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POPULATION CHANGE
IN WESTERN OKLAHOMA
TOWNS AND CITIES,
1950 - 1960

BY

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Population Change

In Western Oklahoma

Towns and Cities

1950 - 1960

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PREFACE

The purpose of this report is to test the significance of four factors in explaining town and city population growth.

The writer wishes to express his sincere appreciation to the following people for the assistance in preparing this study: Dr. James D. Tarver, Professor of Rural Sociology, who was my advisor for this study, and without whose advice this study could not have been possible; Professor William Granet, Director of the Computing center for his techinical advice in running the programs, and to Evelyn Hargrove and Alice Ramey for their assistance in preparing the material for computation.

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CHAPTER I

THE PROBLEM

Oklahoma's inhabitants, though unique in some respects, share with other Americans a characteristic common to humans everywhere. The residents of the state are not distributed uniformly over the land, but tend to be clustered in "bunches" of humanity [4]. These population centers range in size from a handful of families to large metropolitan areas. Since their effects are felt far beyond local community boundaries the changes in the size and composition of these human concentrations are of considerable interest not only to the residents of these centers, but to persons concerned with the state's current and future development [4].

Perhaps the simplest generalization that one can make about these towns and cities is that over the years some have grown while others have not. Some have decreased in population, while others have ceased to exist.

Some students insist that in the future, American Agriculture will dispense with most of the small "inefficient" trade centers, and be organized about a limited number of service centers which are larger and more complete [7].

Differing factors have been responsible for a town's growth or decrease, although with the passing of years some of the factors responsible for growth have changed. This study examines the

population changes of the 183 towns and cities in twenty-eight counties in Western Oklahoma during the 1950 to 1960 decade and the influence of four factors upon these changes.

CHAPTER II

REVIEW OF LITERATURE

Growth is the normal experience of North American communities. From the twenty-four cities of 2,500 or more population at the time of the population census in 1790, the number in the United States grew to 1,737 by 1900 and to 4,270 by 1950 [2].

Contrary to the belief of some, villages also grew. In every decade in this century well over 300 villages grew into the urban category of 2,500 or above. Urban or rural, growth is the normal expectation for American communities, whether from excess of births over deaths, from the movement of more persons in than away, or for both reasons.

The growth of cities has become a selective process. Only certain places grow. The basis of selection seems to be functional; that is, cities grow where cities are needed, not just because they are cities. In some cases this is a part of a regional population growth where more adequate and better distributional facilities and service centers are required. Again, places may be selected as the location of new activities of production or service and draw to themselves workers and their families and those to operate the facilities and services of community living [5].

Cities and towns have a certain amount of stability. Once established, they survive due to habit on the part of potential consumers and due to the difficulty of duplicating in a nearby settlement

the investment in trade and service institutions that have already been formed in answer to effective demands.

In a particular area, the first established urban settlement tends to hold a certain advantage. Priority has a good chance to succeed in competition within an existing service area. Thus, social history carries over into the location and growth of our contemporary cities [6].

Towns and cities provide many services for their population; some centers, however, tend to be specialized because they function as administrative units for larger areas. If a number of administrative functions are localized in a center, it seems logical that there will be a greater recurrent movement of population to the center from the outlying areas. Such movement might in turn stimulate the economic life of the center and thus to increase its "drawing power" for migrants from other areas [4].

In varying the natural environment contributes to the growth and decline of trade centers. Times of drought have brought an immediate out-migration from the rural farm population. This out-migration in turn often results in a sudden and high mortality rate among small trade centers whose existence depends upon their small rural trade and service areas. Consequently, surviving small trade centers decrease in size. Many of the out-migrants from the rural-farm and decreasing village and hamlet populations find their way to the cities. In this manner the natural environment hastens a trend already in process because of other factors [3].

Previous research has shown that various factors affect population trends of communities; its size, its proximity to other competing centers, its transportation facilities, its attractiveness, its opportunities, and so on [1,4,7].

In Tennessee there have been many instances of considerable rivalry over obtaining the county seat [1]. The assumption has been that the county seat will increase the growth of the trade center. It was found that towns containing county seats showed a slight advantage in making rapid gains. But there was little difference between county seats and other trade centers in the percentage that increased or declined.

An opportunity exists for leaders to carefully study the direction of trends in other centers corresponding in size, location, etc., and compare them with their own communities. Also, they can prepare and assist their communities in adjusting more successfully to impending changes [5].

The basic cause of population decline is lack of opportunity [2]. The ghost towns around worked-out mines are the most dramatic illustrations of this. Migration from one community to another tends to leave some with declining populations.

As compared with many other nations and cultures, few Americans experience the security that comes from a family's striking its roots deep in the soil of a simple community and remaining there for generations. It may be, as has been charged, that if the American faces a problem situation he cannot quickly solve, he moves rather than attempts to adjust to it or seek a long-term solution. On the other hand, this mobility is one of the many

privileges of our freedom. We need no police permits to change our jobs or residences. Much mobility, moreover, is not so much because of discontent as because the move offers, as we say, "a chance to get ahead"[2].

CHAPTER III

METHOD OF STUDY

This study analyses the effect of four factors on town and city growth in Western Oklahoma. Economic Areas 1, 2, and 4 were used for this study, which includes the 183 towns and cities in the twenty-eight Western counties (See Map 1).

Economic Area I includes Cimarron, Texas, Beaver, Harper, Woods, Ellis, Woodward, Dewey, Roger Mills, and Custer Counties; Economic Area II, Alfalfa, Grant, Kay, Noble, Garfield, Major, Blaine, and Kingfisher Counties; and Economic Area IV, Beckham, Washita, Caddo, Grady, Kiowa, Greer, Harmon, Jackson, Tillman, and Cotton Counties. All towns and cities listed in the 1950 Census of Population in these counties were included in the analysis.

The population gains and losses for the towns and cities in this study were computed from data published in the 1950 and 1960 Censuses of Population.

The distance to a city of 2,500 population and type of road through the population centers were obtained from a 1950 state highway map. Specifically, the factors selected to account for population change, classified and labeled by the various levels, are as follows:

1. Percent of total population in town or city under 15 years of age in 1950. Places were classified into two groups:

   P_1 = Less than 15 percent of the total population under 15.

Map 1. State Economic Areas, Oklahoma, 1960

P_2 = 15 percent or more of town population under 15.

2. Percent of total population 65 years of age and over in 1950. Places were classified into two groups:

   S_1 = Less than 25 percent of total population 65 years of age and over.

   S_2 = 25 percent or more of total population 65 years of age and over.

3. Distance of the center from a city of 2,500 population or more in 1950. Places were classified into three groups:

   D_1 = less than 15 miles.

   D_2 = 15 to 24 miles.

   D_3 = 25 miles or more.

4. Type of road through town in 1950. Places were classified into three groups:

   R_1 = Paved, federal or through state highway.

   R_2 = Paved state highway.

   R_3 = Unpaved road.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

This study examines, by use of an analysis of variance design, the relative importance of four independent variables (percent of population under 15 years of age, percent of population over 65 years of age, distance of town from another town or city over 2,500 population, and type of road through town or city) in explaining the variation in population increase and decline for the decade 1950 - 1960.

OBJECTIVES

This study was made to gain more knowledge on what factors are involved in determining which towns and cities gain or decline in population.

The two objectives were: first, to determine the relative importance of the four variables in explaining the variation in town and city population growth for the past decade; and second, to measure the interactive effect of these variables upon growth trends.

METHODS

After coding these 183 towns and cities in the twenty-eight Western Oklahoma Counties in Areas 1,2, and 4 with their respective variables, a listing was made showing the number of towns by each variable, total gain or loss and mean gain or loss for the decade (Table 1).

TABLE 1.

Population Gains and Losses of Western Oklahoma Towns, 1950-1960, classified by Independent Variables.

VARIABLE	NUMBER OF TOWNS	TOTAL GAIN OR LOSS, 1950-1960	MEAN GAIN OR LOSS, 1950-1960
Total (N)	183	20,143	110
P_1	82	-2,474	-30
P_2	101	22,617	224
S_1	89	22,703	255
S_2	94	-2,560	-27
D_1	65	-1,017	-16
D_2	74	3,791	51
D_3	44	17,369	395
R_1	92	22,473	244
R_2	36	-1,236	-34
R_3	55	-1,094	-20

Graphs of the various two-, three-, and four-factor interactions were constructed to determine those which might be significant in the analysis. Figures 1 through 7 lists the six interactions showing possible significance. Each was included in the analysis.

RESEARCH DESIGN

To test the objectives set forth in this study regarding the population trends of towns and cities, the study employs the following model:

$$Y = X\beta + e \qquad (1)$$

This study employs the following analysis of variance model:

$$Y_{ijknl} = \mu + P_i + S_j + D_k + R_n + (PR)_{in} + (DR)_{kn} + (SDR)_{jkn} + (DRP)_{kni} + (RSP)_{nji} + (PSDR)_{ijkn} + e_{ijknl}, \qquad (2)$$

i = 1 and 2; j = 1 and 2; k = 1,2,3; n = 1,2,3; l = 1,2.....183.

Where P,S,D, and R correspond to the four variables outlined above (See Pages 7 and 9)

This study employs the method of least squares and computes an abbreviated Doolittle solution for the twenty-seven independent variables in solving the normal equation.

HYPOTHESES AND FINDINGS

Of the various possible tests of significance involving the four variables, this study tests the following two major hypotheses:

First, H_o: (PR) = 0; (DR) = 0; (SDR) = 0;

(DRP) = 0: (RSP) = 0; and (PSDR) = 0.

Second, H_o: $P_1 = P_2$; $S_1 = S_2$; $D_1 = D_2 = D_3$; and

$R_1 = R_2 = R_3$.

FIGURE 3.

DRP Interaction

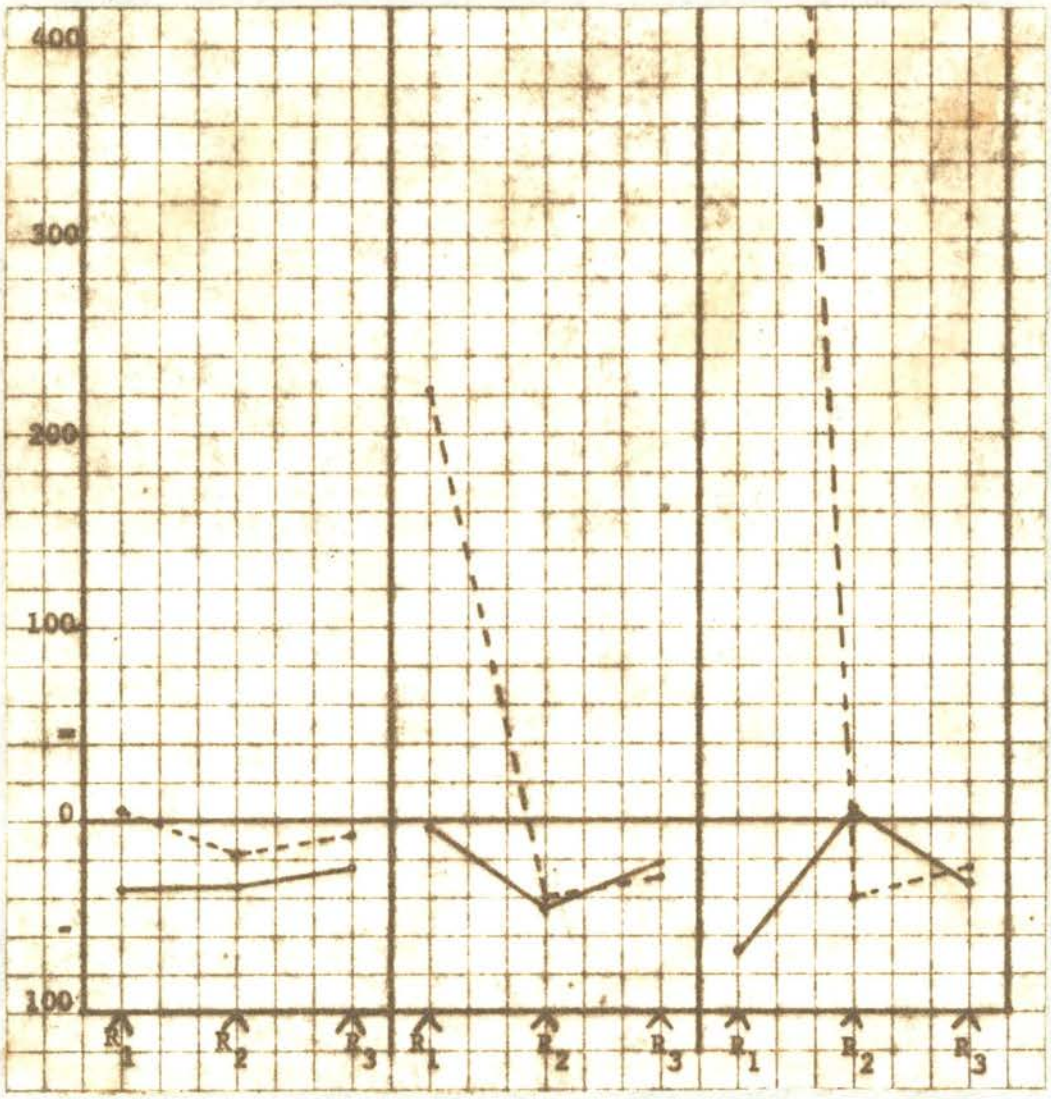
P_1= _____

P_2= - - - - - - - - - - - -

D_1RP Interaction

D_2RP Interaction

D_3RP Interaction



According to the first hypotheses (PR) = 0; and each of the other five interaction terms equal zero. The "F" (variance ratio) test provides appropriate checks for each of the six separate hypotheses involving the interaction variables.

In testing the first interaction in the first hypotheses, namely H_o : (PR) = 0, one computes R(PR|μ, P, S, D, R). Using the five percent level in the variance ration "F" test all six of the original hypotheses were not rejected. Table 2 shows the specific calculations of the "F" test for PR, DR, SDR, DRP, RSP, and PSDR interaction variables for population changes. The "F" test reveals that each of the six interaction variables in the manner specified does not explain a significant part of the variation of Y (population). The six variance ratios being .77, .55, .25, .67, .08, and .05. According to the "F" table they would have to be 2.43 or more before they would show significance at the five percent level.

Both the "F" test, which is appropriate for sample data, and the chi-square test, which is appropriate for the universe (population), provide identical conclusions on tests of the hypotheses in this report.

Since none of the interactions is significant, their sums of squares are combined with the residual error, and the main effects (the four independent variables) are tested without interaction terms (Table 3).

TABLE 2.

Analysis of Variance of Population Change in Western Oklahoma Towns and Cities, 1950-60, Including Selected Interactions

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	Variance Ratio
Total	183	172,489,803		
μ	1	2,217,161		
Corrected Total	182			
$R(P\|\mu)$	1	2,922,122	2,922,122	2.99
$R(S\|\mu,P)$	1	1,601,228	1,601,228	1.64
$R(D\|\mu,P,S)$	2	4,049,465	2,024,732	2.07
$R(R\|\mu,P,S,D)$	2	1,399,892	699,946	.72
$R(PR\|\mu,P,S,D,R)$	2	1,516,109	758,054	.77
$R(DR\|\mu,P,S,D,R)$	4	2,170,438	542,610	.55
$R(SDR\|\mu,P,S,D,R)$	4	965,121	241,280	.25
$R(DRP\|\mu, P,S,D,R)$	4	2,613,025	653,256	.67
$R(RSP\|\mu,P,S,D,R)$	2	163,323	81,661	.08
$R(PSDR\|\mu,P,S,D,R)$	4	183,538	47,134	.05
Error	156	152,683,381	978,739	

None of the variance ratios is significant at the five or one percent levels with the "F" test.

TABLE 3.

Analysis of Variance of Population Change in Western Oklahoma Towns and Cities, 1950-60, Including Only the Four Main Effects.

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	Variance Ratio
Total	183	172,489,803		
μ	1	2,217,161		
Corrected Totals	182			
$R(P\|\mu)$	1	2,922,122	2,922,122	3.21
$R(S\|\mu P)$	1	1,601,228	1,601,228	1.76
$R(D\|\mu,P,S)$	2	4,049,465	2,024,732	2.22
$R(R\|\mu,P,S,D)$	2	1,399,892	699,946	.77
Error	176	160,299,935	910,795	

None of the variance ratios is significant at the five or one percent levels with the "F" test.

According to the second hypotheses, $P_1 = P_2$; $S_1 = S_2$; $D_1 = D_2 = D_3$; and $R_1 = R_2 = R_3$.

To test the first of the four sub-hypotheses, H_o: $P_1 = P_2$, one computes $R(P|\mu)$. Using the five percent level in the variance ratio "F" test the original hypotheses was not rejected. Moreover, the other three hypotheses were not rejected. Table 3 shows the specific calculation of the "F" tests for P,S,D,R variables for population change. The "F" tests reveal that each of the four independent variables in the manner specified does not explain a significant part of the variation of Y (population). The four variance ratios are 3.21, 1.76, 2.22, and .77 respectively. According to the "F" table P and S must be 3.91 or greater and D and R must be 3.06 or greater before they would be significant at the five percent level.

The 1950-1960 population change among the 183 centers was quite variable. The two extremes were Chickasha and Altus, the former losing 976 and the latter gaining 11,490. The average gain for all places was 110 people, but the distribution of the changes is skewed. Consequently, the corrected sum of squares very high, about 170,000,000.

To stabilize the variance 976 was added to equal town's population change to make all values positive. Then, the logarithms of the transformed values, were taken and an analysis of variance was made (Table 4). The results are consistent with the previous findings, for none of the interactions or main effects is significant.

TABLE 4.

Analysis of Variance of the Logarithms of Population Changes

in Selected Oklahoma Towns and Cities, 1950-60

Source of Variation	Degrees of Freedom	Sums of Squares	Mean Square	Calculated Variance Ratio
Total	182	12.45554		
$R(P\|\mu)$	1	.01704	.01704	.23
$R(S\|\mu,P)$	1	.00207	.00207	.03
$R(D\|\mu,P,S)$	2	.22198	.11099	1.47
$R(R\|\mu,P,S,D)$	2	.00101	.00050	.01
Interactions:	(20)			
$(PR\|\mu,P,S,D,R)$	2	.00856	.00428	.06
$(DR\|\mu,P,S,D,R,PR)$	4	.16593	.04148	.55
$(SDR\|\mu,P,S,D,R,PR,DR)$	4	.08697	.02174	.29
$(PDR\|\mu,P,S,D,R,PR,DR,SDR)$	4	.14586	.03646	.48
$(PSR\|\mu,P,S,D,R,PR,DR,SDR,PDR)$	2	.00907	.00454	.06
$(PSDR\|\mu,P,S,D,R,PR,DR,SDR,PDR,PSR)$	4	.05407	.01352	.18
Error	156	11.74298	.07528	

FIGURE 1.

PR Interaction

P_1= ————————

P_2= ----------

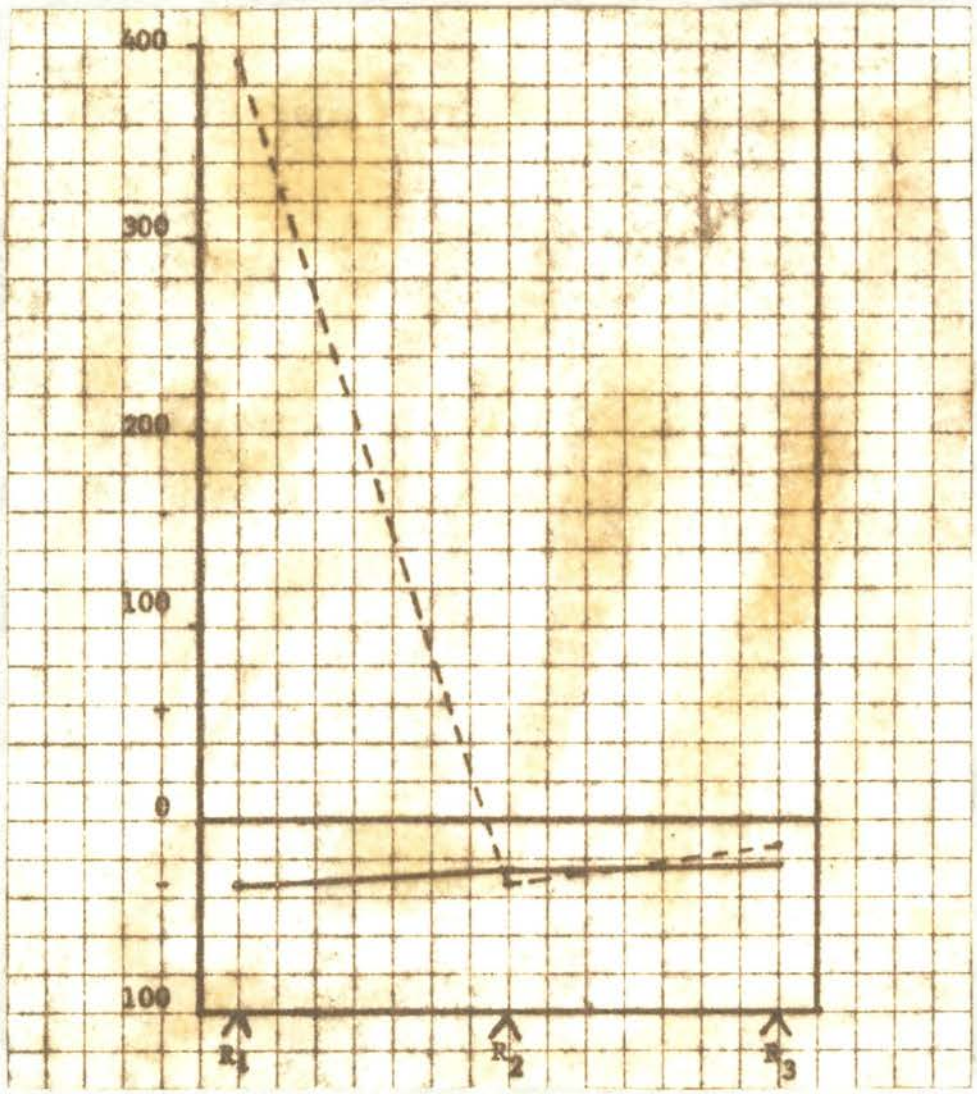


FIGURE 2.

DR Interaction

D_1 = ————————

D_2 = ----------

D_3 = — — — —

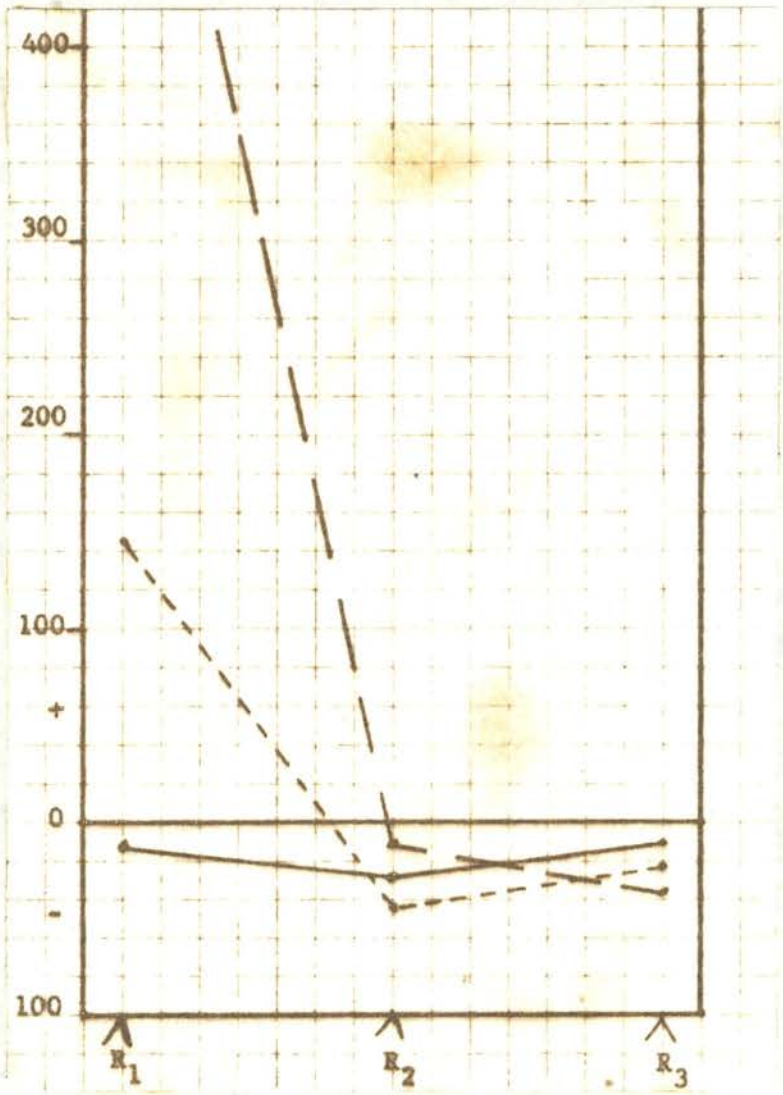


FIGURE 3.

DRP Interaction

P_1= _____

P_2= - - - - - - - - - - - -

D_1RP Interaction

D_2RP Interaction

D_3RP Interaction

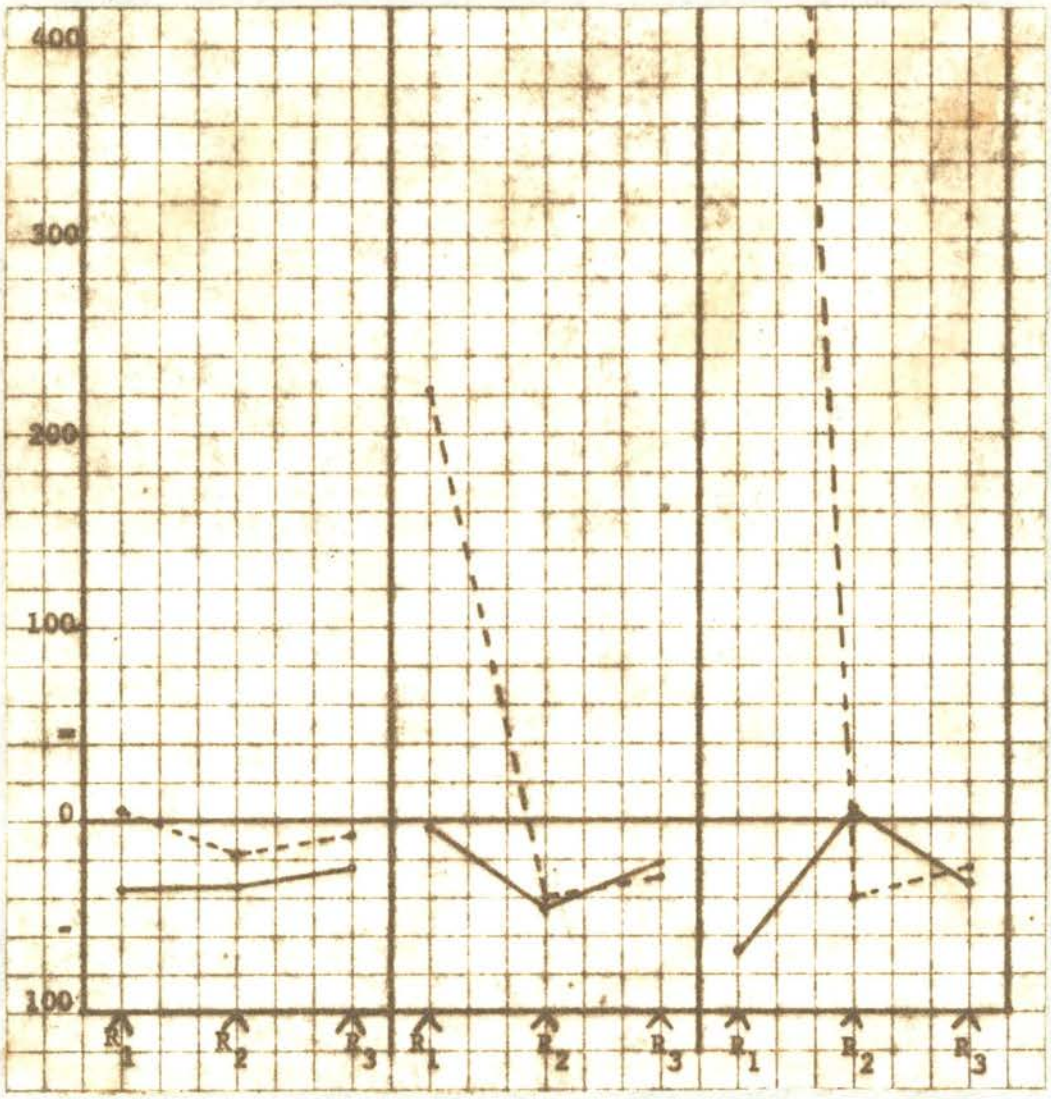


FIGURE 4.

RSP Interaction

P_1= _____

P_2= ----------

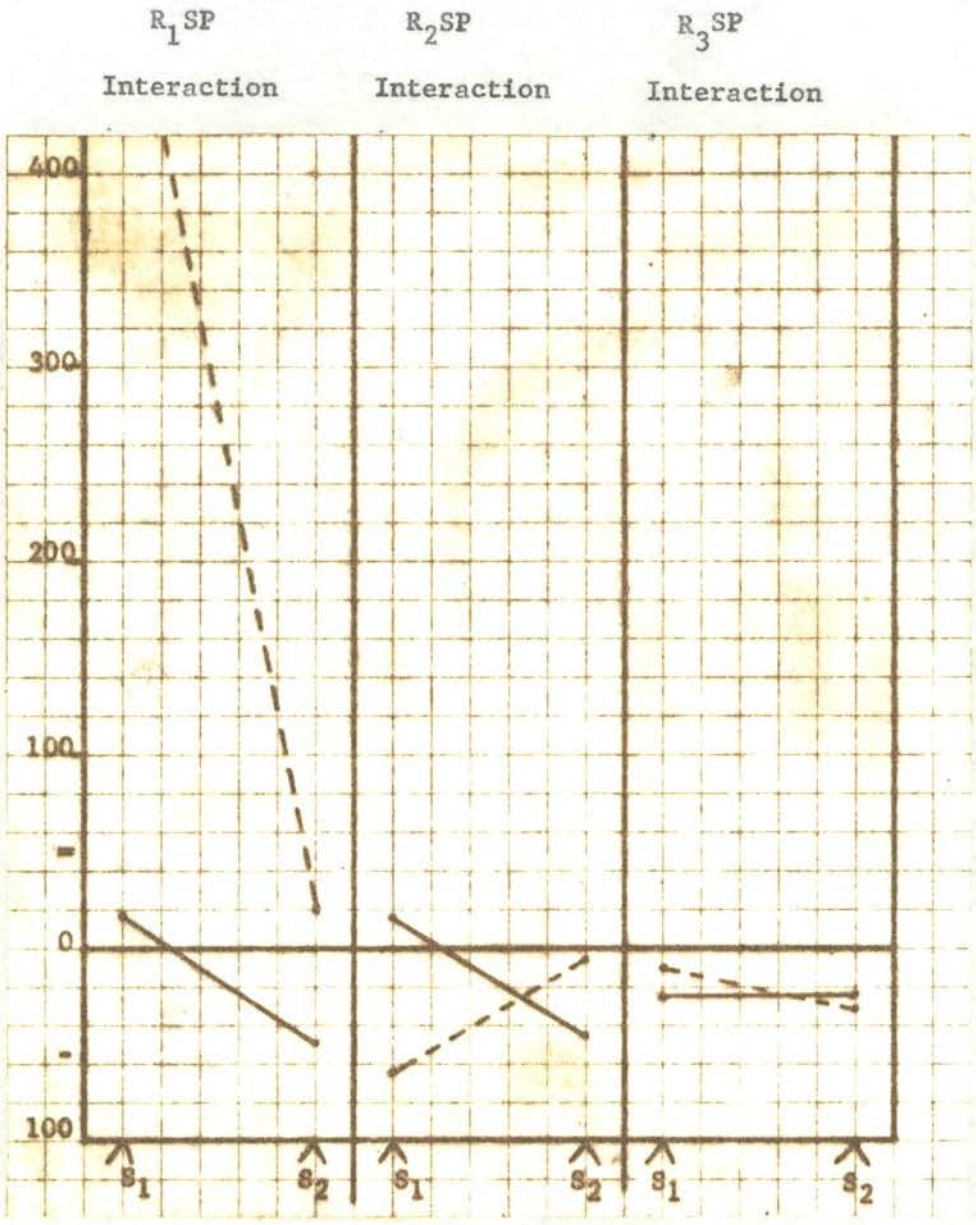


FIGURE 5.

SDR Interaction

R_1 = ————————

R_2 ----------

R_3 = — — —

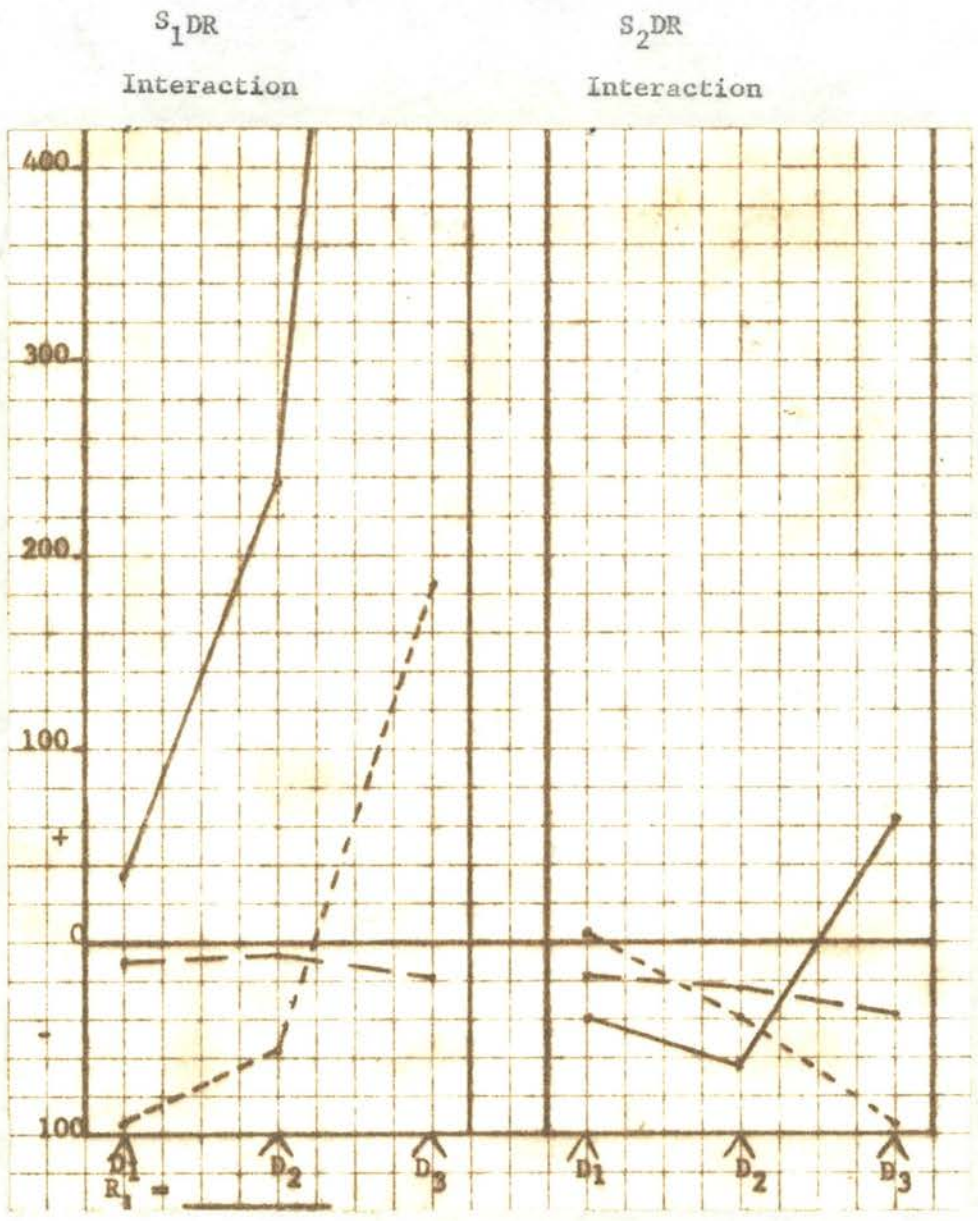


FIGURE 6.

P_1 SDR Interaction

R_1= ——————

R_2= - - - - - - - - - - - - -

R_3= — — — — —

P_1S_1DR Interaction

P_1S_1DR Interaction

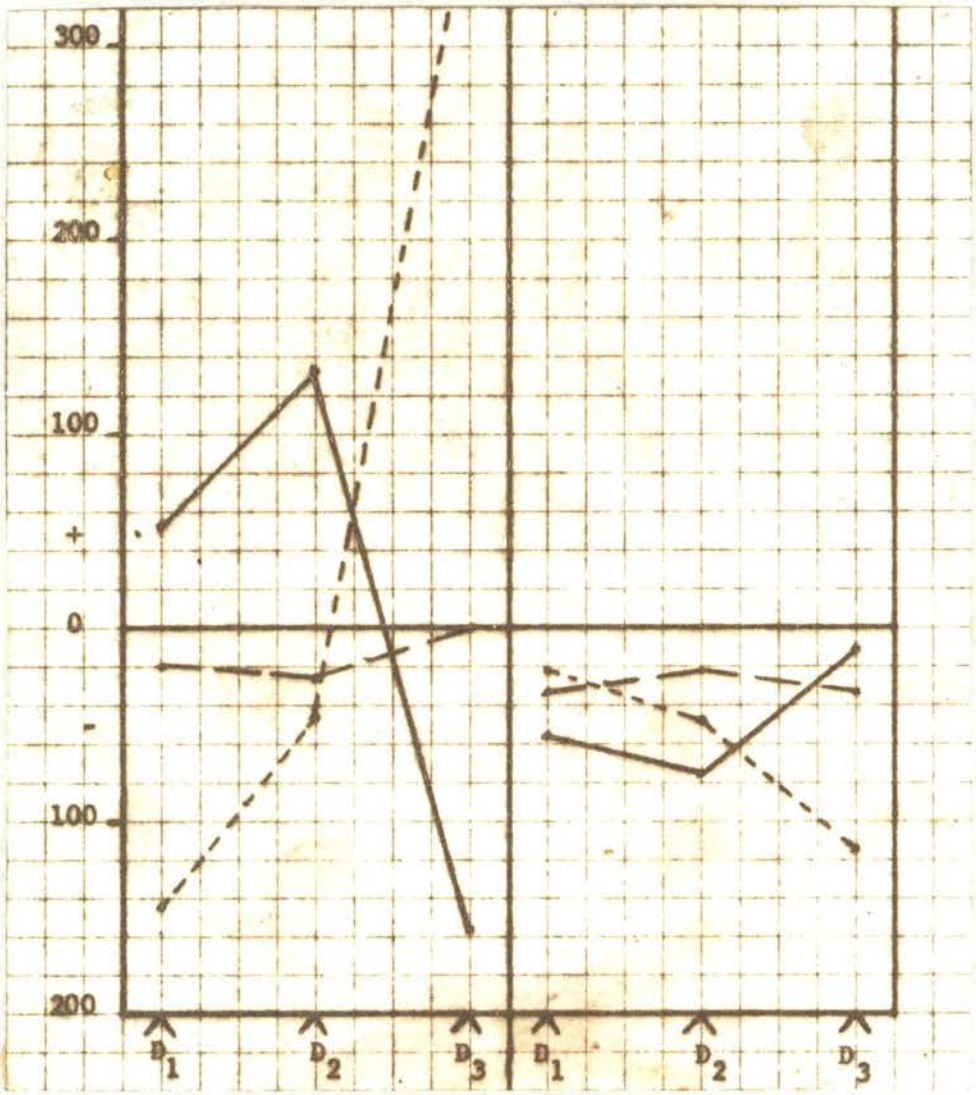


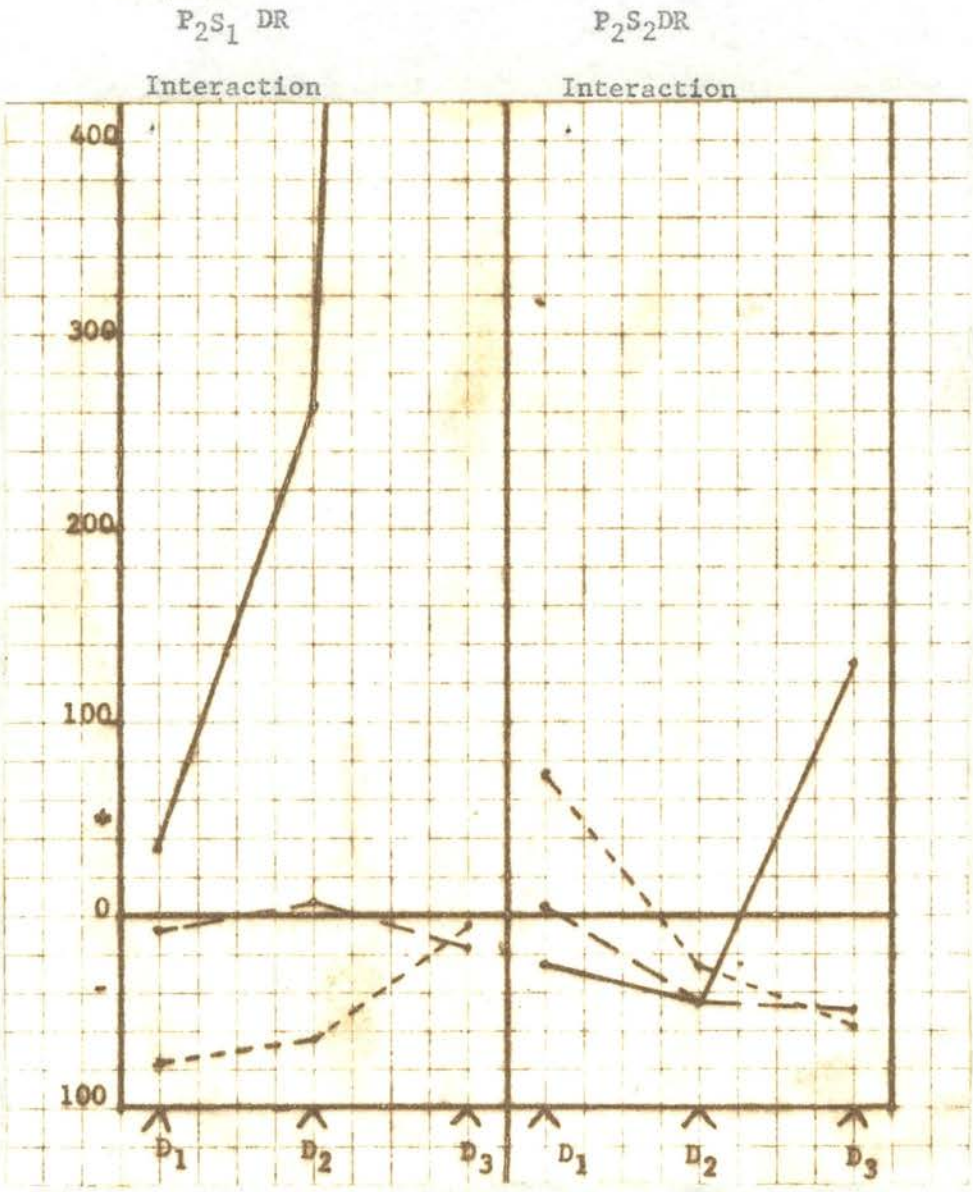
FIGURE 7.

P_2 SDR Interaction

R_1= ————————

R_2= - - - - - - - - - - - -

R_3= — — — — — —



SUMMARY

The findings of this study do not substantiate previous studies: however previous studies were made over a longer era and of an earlier date. Therefore, it is possible that the four factors previously responsible for population trends are no longer applicable for this past decade. The statistical analysis indicates that none of the factors, (percent of population under 15, percent of population 65 and over,distance of town to town or city of 2,500 or more population, and type of road) is significant in explaining population trends.

Places with relatively large numbers of children under 15 years of age and with proportionately small numbers of aged experienced the larger population gains during the decade (Table 1). Also, distance from competing urban centers was directly related to population increase. Finally, places which had federal or through state highways gained in population, whereas places on other roads declined. Even so, there differences are not great enough to show real differences between towns.

The largest place in Economic Areas 1, 2, and 4 had a population of 36,017; the smallest had but 17 inhabitants. Because of the great variation in town-size, the gains are likewise rather diverse in magnitude. Possible, this distracted the findings since the largest cities had factors responsible for their growth other than

those tested in the analysis. In addition, this part of the state is quite remote from the metropolitan centers and the factors which determined the population trends in this area were perhaps somewhat different.

From the findings of this study, it is concluded that none of the four factors tested had a significant effect upon population growth and decline of towns and cities in Western Oklahoma during 1950 to 1960.

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Institution: Oklahoma State University | Location: Stillwater, Oklahoma

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Scope of Study: Analysis of variance was made on four factors and their interactive influence on population growth or decline. This study was for the 1950-1960 decade and included the 103 towns and cities in State Economic Areas 1, 2, and 4, the twenty-eight counties in Western Oklahoma. The four variables included in the study were: Percent of total population in town or city under 15 years of age in 1950; percent of total population in town or city 65 years of age and over in 1950; distance to another city of 2,500 population or more in 1950; and type of road through town in 1950. An "F" test was run on a total of twenty-seven independent variables and their selected interaction terms.

Findings and Conclusions: The analysis indicates that none of the four factors used in the study is significant in explaining trends of Western Oklahoma towns and cities during the 1950-1960 census decade.

ADVISOR'S APPROVAL Fred Lee Grimes