical support which indicated that the locational characteristics and the people of a community influence its growth. They also found that there exists little evidence to indicate that policy variables will have any significant effect upon economic growth and development.

The basic objective of this paper is to explore statistically some possible determinants of community growth in a nonmetropolitan setting.

The Old West Region, which is an outgrowth of the Public Works and Economic Development Act of 1965 and includes the states of Montana, Wyoming, North Dakota, South Dakota, and Nebraska, was chosen as the nonmetropolitan study region. With the Region's predominant non-urban character, it was possible to focus the analysis upon a substantial number of towns/cities within the 2,500 to 20,000 population range. To be more specific, the size of place under study was towns and small cities with a population of at

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least 2,500 but not more than 20,000 in the 1960-70 period. Exceptions were made for those places which were under 20,000 in 1960 but over this amount by 1970. One hundred and seven communities in the Region fit this description, and a complete list of these communities is given in Table 1. The 1960-70 period was chosen because of Census data constraints and, most important, because this decade marks the latest period of growth for the Region that precedes the onrush of coal development, particularly in Wyoming and Montana.

Growth was defined in two ways: (1) percent change in population for the 1960-70 period, and (2) percent change in employment for the same period. Most of the selected communities of the Region experienced both population and employment growth over this period. Measured in terms of population, the average annual growth rate for the combined 107 communities was approximately 0.9 percent. This compares very favorably with the 0.7 percent annual rate for all nonmetropolitan areas for the nation for the same period. The average annual growth rate spread for the Old West Region ranged from a -2.6 percent (Glasgow, Montana) to 12.1 percent (Bellevue, Nebraska). Sixty-nine communities experienced positive growth rates; contrastingly 38 experienced negative growth rates, on the average.

Since the study was primarily viewed as an exploratory analysis of nonmetropolitan community growth, the approach in the selection of variables was to "cast the net broadly." Thus, a total of 74 variables relating to income, education, location, industry mix, government, agriculture, and population were used to portray each community.

Employing the principal components technique to these 74 variables reduced the number to a manageable 13 factors, or dimensions, which had eigenvalues of one or more.[1] Once the 13 factors were obtained, they were subjected to the varimax rotational procedure in order to obtain the final factors, or what has been called the simple structure in the literature. See, for example, Rummel [6] or Bennett [1]. These rotated factors become the basis for expressing community differences. 81.6 percent of the total variance is explained by these 13 factors, and over one-half of the total is attributed to the first three factors, which will be called the primary factors. The remaining ten factors will be called secondary factors because together they explain less than one-half of the total variance. Table 2 indicates the percentage amount of reduction in variation attributed to each factor. It should be mentioned here that the naming and interpretation of the 13 factors were carried out by arbitrarily eliminating the factor loadings between $\pm$ 0.30. This enhances the probability that those variables which remain tend to have at least some degree of association within the set, and hence, it simplifies greatly the task of naming and interpreting the final sets of variables. The tables in the appendix list the original variables for each of the significant factors.

The principal components technique was extended to explore for community socioeconomic differences between subregions and, also, between high U.S. slow-growing communities. An east-west differential was used to form two subregions. The 20 communities from Montana, the 17 of Wyoming, and

[1]The use of one as the cut-off for factor significance is standard procedure in this field of research. An alternative criterion is to halt the selection when the inclusion of one or more factors does not contribute significantly to the amount of total explained variation. The particular criterion to follow is simply a matter of judgment.

TABLE I

TOWNS AND CITIES OF THE OLD WEST REGION, 2,500-20,000 IN POPULATION

STATE	1970	1960
NEBRASKA		
Alliance	7051	7845
Auburn	3628	3229
Aurora	3138	2576
Beatrice	12389	12132
Bellevue	19470	8831
Blair	6106	4931
Broken Bow	3736	3482
Chadron	5822	5079
Columbus	15471	12476
Cozad	4095	3184
Crete	4444	3546
Fairbury	5329	5572
Falls City	5408	5598
Fremont	22962	19698
Gering	5603	4585
Gothenburg	3013	3050
Holdrege	6078	5226
Kearney	19181	14210
Kimball	3507	4384
Lexington	5662	5572
McCook	8395	8301
Nebraska City	7441	7252
Norfolk	16435	13640
North Platte	19447	17184
Ogallala	4929	4250
O'Neill	3922	3181
Plattsmouth	6371	6244
Ralston	4312	2977
Schuyler	3544	3096
Scottsbluff	14507	13377
Seward	5294	4208
Sidney	6374	8004
So. Sioux City	7920	7200
Superior	2602	2935
Valentine	2737	2875
Wahoo	3835	3610
Wayne	5253	4217
West Point	3385	2921
York	6761	6173
MONTANA		
Anaconda	9971	12054
Bozeman	18670	13361
Conrad	2770	2665
Cut Bank	4004	4539
Deer Lodge	4306	4681
Dillon	4548	3690
Glasgow	4700	6398
MONTANA		
Glendive	6305	7058
Hardin	2733	2789
Havre	10558	10740
Kalispell	10526	10151
Laurel	4454	4601
Lewistown	6437	7408
Libby	3286	2828
Livingston	6883	8229
Miles City	9023	9665
Shelby	3111	4017
Sidney	4543	4564
Whitefish	3349	2965
Wolf Point	3095	3585
WYOMING		
Buffalo	3394	2907
Cody	5161	4838
Douglas	2677	2822
Evanston	4462	4901
Gillette	7194	3580
Green River	4196	3497
Lander	7125	4182
Laramie	23143	17520
Newcastle	3432	4345
Powell	4807	4740
Rawlins	7855	8968
Riverton	7995	6845
Rock Springs	11657	10371
Sheridan	10856	11651
Thermopolis	3063	3955
Torrington	4237	4188
Worland	5055	5806
NORTH DAKOTA		
Bottineau	2760	2613
Devils Lake	7078	6299
Dickinson	12405	9971
Grafton	5946	5885
Jamestown	15385	15163
Mandan	11093	10525
Rugby	2889	2972
Valley City	7843	7809
Wahpeton	7076	5876
West Fargo	5161	3328
Williston	11280	11866

TABLE I (cont.)

TOWNS AND CITIES OF THE OLD WEST REGION, 2,500-20,000 IN POPULATION

STATE	1970	1960	STATE	1970	1960
SOUTH DAKOTA			*SOUTH DAKOTA*		
Belle Fourche	4236	4087	Mobridge	4545	4391
Brookings	13717	10558	Pierre	9699	10888
Canton	2665	2511	Redfield	2943	2952
Chamberlain	2626	2598	Sisseton	3094	3218
Hot Springs	4434	4943			
Huron	14299	14180	Spearfish	4661	3682
Lead	5420	6211	Sturgis	4536	4639
			Vermillion	9128	6102
Madison	6315	5420	Watertown	13388	14077
Milbank	3727	3500	Winner	3789	3705
Mitchell	13425	12555	Yankton	11919	9279

Source: U.S. Bureau of the Census, *Census of Population: 1960, 1970.* U.S. Government Printing Office, Washington, D.C.

TABLE 2

LIST OF FACTORS EXPLAINING COMMUNITY VARIATION

Factor Number	Factor Name	Percent of Total Variance Explained
	Primary Factors	
I	Agglomeration	24.8
II	Savings and Governmental Expenditures	20.1
III	Level of Income, Quality of Housing, and Demographic Structure	10.3
	Secondary Factors	
IV	Agricultural Activity and Prximity to Urban Centers	4.7
V	Levels of Retail and Light Industry Employment	4.4
VI	Per Capita Sales of Commercial Activity and Accessibility	3.3
VII	Male and Female Participation in the Labor Force	2.9
VIII	Level of Agricultural Activity	2.3
IX	Quality of Housing Facilities	2.3
X	Accessibility	1.9
XI	Railroad Access, Infrastructure Employment and Level of Mining Activity	1.7
XII	Median Level of Education	1.6
XIII	Levels of Heavy Industry and Public Administration Employment	1.4
		81.6

Source: Data generated in SPSS Factor Analysis Program.

five from the western portion of South Dakota (Lead, Spearfish, Sturgis, Hot Springs, and Belle Fourche) formed the western subregion. The remaining 15 communities of South Dakota, 11 from North Dakota and 39 from Nebraska comprised the eastern subregion. The rationale for this subregion break-down was to determine whether a substantial difference would occur in the primary set of factors for two quite dissimilar economies — mining, tourism, and ranching for the western subregion and agriculture (crop production) for the eastern subregion. Interestingly, in terms of primary factors, the two subregions were found to be identical. Consequently, since the first three factors for each subregion; that is (1) agglomeration, (2) savings and budget factors, and (3) levels of income, housing and age structure, were identical to each other as well as for the region as a whole, there appeared to be no reason to continue with this subregional analysis. The total amount of variance explained by the first three factors for the region as a whole was 55.2 percent; for the western subregion it was 48.8 percent; and for the eastern subregion it was 58.6 percent. Total variance explained by all significant factors in the western and eastern subregions was 87.2 percent and 85.7 percent, respectively.

Next, a disaggregation on the basis of growth rates was carried out by dividing the total region into two classes based upon whether the community grew in population by an amount greater than the mean percent rate of population change for the region in the sixties or if it grew by less than the mean amount. Thirty-seven communities grew at a rate exceeding the mean rate and 70 communities grew by an amount less than the mean. Once again, no basic differences surfaced concerning the number of factors nor in the first three most important factors. The "greater than" group explained 89.0 percent of the total variance in 12 factors with the first three factors accounting for 60.0 percent, and in the "less than" group 16 factors explained 83.7 percent of the variation and the first three factors accounted for 49.0 percent. The first three factors were identical in each group.

Since the two types of disaggregation did not substantially alter the principal component factors, it seemed appropriate to continue the analysis for the entire Region. To backtrack for a moment, it should be mentioned that it is interesting and important to interpret, in detail, each of the factors that emerge from the technique of principal components. This arduous task was undertaken in the study, but for the sake of brevity it will not be repeated here.

The focal point of the study was the use of the 13 factors in a multiple regression model to explain (1) the percent population growth and (2) the percent employment growth at the community level. It should be mentioned here that because of the use of principal components, there should be no correlation between the independent variables as each of these has been extracted orthogonal to the rest. That is, each factor was compiled on the assumption that the entire system is recomputed each time a previous factor has been exhausted. Finally, recall that the time period for the study was from 1960 to 1970.

The forward stepwise procedure of regression analysis was used wherein the variable with the highest partial correlation coefficient with the dependent variable is selected first and its coefficient tested for significance. See Murphy [5]. If the value is significant, the process continues with the selection of the second variable. This variable will have the highest correlation with the dependent variable after accounting for the effect of the previously included variable. The program continues until the variables no longer are significant. Table 3

summarizes the results of the two equations, where an alpha level of 0.05 was used to determine the factors of significance. These factors are listed in accordance to their relative order of importance, and the signs shown in parentheses are the regression signs on the variables.

As Table 3 indicates, each equation contains six significant factors, and five of the six factors are common to both equations. Factor four appeared to be the most significant factor (i.e., the factor with the highest F value) explaining percent change in population and percent change in employment. In terms of the original variables that make-up factor four, the most important ones (that is, the variables with significant factor loadings) include (1) average value of land and buildings per acre, (2) distance from nearest city over 100,000 population, (3) distance from nearest city over 50,000 population, (4) distance to nearest major metropolitan area, and (5) percent of owner occupied housing units. As one might expect, the signs on these access variables showed that the communities in close proximity to cities and/or major metropolitan areas experienced above average growth rates in both population and employment.

TABLE 3

F VALUES FOR SIGNIFICANT VARIABLES

Percent Change in Population			Percent Change in Employment		
Factor Number	F Value	Sign	Factor Number	F Value	Sign
4	18.9598	(+)	4	35.3550	(+)
3	8.6853	(+)	3	14.0027	(+)
8	4.9909	(+)	2	7.8668	(+)
7	4.5674	(-)	5	4.6251	(-)
2	3.2028	(+)	10	3.0983	(+)
5	3.1446	(-)	7	2.3405	(-)

Factor Titles

Factor 2: Savings and Governmental Expenditures
Factor 3: Level of Income, Quality of Housing, and Demographic Structure
Factor 4: Agricultural Activity and Proximity to Urban Centers
Factor 5: Levels of Retail and Light Industry Employment
Factor 7: Male and Female Participation in the Labor Force
Factor 8: Level of Agricultural Activity
Factor 10: Accessibility

Considerable evidence of this is available from the data. Cities which can be considered suburbs of the urban centers such as Ralston, Bellevue, South Sioux City, and West Fargo all increased in population over the period. Many towns in the Montana-Wyoming area which are greater distances from the cities did not experience growth. The results also give credence to the idea that business and employees prefer to locate in regions not too far removed from the recognized social and cultural centers of the Upper Midwest. Some of the employment growth in these communities can no doubt be attributed to the urban sprawl accompanying the growth of the urban centers; however, most of the region is not representative of this kind of structural topography and the majority of the employment growth in the area is related to places which are

not attached to major cities but which lie farther away yet are likely within easy access, and the social and business amenities of the metro region can still be acquired albeit at a higher cost in terms of time and transportation.

In addition, a significant positive association was found between the value of farm land and buildings and the rate of population and employment growth. Even though many counties declined in population during the decade studied, a large number of the outmigrants were farmers and the children of farmers after they had reached age 18. The remaining farmers could not increase their scale of operations and with improved technology, enhance the overall level of productivity. These findings are consistent with similar studies of other regions of the country.

The next most significant factor explaining percent change in population was in the same rank order of significance as the order of factors explaining the percent change in employment. This is factor three and it contains the level of income, quality of housing, and the basic demographic structure of the communities. This is the first of the three primary factors to surface in the regression analysis. Since several original variables were important in this factor, it is difficult to affix precisely the major source of the configuration. Nevertheless, the largest loadings are taken from the demographic portion of the factor and tend to show that a previous record of growth in the community combined with a younger, better educated population will be the most likely interpretation of the regressor and, therefore, population growth.

On the other hand, the community which is least likely to exhibit employment growth in the sixties would be one with a large number of poverty stricken families, a city with a larger proportion of people over age 65 and one which did not grow during the decade of the fifties either.

As Table 3 shows, factor eight came in as the third most significant factor for explaining percent change in population, but it is not part of the list of significant factors for the percent change in employment. In view of the fact that this factor is mostly made up of agricultural variables, which reflect, no doubt, young farm proprietors with families, it had a positive effect on population growth. This factor reinforces the commonly held perception that the local community must defer to its surrounding farm land as a major and highly visible aspect in explaining why it has achieved whatever level of existence that it is enjoying.

Factors five and seven were found to be significant in both equations, although the rank order of significance differs for each equation. Factor seven measures the male and female participation rates in the community's labor force as well as the amount of professionally related activities going on inside it. In the initial analysis of the Region, it was found that the highest levels of female participation rates could be found in cities which also had a large amount of professional service activity such as university towns and places with government offices at the state or county level. On the other hand, high male employment rates were found in areas where the first two variables mentioned were lower. It is important to note that the sign for factor seven for both equations was negative. This negative sign supports the notion that the higher the level of professional activity and female participation, the more likely growth is to occur, while the male employment rate is not given as much weight. This line of reasoning is based on the fact that the factor loadings for variable 29 (percent of female participation in labor force) and variable 36 (per-

cent of labor force engaged in professional activity) were also negative. See Table A-5 of the appendix.

Factor five, which shows up as significant in both equations, relates to the levels of retail and light industry employment found within the community. In particular, the industries of concern are the retail, wholesale, finance, and real estate sectors. A good foundation in these areas does not appear to be enough to attract employment into the communities because of the negative sign on this factor. The factor suggests that it is only in durable manufacturing that a community of this size is able to benefit in terms of additional growth and employment

Factor two, which is one of the three primary factors, is significant in the population equation as well as in the employment equation. A review of the original variables that are contained in this factor provides the explanation of this outcome (see Table A-1 of the appendix). The public service variables of this list involve mostly personal services, and it is likely that the growth in these services followed an initial growth in population (e.g., growth of retirement communities).

This would account for the considerable increase in per capita expenditure for hospitals, public welfare, etc., as well as the larger number of hospitals and the overall increases in the volume of time deposits in local financial institutions. The increase in county taxes and revenues collected typically involves further hiring in the local government employment as well.

Finally, factor ten is significant in the employment equation but not in the population equation. This factor deals primarily with the community's accessibility to a major metro area and to the nearest interstate highway entrance. It also is concerned with the number of major highways in the community; therefore, it likely emphasizes the accessibility of commodity movements to the metropolitan market centers. The positive sign on the regression coefficient indicates that the closer the community to the urban center and the better access it has to it through the interstate and other highway systems, the more likely it is to have a growing employment sector.

It is noteworthy that the first factor, which is the agglomeration factor, was not statistically significant in either equation. The agglomeration factor is one of the three primary factors of the principal components procedure, and it explained 24.8 percent of the total variance in the system. It is basically dependent upon a number of size variables for its existence. From the table of factor loadings in the appendix, it can be seen that all the significant loadings are positive except one, and they rely heavily upon the commercial sector of the communities. The number of retail and selected service activities in the area, size of the population, the size of the labor force, and the number of housing units all are included in the composition of the factor. This correlation appears acceptable since large labor forces, large commercial sectors, and greater numbers of housing units are expected in larger communities. The absence of the agglomeration factor in the two regression equations is consistent with the recent population rates of entirely rural areas that contain only towns/cities of the size range used in this study. Its absence from the employment equation indicates that the growth of business activity in rural communities is not dependent upon the existence of a relatively large commercial center. For businesses, the often cited locational advantage of the smaller city and rural community is lower labor costs. Continued successful operation in such areas

has been further encouraged by the interstate highway system, available financing, local job training programs, improvements in utility services, and a general feeling of acceptance by the community for new business activities. It must be remembered that the dependent variables were measured in terms of percent change. Undoubtedly, the use of actual changes would have resulted in the inclusion of the agglomeration factor in both equations.

Finally, it is informative to briefly consider events of the past years in order to update the material and determine whether or not these trends are still occurring. In another study covering the West North Central Region of the U.S., Dorf and Emerson [3] utilized the factor analysis technique to identify structural differences among nonmetropolitan communities during the same 1960-70 period.

They conclude that community size, accessibility to urban areas and characteristics of the labor force are the major determinants of location of new industrial plants in the rural communities, and provide a source of employment growth in these areas. The proximity to railroads, the level of property taxes and the housing quality were also identified as important variables in the location process.

No official Census of Population materials will be available until the 1980 census is released; however, ongoing research results provide some perspective on current events. From data made available by the respective state departments of economic development, it is obvious that at least a slight increase in population continues to occur in nearly all of the 107 communities studied.

Once the official figures for the current decade are published, it will be feasible to extend the analysis through the seventies, enabling comparisons to be made over a larger time span in an effort to either give further credence to, or to modify the present analysis.

TABLE A-1

SIGNIFICANT FACTOR LOADINGS ON FACTOR II: SAVINGS AND GOVERNMENTAL EXPENDITURES

Variable Number	Variable Name	Rotated Loading
23	Percent in population increase from 1950 to 1960	.33
38	Median income of families	.30
41	Total volume of time deposits in commercial banks in county	.75
42	Total volume of savings capital in savings and loan institutions in county	.95
56	Average value of land and buildings per acre in county	.36
61	Number of hospitals in county	.78
62	Total county employment payroll	.98
63	General revenue collected in county	.98
64	Property tax in county	.97
65	Total direct general expenditure in county	.98
66	Per capita expenditure for education in county	.97
67	Per capita expenditure for highways in county	.92
68	Per capita expenditure for public welfare in county	.96
69	Per capita expenditure for hospitals in county	.94
70	Per capita expenditure for police protection in county	.98
71	Per capita expenditure for fire protection in county	.98
72	Per capita expenditure for parks and recreation in county	.98
73	Per capita expenditure for libraries in county	.88
74	Per capita expenditure for financial adminstration in county	.97

Source: Data generated from SPSS Factor Analysis Program.

TABLE A-2

SIGNIFICANT FACTOR LOADINGS ON FACTOR III: LEVEL OF INCOME, QUALITY OF HOUSING, AND DEMOGRAPHIC STRUCTURE

Variable Number	Variable Name	Rotated Loading
23	Percent in population increase from 1950 to 1960	.75
24	Percent of people 65 years and over	-.85
25	Median age of people in county	-.75
26	Median school years completed (age 25 and over)	.32
28	Percent of male population in labor force (14 years and over)	.45
38	Median income of families	.76
39	Percent of families with incomes less than $3000	-.72
40	Percent of families with incomes greater than $10,000	.71
46	Percent of all housing facilities with 1.01 persons or more per room	.60
47	Median value of owner occupied units	.76
48	Median gross rent	.74
60	Number of mining establishments in county	.45

Source: Data generated in SPSS Factor Analysis Program.

TABLE A-3

SIGNIFICANT FACTOR LOADINGS ON FACTOR IV AGRICULTURAL ACTIVITY AND PROXIMITY TO URBAN CENTERS

Variable Number	Variable Name	Rotated Loading
17	Number of hotels, motels, and camps	-.36
25	Median age of people in county	.31
44	Percent of owner occupied housing units	.62
48	Median gross rent	.31
49	Distance from nearest city over 50,000 population	-.62
50	Distance from nearest city over 100,000 population	-.81
51	Distance to nearest major metropolitan area	-.55
56	Average value of land and buildings per acre, county	.78
57	Total farm production expenses	.36
58	Market value of all farm products sold	.34

Source: Data generated from SPSS Factor Analysis Program.

TABLE A-4

SIGNIFICANT FACTOR LOADINGS ON FACTOR V: LEVELS OF RETAIL AND LIGHT INDUSTRY EMPLOYMENT

Variable Number	Variable Name	Rotated Loading
2	Per capita sales of all retail trade establishments	.54
4	Total number of building material retail establishments	.34
31	Percent of labor force engaged in durable manufacturing activity	-.51
34	Percent of labor force engaged in wholesale and retail activity	.64
35	Percent of labor force engaged in finance, insurance and real estate activity	.79
59	Average age of farm operator in county	-30

Source: Data generated in SPSS Factor Analysis Program.

TABLE A-5

SIGNIFICANT FACTOR LOADINGS ON FACTOR VII MALE AND FEMALE PARTICIPATION IN THE LABOR FORCE

Variable Number	Variable Name	Rotated Loading
28	Percent of male population in labor force	.72
29	Percent of female population in labor force	-.32
36	Percent of labor force engaged in professional activity	-.89

Source: Data generated in SPSS Factor Analysis Program.

TABLE A-6

SIGNIFICANT FACTOR LOADINGS ON FACTOR VIII LEVEL OF AGRICULTURAL ACTIVITY

Variable Number	Variable Name	Rotated Loading
29	Percent of female population in labor force	.31
32	Percent of labor force engaged in non-durable manufacturing activity	.50
56	Average value of land and buildings per acre, county	.32
57	Total farm production expenses	.76
58	Market value of all farm products sold	.79
59	Average age of farm operator in county	-.31

Source: Data generated in SPSS Factor Analysis Program

TABLE A-7

SIGNIFICANT FACTOR LOADINGS ON FACTOR X ACCESSIBILITY

Variable Number	Variable Name	Rotated Loading
2	Per Capita sales of all retail trade establishments	-.31
21	Number of amusements and recreational services, including motion pictures	.32
51	Distance to nearest major metropolitan area	-.41
52	Number of major highways thru town	.65
53	Distance to nearest interstate highway entrance	-.67

Source: Data generated in SPSS Factor Analysis Program.

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