Natural Population Decrease in the West South-Central United States.

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Louisiana State University and Agricultural & Mechanical College

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in partial fulfillment of the
requirements for the degree of
Doctorate of Philosophy

in

The Department of Sociology

by
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B.A., Bowling Green State
University, 1972
M.A., Louisiana State University, 1973
December 21, 1976
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This is an investigation of the phenomenon of natural population decrease (excess of deaths over births) in the West South-Central region of the United States. Natural decrease is studied for the period 1968-1974 with counties serving as the units of observation. It was found that of the 406 counties comprising the states of Texas, Oklahoma and Arkansas, 111 experienced natural population decrease during 1968-1974.

The purpose of this research was to investigate the development and extent of natural decrease in the region and attempt to delineate its causes. Guidelines were provided by past literature specifically dealing with natural population decrease, and by existing theoretical development falling under the rubric the "Theory of the Demographic Response".

A rate of natural decrease (increase) was computed for every county in the region using the formula (Number of Births-Number of Deaths during 1968-1974)/ (1970 County Population) X 100. Counties experiencing natural increase during this period were classified as low and high natural increase counties. The resulting three groupings of counties were subsequently compared on many demographic and socioeconomic variables. Such comparisons provided strong
support for the findings of previous studies relating to the importance of the age structure and outmigration of young adults. Natural decrease counties were in general much "older" and experienced higher rates of net outmigration of persons aged 15-29 than natural increase counties. In addition they exhibited consistently lower fertility.

To further investigate the phenomenon, this author developed a simple path analysis model of natural increase with "fertility" and "migration" serving as exogenous variables and with median age serving as an intervening variable. The path analysis confirmed the importance of the age distribution and outmigration in producing natural population decrease; in addition it indicated that previous studies might have underestimated the role of low fertility. The model was subsequently expanded to include socioeconomic determinants of migration and fertility. The choice of these variables was guided by the Theory of the Demographic Response, human ecological theory and peculiarities of the problem under study. In the expanded version of the path analysis four variables emerged as important contributors to the model: Percent of the population who were of "Spanish" origin, percent Negro, percent white-collar and median earnings.

The findings yielded by the analysis were discussed in terms of previous studies of natural decrease, but also
in terms of the theoretical framework followed: the Theory of the Demographic Response. Implications for future research and demographic theory are subsequently discussed along with some policy implications.
CHAPTER 1
INTRODUCTION

The phenomenon of natural population decrease in the United States is rather recent, occurring first during the 1930's. It was first noticed by Dorn in a short research note in the Journal of the American Statistical Association (1939:106-109), who identified 145 counties experiencing more deaths than births during the years 1935 and 1936, the first years for which vital statistics were published by place of residence. These counties which had a combined population of 8,267,000 in 1930 were primarily located in the Middle Atlantic States and in the three Pacific Coast States (Dorn, 1939:107). While some of these counties were primarily rural areas with a history of population decline, most of them had young populations and a history of population growth but were characterized by very low fertility (Beale, 1969:91). Many of them contained cities with populations over 100,000 (Dorn, 1939:108).

Dorn predicted that the situation "will undoubtedly become more widespread in the near future" (1939:109); shortly after his publication, however, natural population decrease disappeared almost entirely due to higher fertility during World War II. Beale (1964; 1969) observed that the phenomenon reappeared in the early 1950's and has accelerated since then. Recent statistics indicate that 445 counties
registered an excess number of deaths over births during 1972. Unlike Dorn, Beale attributed the emergence of this more recent natural population decrease to heavy outmigration of persons in their child-bearing years rather than inadequate fertility (1964:270;1969:93). He noted that in every county experiencing natural population decrease during 1950-1966 (the period his study covered), while fertility was not particularly high, it was above the level required for population replacement (1969:93).

In a few cases, such as a number of counties in central Florida and other "retirement counties" scattered throughout the country, natural population decrease is clearly the outcome of heavy inmigration of older persons rather than outmigration of young persons. In both cases, however, the outcome is the same: age-selective migration produces a "distorted age structure" characterized by high proportions of older persons and low proportions of young persons (Beale,1969:93).

Natural population decrease since the 1950's has been primarily a rural phenomenon concentrated in marginal agricultural areas such as Southern Iowa-Northern Missouri, Southeastern Kansas-Southwestern Missouri, Southern Illinois and Western Kentucky, and Central Texas with a few counties in Oklahoma and Arkansas. Beale's study (1969) was mainly a descriptive account of the emergence and development of
the phenomenon in the above areas from 1950 to 1966 without any attempt at verifying its causes through statistical analysis. In a more recent study Chang investigated the phenomenon in Iowa counties and engaged in some statistical analysis (Chang, 1974). After comparing counties experiencing natural decrease to those experiencing natural increase, Chang's conclusions supported Beale's claim that the major cause of natural decrease has been heavy outmigration of young persons from areas of agricultural decline. In addition, he found that relatively low fertility in Iowa's natural decrease counties was a factor, but of secondary importance (Chang, 1974:670).

While the studies by Beale and Chang have been quite informative and important in reviving interest in the area, they did not go far enough in discerning the causes of natural population decrease. Beale's paper (1969) is primarily descriptive and Chang's analysis is limited to comparisons between groups of counties. Nevertheless, they are the only two important studies to date upon which future research must build. Close investigation of these two studies and the factors involved has led this writer to believe that more sophisticated statistical analysis can shed additional light on the problem, especially since measurements on the variables involved are available at the interval level.
This study will focus on one region of the country where natural population decrease is concentrated: the West South-Central region of the United States; more specifically the states of Texas, Oklahoma and Arkansas. (The state of Louisiana is omitted since only one of its counties experienced natural population decrease in 1972). A total of 114 counties in the three states experienced natural population decrease in 1972. They accounted for more than a fourth of the nation's 445 natural decrease counties for that year. They also made up about 28 percent of all counties in Texas, Oklahoma and Arkansas. Of these natural decrease counties 76 are located in Texas, 24 in Oklahoma and 14 in Arkansas (Table 1).

As noted earlier Beale had identified central Texas as one of the major regions of natural population decrease. In describing the affected counties, he noted that "the area lacks physiographic or cultural unity, but all of the (decrease) counties do have one thing in common; namely a former dependency on cotton production and a lack of alternative newer forms of employment to replace the drop in farm employment" (1969:95). In an earlier publication Beale (1964) had mentioned the occurrence of the phenomenon in part of Oklahoma also. In more recent years natural decrease has spread throughout rural Oklahoma and a few counties in Arkansas. As is the case in central Texas
Table 1.- Counties Experiencing Natural Population Decrease in Texas, Oklahoma and Arkansas: 1972

<table>
<thead>
<tr>
<th>County</th>
<th>All Counties</th>
<th>Counties</th>
<th>Percent</th>
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<tr>
<td>Texas</td>
<td>254</td>
<td>76</td>
<td>29.9</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>77</td>
<td>24</td>
<td>31.2</td>
</tr>
<tr>
<td>Arkansas</td>
<td>75</td>
<td>14</td>
<td>18.7</td>
</tr>
<tr>
<td>Total</td>
<td>406</td>
<td>114</td>
<td>28.1</td>
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most of the affected Oklahoma and Arkansas counties share the same former dependency on the cotton industry; they are not, however, as concentrated as the natural decrease counties in central Texas. Since Beale's publication (1969) natural decrease has been spreading into other areas of Texas especially the northern and eastern part of the state.

The three-state area with many of its counties experiencing natural population decrease provides an excellent opportunity for an in-depth examination of the problem and its causes. Such study becomes extremely significant for many reasons: (1) Beale called natural decrease an emergent American phenomenon (1969:91). While it had affected 324 counties from 1950 to 1966 (Beale, 1969:91), it has since become much more widespread affecting 445 counties in 1972 alone. (2) Given that the present national trend toward low fertility persists we can expect the United States population to move closer to the stationary state. Projections by the U.S. Bureau of the Census (1972) indicate that if present trends continue the United States will reach a stationary population in about seven decades—assuming no immigration. Such a population will have a median age of about 37.3 (U.S. Bureau of the Census, 1972:22). Since in a stationary population, births equal deaths, any movement in that direction would involve the increasing oc-
currence of natural population decrease (excess of deaths over births) in an increasingly larger number of areas. Many of these areas are likely to be large cities where fertility is generally lower. Thus, there are indications that natural population decrease will not remain a primarily rural phenomenon but will increasingly affect more and more urban areas. Research attention to the phenomenon can provide a theoretical and methodological framework for the study of a phenomenon which is likely to require more research attention in the future. An understanding of the dynamics of natural population decrease can also aid in easing the transition from population growth to zero population growth when and if it takes place. (3) The subject area—Texas, Oklahoma and Arkansas—includes many counties experiencing natural decrease enabling the investigator to engage in in-depth analysis of the problem. (4) The nature of the data permit the investigator to go beyond past research in the area and conduct multivariate analyses. This can provide additional insight into the problem and can make a contribution to theoretical development in social demography. (5) Finally, the study of natural population decrease has obvious policy implications. The occurrence of natural decrease is not an inherently negative and, therefore, undesirable phenomenon. It is likely to be more widespread as the United States moves closer
to a stationary population or a situation of zero population growth—presumably a desirable phenomenon. Its occurrence, however, in the West South-Central United States, as in most other areas in the Country, is rooted in poverty. Given past and present demographic trends in the United States, the occurrence of natural decrease in rural areas of economic decline seems to be the ultimate indicator of their poverty.

Specifically, then, this investigator looks at the phenomenon of natural population decrease in the three states of Texas, Oklahoma and Arkansas during the years 1968-1974. He attempts to identify its causes, consequences, and implications for research and policy.

Chapter 2 includes a review of the literature on natural population decrease. More specifically it takes a closer look at the studies by Dorn (1939), Beale (1969), and Chang (1974). After discussing these studies a search for a theoretical framework within which the problem can be approached is undertaken.

Chapter 3 includes a description of the methodological procedures of this investigation: sources of data, the subject counties, definitions, measures, and techniques employed.

In Chapter 4 the findings of the study are presented in detail. The discussion is presented in two parts: find-
ings of comparisons of natural decrease counties with natural increase counties, and the results of a proposed path analysis model of natural decrease with all 406 counties of the region serving as units of observation.

Chapter 5 includes a brief summary of the study, a discussion of its theoretical, methodological and policy implications and suggestions for future research.
CHAPTER 2

REVIEW OF THE LITERATURE

I. The literature on Natural Population Decrease

As indicated in the previous chapter the literature on natural population decrease is quite limited. Only three notable studies have dealt directly with the subject and the three are essentially different.

Harold Dorn (1939) looked at data on births and deaths by place of residence during the years 1935 and 1936. He noted that of the 145 counties with more deaths than births in 1935-36 most were concentrated in the Middle Atlantic and the three Pacific Coast States. More specifically "New York with 16 out of 62 counties and California with 19 out of 58 counties reporting more deaths than births represent the areas of most widespread natural population decrease" (Dorn:107). But, according to Dorn, every region in the country was represented, even the South with several of its large cities experiencing natural decrease (Dorn:107). In fact Dorn had identified 19 cities with populations of over 50,000 in 1930 which reported more deaths than births in 1935-36 (Dorn, Table II). "All of (these) cities", he observed, "have very low net reproduction rates which strengthens the belief that their crude rates of natural decrease are real
and not the result of unusual fluctuations" (p.108).

Thus the occurrence of natural decrease in the 1930's was not primarily a rural phenomenon, and, according to Dorn, it was exclusively the result of very low fertility. Migration is not even mentioned as a possible cause of natural decrease. Dorn had predicted that natural decrease "would become more widespread in the near future" (Dorn:109). In doing so he failed to foresee the higher fertility during World War II which brought about the virtual disappearance of natural decrease.

Natural decrease reappeared in the early 1950's. Beale gave it limited attention in a paper dealing with rural depopulation (1964). A few years later he published a major work dealing exclusively with the growth of natural decrease from 1950 to 1966 (Beale,1969). As briefly mentioned in the first chapter, Beale's study was a descriptive account of the development of natural decrease during this period. Beale, however, unlike Dorn, attributed the emergence of natural decrease in the 1950's to outmigration of young persons rather than low fertility. He argued that:

The major cause of the current and prospective natural decrease is the distortion of county age structures resulting from high rates of age-selective net outmigration. Where counties of moderate fertility have experienced a prolonged or severe net outmovement of successive cohorts of young adults, the age structure
has often become so altered that there are not enough couples of childbearing age remaining to offset with their births the deaths that occur to less depleted old cohorts....Inasmuch as the most common cause of heavy outmigration from counties is declining agricultural employment, without offsetting increases in other industries, the phenomenon of natural decrease is very largely rural-despite our traditional conception of rural areas as areas of substantial natural increase (Beale, 1969:93)

Without any doubt Beale identifies outmigration as the primary force behind natural decrease. While he indicates that the subject counties have moderate fertility, nowhere does he attempt to explain why this is so. He merely assumes that when heavy outmigration of young persons is coupled with moderate fertility natural decrease is produced. The important question to be asked at this point is why natural decrease counties have moderate fertility. This Beale does not do, except indirectly by pointing out that part of the answer why natural increase has not occurred in other areas of heavy outmigration, such as the cotton areas of the Delta and the Southeast, is high fertility (Beale, 1969:97). This, however, is not an answer to the question: why is fertility low or moderate in the primarily rural natural decrease counties?

In short, Beale's investigation is primarily descriptive, it attributes natural decrease almost exclusively to outmigration while paying little attention to the role of
fertility, and his explanation is not placed within an adequate theoretical framework. Nevertheless it is an important study which provides a great deal of insight into the process of natural population decrease.

A more sophisticated approach to the study of natural decrease was given by Chang (1974) who focused on one of the nation's major natural decrease areas: southern Iowa. By limiting his investigation to only one area, Chang was able to engage in more detailed study of the characteristics of natural decrease counties and the causes of natural decrease. He defined as natural decrease counties those which registered an excess number of deaths over births in at least three of the five years 1966-1970 (1974: 659). By this definition, 17 of Iowa's 99 counties were labeled natural decrease counties. Of these, 14 were located along the state's southern border. Chang's analysis consisted mainly of comparing natural decrease counties with the remaining 82 counties of the state which were divided into low and high natural increase counties. Such comparisons led him to conclude that the major cause of natural decrease in Iowa counties was heavy outmigration of young adults. Fertility was given a secondary role, but not to be underestimated, since "prolonged net out-migration was more likely to trigger natural decrease in counties of comparatively low fertility" (1974: 670). Chang
found that the natural decrease counties were generally very small in population, with a high proportion of rural-farm population, and concentrated in an area "with low crop yield due to inadequate soil fertility and natural hazards, which made crop production risky and uncertain (1974:669).

In sum, Chang agrees with Beale that outmigration seems to be the cause of natural decrease and not low fertility. As he puts it, "although fertility is lower in natural decrease counties than in natural increase counties, it would be inaccurate to say that natural population decrease in Iowa counties was due to inadequate fertility" (1974:665). Chang, however recognizes a more significant role of fertility than Beale did: "Low fertility, . . . , must have contributed to the imbalance between births and deaths in Iowa counties" (1974:665). Moreover, he attempts to explain why fertility is lower in the primarily rural natural decrease counties. He partially attributed this lower fertility to the religious composition of the counties. The natural decrease counties had fewer Catholics than the natural increase counties. But, as he admits, the data utilized (National Council of Churches, 1956; 1957) were for 1950 while the fertility data were for 1970, and the proportion of Catholics in each county group was very small (1974:667). This, however, is a very small part of the answer. Chang goes on to search for an explanation of
the lower fertility among natural decrease counties by referring to the work of Davis (1963) and Sly (1972) both of whom propose that populations can be expected to adjust their demographic behavior under certain circumstances. In essence Chang argues that the subject counties "have responded to their generally less favorable socioeconomic conditions by adjusting their demographic behavior, specifically migration and fertility" (Chang, 1974:670).

Chang, unlike Beale, places his explanation of the causes of natural decrease within a theoretical framework. As will be seen later in this chapter, however, his interpretation of the theoretical ideas set forth by Davis and to a degree by Sly is somewhat erroneous and he seems to accept them without any criticism.

This writer is generally in agreement with Chang's explanations. I believe, however, that a more thorough and complete study of the available theoretical literature is needed before one makes the conclusion that natural decrease counties are responding by adjusting their demographic behavior, especially fertility. This task is undertaken in the second part of this chapter.
II. Search for a Theoretical Framework: The Theory of the Demographic Response

Chang had relied primarily on the work of Davis (1963) and to a lesser extent Sly (1972) in order to provide a theoretical explanation for the heavy outmigration and lower fertility characterizing Iowa's natural decrease counties. A more detailed discussion of these works along with similar ideas of others is presented here to integrate existing thought into a theoretical framework to be referred to as the Theory of the Demographic Response. These ideas, once integrated, will provide guidelines for the methods and empirical analysis undertaken in this study.

Kingsley Davis outlined what he called a "Theory of the Multiphasic Response" in a paper entitled, "The theory of change and response in modern demographic history" which appeared in the Population Index in 1963 (pp.345-366). In order to illustrate his "theory", Davis used the demographic history of Japan during the twentieth century and of northwest Europe in the eighteenth and twentieth centuries. He argued that during the twentieth century the Japanese population responded demographically to some stimulus. Their demographic responses consisted mainly of celibacy, postponement of marriage, sterilization, increased
abortion, and outward migration. The stimulus to these responses, according to Davis, was "the decline in mortality and the sustained natural increase to which it gave rise" (1963:350). These responses, he continues, were not the consequence of "subjective poverty" since during this period Japan had experienced very high rates of economic growth. Rather they stemmed from the fact that the Japanese "found that their accustomed demographic behavior was handicapping them in their effort to take advantage of the opportunities being provided by an emerging economy.... Thus it was in a sense the rising prosperity itself, viewed from the standpoint of the individual's desire to get ahead and appear respectable, that forced a modification of his reproductive behavior" (1963:353). Davis argued that the demographic stimulus of lower mortality and consequently higher natural increase, affected especially the rural population of Japan as well as of northwest Europe in the eighteenth and nineteenth centuries. He suggested that the adjustment of Japanese and European peasants consisted primarily in outmigration to the industrializing urban areas, but also in lower fertility. As he puts it "rural marital postponement was particularly important in the eighteenth and early nineteenth centuries in northwest Europe, because outside opportunities were then too few to make outmigration work as the sole adjustment" (1963:358).
Davis summarizes his thesis by stating that, "faced with a persistent high rate of natural increase resulting from past success in controlling mortality, families tended to use every demographic means possible to maximize their new opportunities and to avoid relative loss of status" (1963:366). Davis, then, presents a thesis which sees populations responding to some stimulus by altering their demographic behavior, specifically through migration and fertility. His thesis would have been more complete if he had discussed increased mortality as a possible demographic response, as the existence of infanticide and gerocide along with other similar practices would suggest. While this was not a notable response in the societies Davis investigated a discussion of mortality would make his "Theory of the Multiphasic Response" more complete and more useful to other researchers.

While Davis' theory seems logically cogent and quite insightful it has serious drawbacks which need to be discussed before his ideas can be useful. First, he tends to overemphasize that in the case of Japan and northwest Europe the demographic response was due to an attempt to maximize new opportunities, rather than due to the experience or fear of poverty, since in his words, "the multiphasic effort to reduce population growth occurs simultaneously with a spectacular economic growth" (1963:}
Such an explanation leaves no room for the experience of "subjective" or real poverty on the part of rural populations resulting from their displacement through the mechanization of agriculture that accompanies the process of economic growth and industrialization. He makes what I consider a questionable assumption: that the fruits of economic growth are equally available for consumption to all segments of society; put in another way, he clearly implies that economic growth is not accompanied by the growth of poverty, at least for some. At a time when the benefits of economic growth, particularly in industrial societies, are increasingly being questioned, Davis' assumptions and implicit denial that segments of a society experience poverty (whether subjective or real) during the process of industrialization and economic growth, seem quite naive and unrealistic.

Another drawback in Davis' work is his insistence that the stimulus to which the populations of Japan and Northwest Europe responded demographically was lower mortality and the resulting higher natural increase. This seems somewhat unrealistic in addition to limiting the predictive utility of his theory. It is not lower mortality itself, but as Glass points out in commenting on Davis' paper, what produces a demographic response is
a "conflict between levels of living and aspirations..." (Glass, 1965). Such a conflict cannot only be brought about by lower mortality and higher natural increase as Davis strongly indicates, but by other factors as well. In my mind these other factors include the growth of poverty, especially in rural areas, which accompanies economic growth and industrialization, the exact factor that Davis chooses to discard.

Finally, while Davis' ideas seem to be an improvement on earlier formulations of the Theory of the Demographic Transition (Thompson, 1929; Notestein, 1945; Davis, 1945; Wrong, 1956; Hertzler, 1956; Kirk, 1955)—especially his consideration of the possible role of migration—he main point still lies within the parameters of that theory: that economic growth, somehow, brings about a fertility decline. The theory has come under increasing criticism in more recent years especially since many empirical studies did not find an inverse relationship between development (economic growth) and fertility (Collver, 1965). In discussing the transition theory Heer suggested that while in the long run the indirect effect of development is a decline in fertility, the initial direct effect of development is to increase fertility (1966). In the face of mounting criticism and the fact that scholars seem to be abandoning the theory at a time when policy makers are
beginning to take it seriously (Teitelbaum, 1975). Davis' proposition that economic growth produces fertility declines without specifying adequately the process and mechanisms which produce the decline seems somewhat outdated and misleading.

Despite its many shortcomings, Davis' work does provide great insight into the dynamics of natural population decrease. Chang was right in proposing that Iowa's natural decrease counties were responding to "unfavorable socioeconomic conditions" (1974:670). He was wrong, however, in placing this explanation within Davis' theory since Davis clearly stated that populations did not modify their fertility behavior because of poverty (undesirable socioeconomic conditions), but rather "it was the rising prosperity,..., that forced a modification of (the population's) reproductive behavior" (1963:359). Moreover, by taking Davis' thesis at face value and without any attempt at reformulating it, he is guilty of contradicting himself; Davis clearly remarked that populations responded to lower mortality and the subsequent higher natural increase this brought about (1963:353). It seems rather awkward for Chang to apply such a thesis without modifying it, to counties which are not experiencing declining mortality and, moreover, to counties experiencing lower (actually negative) rather than higher natural in-
crease.

This writer generally agrees with Chang that natural decrease counties respond to "undesirable socioeconomic conditions", but attributing such an explanation to Davis' version of the Theory of the Demographic Response would be wrong.

Ideas similar to Davis' which relate to the "demographic transition" of northwest Europe are supplied by Friedlander (1969) who is critical of the Theory of the Demographic Transition for ignoring the role of migration. One of Friedlander's main points is that an "adjustment in reproductive behavior of a community in response to a rising 'strain', for instance, a fall in death rates resulting in higher natural increase, may differ depending upon the ease with which the community can relieve the 'strain' through out-migration" (Friedlander, 1969:360). Thus, he proposes that the reason why the rural birth rate in France declined much earlier than in England, was France's slower and later urbanization (industrialization) so that rural to urban migration did not constitute a sufficient outlet (p.363). The English rural birth rate, on the other hand, declined much later because the excess natural increase was being absorbed in the rapidly industrializing urban areas. The Theory of the Demographic Transition, according to Friedlander, is not sensitive to
differences in the timing of alternative responses made by populations (p.363).

On the surface, Friedlander's version of the Theory of the Demographic Response might appear similar to Davis' especially since both writers discuss lower mortality and higher natural increase as a stimulus to outmigration and/or lower fertility. Friedlander, however, considers lower mortality as only one possible "strain" producing a demographic response. Moreover, Friedlander's interpretation of the differences in the timing of alternative responses stands in direct contrast to Davis' thesis that the response—primarily through fertility—is not the result of "subjective poverty" since it takes place (in Japan and northwest Europe) at a time when economic growth and opportunity are "spectacular". Friedlander clearly shows the exact opposite to be true in his comparison of rural fertility change in England and France. In England which experienced earlier and more rapid industrialization the fertility response of the rural population was much slower. An earlier and stronger fertility response was made by the rural population of France which experienced a later and slower rate of economic growth and industrialization. Davis' theory would predict a stronger fertility response in England where "...the rising prosperity..., viewed from the standpoint of the individual's desire to get ahead....
(would force) a modification of his reproductive behavior" (Davis, 1963: 353). Davis' version of the Theory of the Demographic Response is a minor modification of traditional Transition theory, while Friedlander's version can be better described as an alternative to Transition Theory.

More recently David Sly, working within the framework of human ecology, argued that populations can respond demographically through fertility, mortality, and migration. Among the three, he considers migration the most effective response in the short run. "It can increase or decrease population more rapidly than can changing fertility and is more efficient in that it can be selective. Its selective aspect also indicates that population composition and distribution can be changed more rapidly through migration than through the fertility response" (Sly, 1972, p. 618). To what do populations respond? Drawing upon the work of Hawley (1950), Schnore (1958), Duncan and Schnore (1959), and Gibbs and Martin (1959), Sly argues that populations respond demographically to changes in "sustenance organization". He views the "organization" component of the "ecological complex", following mainly the work of Gibbs, as:

a property of population (which) refers to the constellation of its activities which provide its livelihood. These activities we call sustenance activities...
Thus, the important question is whether the activity helps the population to sustain itself... In modern societies where money is the medium for sustenance, any activity yielding money is a sustenance activity... A population's sustenance organization can vary along two interrelated dimensions: (1.) The number of occupational niches and the population's distribution among them, and (2.) the degree of interdependence between occupations. The latter is conceived of as depending on the former because we assume that as the number of occupations increases, the degree of specialization in each increases. Thus, to study changes in population organization, we must focus on changes in the structure of the occupational pyramid and changes in the interdependence among occupations (Sly, 1972, pp. 616-17).

Since all the components of the ecological complex (population, organization, environment, technology) are interdependent, Sly points out that "population" can be viewed as a dependent variable. A population can alter itself through a "response" when there is an imbalance or disequilibrium between "population" and "organization" (Sly, 1972, p. 618). While he argues that populations can respond to "environmental" changes directly, "such responses are always reactions to cataclysmic changes like wars or epidemics" (1972, p. 619). Environmental change usually affects population indirectly by changing the population's organization. He further argues that popula-
tions never respond directly to changes in technology "because technology is effective to the extent that it alters organization" (1972, p. 619).

Sly applies the above ideas to the study of migration. His main argument is that "technology" and "environment" operate indirectly on migration by altering a population's "organization". He tests this proposition empirically by examining the migration of Blacks from the "old cotton belt" and finds general support for his ecological model.

Thus, working within the framework of human ecology, Sly sees populations responding demographically to changes in "sustenance organization". The most efficient response, he argues, is through migration. His empirical assessment of his model was limited to demonstrating a "migration response" on the part of southern rural blacks. His empirical model is only applicable to such a population and guidelines for dealing with the total population of counties and for investigating a possible fertility response are lacking.

In a recent paper Frisbie and Poston criticized Sly for not assessing "the differential impact of various types of sustenance activities" (1975, 773), implying that the simultaneous effect of several sustenance activities must be analyzed. They also indicate that sustenance indicators are better related to population change (growth
or decline) rather than just migration. Thus, they proceed to examine through multiple regression the relationship between different sustenance activities and population change in nonmetropolitan counties of the United States from 1960 to 1970. The independent variables succeeded in explaining 23 percent of the variation in population change an amount which the authors consider "substantial" (p.781). The addition of other independent variables to test alternate hypotheses added only 2 percentage points to the total variance explained. These additional variables were indicators of the age structure, racial composition, employment and income, and proximity to metropolitan areas (pp.779-781). Their lack of explanatory power, they suggest, leads to more faith in the relationship between sustenance organization and population change.

Frisbie and Poston place a great deal of faith in their findings. In the conclusion of their paper they state: "Our demonstration that the sustenance activities examined in this paper account for almost one-quarter of the variability in nonmetropolitan population change supports these earlier discussions (by human ecologists). It is tempting to go even further and interpret these results as evidence that changes in the size of nonmetropolitan county populations represent a demographic response to variation in sustenance organization" (p.782). They
choose to resist that temptation but at the same time em¬
phasize that "one of the most compelling conclusions
emanating from this study concerns the viability of an
explanation based on sustenance organization. This ex¬
planation was sustained under the pressure of five com¬
peting hypotheses" (p.782).

Some critical comments on the work by Frisbie and
Poston is in order. First, the hypothesis that suste­
nance organization influences population change is a
valid one. I do not share, however, with the authors the
belief that 23 percent explanation of variance is sub­
stantial. It is rather low and, I believe, that the
reason for this does not lie in their choice or construc­
tion of their predictor variables; rather it is due to
their choice of the dependent variable. No doubt sus­
tenance activities influence population change, but pop­
ulation change is the product of primarily two demographic
processes: fertility and migration. Sustenance indica­
tors are likely to influence fertility and migration dif­
ferently and lumping the two together is bound to reduce
the variation explained. The same can be said about the
alternate hypotheses which were dismissed since the rele­
vant variables, when introduced, failed to show explanatory
power. A clear example is the effect of racial composition.
The proportion of blacks in counties is likely to have a
positive effect on fertility, thus increasing population size. At the same time it is likely to be negatively related to net migration, thus reducing population size. The counterbalancing effects lead to an insignificant effect of racial composition which Frisbie and Poston report. Much the same applies to the other variables which were dismissed, such as the age structure, income, etc. While it is important to examine the factors influencing population change, the authors would have contributed more by examining the effect of such factors on fertility and migration separately and then investigating the effect of fertility and migration on population change.

The work by Frisbie and Poston was discussed here because it is related to previous studies dealing with the question of demographic responses despite the fact that the authors resist the temptation to resort to such an explanation. Furthermore, its approach and limitations can provide some guidelines for this investigation.

III. The Theory of The Demographic Response as a Theoretical Framework

In the first part of this section a review of the existing literature on natural population decrease was given. The three important studies by Dorn, Beale, and Chang are essentially different. Dorn looked at the
phenomenon during the 1930's and attributed it to the very low fertility of the depression era. While he seemed somewhat alarmed and projected that natural decrease would be more widespread in the future, the phenomenon disappeared almost entirely during World War II. Beale gives a descriptive account of the development of natural population decrease from 1950 to 1966. He shows how, during this period, natural decrease expanded to affect many counties in the United States most of which were primarily rural. He attributes the emergence of natural decrease during this period to heavy outmigration of persons in their childbearing years and the resulting distortion of the age distribution of the counties affected. While the possible effect of low fertility is discussed, it is given a very secondary role. Chang looks at natural population decrease in Iowa counties during the period 1966-1970 and generally agrees with Beale regarding the role of outmigration in producing natural population decrease. His study differs from Beale's in that he engages in some statistical analysis and attempts to delineate the importance of low fertility. He concludes, however, that while fertility is an important factor it is of secondary importance.

In the second part of this chapter a search was made for a theoretical framework within which natural population
decrease can be explained. A review was presented of several studies which see populations modifying their demographic behavior in response to some stimulus. More specifically, a critical review was presented of studies by Davis, Friedlander, Sly, and Frisbie and Poston. These studies are different in their subject matter and approach, but all contain ideas related to what is here called the Theory of the Demographic Response. What follows is an attempt to integrate some of these ideas into a framework which will provide theoretical guidelines for the present study.

The most general proposition that is common to all four studies reviewed is that populations alter their demographic behavior by responding to some stimulus. For Davis this stimulus is lower mortality and sustained population growth. Friedlander recognizes lower mortality as a stimulus but only as one of several possible "strains" felt by a population. Sly and Frisbie and Poston entertain the hypothesis that populations respond to variations in a population's sustenance organization.

While none of the above explanations are necessarily false, they seem to be incomplete and limited in their utility as general theoretical frameworks which can guide empirical research seeking to explain demographic change. A possible exception is Friedlander's work which takes into account the relation between migration and fertility.
which can lead to different patterns of response. To re-
capitulate, he argued that the timing of a fertility re-
response depends on the ease with which populations can re-
lieve their excess natural increase through outmigration.
But what is *excess* natural increase which both Davis and
Friedlander attribute to lower mortality? It seems that
if we define excess natural increase as a factor which
can, if not relieved through outmigration, create an im-
balance between a community's "sustenance organization"
and "population", we are a step closer to bridging the
gap between Davis and Friedlander on the one hand, and
Sly and Frisbie and Poston on the other. Friedlander,
however, unlike Davis, indicated that lower mortality and
excess natural increase is not the only stimulus to demo-
graphic response; it is one of several possible "strains"
that can bring about demographic adjustments. The human
ecologists, including Sly and Frisbie and Poston, would
be in agreement with such a broader explanation since they
generally see imbalances between "population" and "organ-
ization" as originating in any of the four components of
the "ecological complex", specifically population, organ-
ization, environment and technology (Duncan, 1959; Duncan
and Schnore, 1959). While Sly's main argument is that en-
vironment and technology affect population indirectly
through changes in sustenance organization (1972:619), this
is not in contradiction to Duncan's earlier hypothesis that an imbalance in ecological equilibrium can originate in any one of the four components of the ecological complex. Davis, on the other hand, saw an imbalance in the ecological equilibrium of the populations he studied as originating primarily in the "population" component of the ecological complex, more specifically in lower mortality. One could, of course, working within the ecological framework trace Davis' explanation to a change in technology. But this is besides the point made here: that Davis' work is limited as a general theoretical framework which could guide empirical research; demographic adjustments through fertility and/or migration are not the result of mortality change alone.

Friedlander was a step closer to a general theoretical framework by arguing that other "strains" can cause demographic responses, although he did not specify them. These "strains", again, can be seen as imbalances in the ecological equilibrium the human ecologists discuss. What the human ecologists ignore is the intervening or social psychological variables which must be discussed if one is to understand population change. In other words a strain or imbalance in equilibrium will vary in its effect on population change depending on the motivations and perceptions by individuals of such a strain or im-
balance. For example a strain does not become effective in modifying demographic behavior unless it disturbs the standard of living of a population which is viewed subjectively from the point of view of the individual person. At the same time there must be a knowledge and/or belief that one's standard of living can be improved by changes in demographic behavior, specifically outmigration or fertility control. And, as Friedlander hypothesizes, fertility change depends on the degree to which an outmigration outlet exists.

In order to arrive at a second proposition of the Theory of the Demographic Response we need to agree what constitutes, in general terms, a stimulus to adjustments in demographic behavior. It was just mentioned that in such a venture the subjective point of view of individuals must be taken into consideration. In commenting on Davis' paper, Glass proposed that what is important is not lower mortality but a "conflict between levels of living and aspirations..." (1965). Indeed a number of "strains" can bring about such a conflict which, by definition, is subjectively viewed.

The examination of the work of Davis, Friedlander, Sly, Frisbie and Poston along with a more general consideration of human ecology leads to the formulation of a second general proposition of the Theory of the Demographic
Response: **Populations adjust their demographic behavior in response to a “strain” which threatens their standard of living viewed subjectively from the point of view of the individual and when there is sufficient knowledge and a belief that one's standard of living can be improved through changes in his demographic behavior.** From this general proposition many lower level ones could be derived. Indeed many such propositions are given by the authors discussed previously. For example, Sly proposes that migration is the most efficient demographic response in the short run. "It can increase or decrease population more rapidly than can changing fertility and is more efficient in that it can be selective" (Sly, 1972:619). Migration, however, is not always a sufficient response as Friedlander shows. A proposition derived from Friedlander's work states that the intensity of a fertility response depends on the degree of existence of a migration outlet (Friedlander, 1969:360). Another lower level proposition derived from Davis suggests that a possible strain causing demographic responses is success in controlling mortality (Davis, 1963:350). Indeed such a proposition dealing in particular with reductions in infant mortality has long been held by demographic transition theorists (Teitelbaum, 1975:420).

One can go on in deriving propositions of this sort
or identifying them in many existing studies. What was intended here was an attempt to integrate existing ideas so that a framework could be developed to guide the empirical analysis of this study. Thus what is needed here is a discussion of how this synthesis of ideas will provide guidelines to a study of natural population decrease.

Before that is done, however, another comment on the Theory of the Demographic Response is in order. In the discussion thus far it has been assumed that fertility and migration are the demographic processes through which a demographic response operates. While this is the case most of the time, it should be recognized that populations can also respond by increasing mortality. Infanticide and similar population control means have been common in some societies. But there is evidence that even where such practices are absent societies may "institutionalize the noncontrol of mortality" (Matras, 1973:471). Discussion of mortality in these terms assumes a conscious and/or institutionalized response on the part of populations. Discussion of mortality within the Theory of the Demographic Response becomes important when we consider that increased mortality can also be an "unconscious response" on the part of populations. The Malthusian "positive checks" are an example of such an unconscious response. The human ecologists also have recognized that mortality can rise, in the absence of
a migration outlet, when population growth outstrips the growth of sustenance activities (Hawley, 1950). While such a mortality "response" might seem unimportant, I believe that, given the realities of our times and future prospects, it could be a factor to which demographers and other social scientists might want to pay more attention.

IV. Implications of The Theory of the Demographic Response for the study of natural population decrease

In his analysis of natural population decrease in Iowa counties Chang (1974) sought to explain the heavy outmigration and low fertility in the natural decrease counties within the framework of Davis' version of the Theory of the Demographic Response. It was pointed out previously that while he was essentially right in attributing the emergence of natural decrease to "unfavorable socioeconomic conditions", tracing this to Davis would be wrong. In this chapter a more general theoretical framework was developed by integrating the work of several writers. This, I believe, will provide a better theoretical framework within which natural population decrease in Iowa as well as the West South-Central region of the United States can be explained. The statement that Iowa's natural decrease counties were responding to unfavorable socioeconomic conditions through outmigration and lower fertility by Chang is an explanation that can be derived from the main
proposition developed in the previous section of this chapter.

Much the same applies to the experience of natural population decrease in Texas, Oklahoma and Arkansas. It is hypothesized here that natural population decrease in the subject area is the result of a demographic response. The response mainly responsible for the occurrence of natural decrease consists of heavy outmigration of persons in their child-bearing years, but also of lower fertility. One of the main tasks of this study is to show why a demographic response is exercised by the subject counties. An attempt will be made to find indicators of "strains" which operate to bring about a "conflict between levels of living and aspirations" and which indirectly produce natural population decrease. How this is to be done is discussed in the following chapter which describes the methods followed and presents more specific hypotheses to be tested.
CHAPTER 3

METHODS

I. Natural Decrease defined

Natural population decrease occurs when there is an excess of deaths over births in a population during a specified period of time. Since migration is not considered by this definition, natural decrease does not necessarily imply a population decline although this can be expected most of the time. Similarly, the existence of natural increase in an area is not always accompanied by population growth since outmigration can offset the gains of natural increase. Indeed many natural increase counties can be expected to exhibit population losses.

In his study of natural population decrease in Iowa counties Chang defined as natural decrease counties those which experienced an excess number of deaths over births in at least three years during the period 1966-1970 (Chang, 1974:659). In this study, natural decrease in Texas, Oklahoma and Arkansas is investigated for the seven-year period 1968-1974. Natural decrease counties are designated those with an excess number of deaths over births during the seven-year period taken together. A rate of natural decrease (and increase) is computed for each county using the formula (Number of Births - Number of

39
Deaths during 1968-1974)/(1970 County Population) × 100. Looking at natural decrease in this fashion avoids the problem of fluctuations in births and deaths from year to year.

According to the above formula, 111 of the region's 406 counties are natural decrease counties. Of these 75 are located in Texas, 26 in Oklahoma, and 10 in Arkansas. Thus more than 27 percent of the region's counties are natural decrease counties by the definition employed here (Table 2).

The counties experiencing natural increase are further subdivided into two groups: those with a rate of natural increase below the mean natural increase rate of all increase counties (5.0) are labelled low increase counties, while those above the mean are labelled high increase counties. This yields 166 low increase and 129 high increase counties.

II. Specific Objectives and Approach

Building upon the extant literature on natural decrease, this study will investigate the nature of the phenomenon in the West South-Central United States and will attempt to empirically delineate its causes. The empirical findings will subsequently be compared to the theoretical ideas presented in Chapter 2. Specifically, this study is an attempt to empirically test hypotheses derived from the Theory of
Table 2.- Counties Experiencing Natural Population Decrease
in Texas, Oklahoma and Arkansas: 1968-1974

<table>
<thead>
<tr>
<th></th>
<th>All Counties</th>
<th>Natural Decrease Counties</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>254</td>
<td>75</td>
<td>29.5</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>77</td>
<td>26</td>
<td>33.8</td>
</tr>
<tr>
<td>Arkansas</td>
<td>75</td>
<td>10</td>
<td>13.3</td>
</tr>
<tr>
<td>Total</td>
<td>406</td>
<td>111</td>
<td>27.3</td>
</tr>
</tbody>
</table>
the Demographic Response. In addition it attempts to verify whether Beale's and Chang's findings are supported by the analysis in the subject region.

Thus, this writer intends to investigate the role of outmigration and low fertility in producing natural decrease. Beale (1969) and Chang (1974) argued that the main force behind natural decrease was heavy outmigration of young persons which led to a decrease in the proportion of persons of child-bearing age and an increase in the proportion of older persons. One of our tasks then becomes the verification of the extent to which the age structure of natural decrease counties is significantly different from that of natural increase counties. At the same time an attempt will be made to show the respective contribution of outmigration and fertility to age-structural changes and natural decrease.

In searching for the immediate causes of natural decrease, then, the author will look at the effects of three key demographic variables: age structure, migration and fertility. These variables, however, provide only a demographic explanation of natural decrease since they are elements of the "population model" or "population system" (Ryder, 1964: 447-450; Goldscheider, 1971, chapter 1). Following Goldscheider's suggestions (1971, chapter 2) the writer
will move out of the boundaries of the population system in order to seek sociological explanations of the elements of the population system and, consequently, of natural decrease. In other words, the investigator's task becomes one of explaining not just how migration, fertility and age structure interact to produce natural decrease, but also of explaining why this is the case. Thus, socioeconomic variables influencing the demographic variables will be introduced into the analysis in order to provide for a more complete explanation of natural population decrease.

The investigation of the factors behind natural decrease will consist of two parts. First, following Chang's methods, the three groups of counties specified earlier in this chapter, will be compared in terms of many demographic and socioeconomic variables. This will permit this investigator to assess whether relationships found by Chang in Iowa also hold in Texas, Oklahoma and Arkansas. Second, this study will go beyond past research by approaching the problem from a multistage-multivariate perspective. It was felt that making causal inferences from differences observed in groups of counties would not be sufficient. More specifically, based on the results of comparisons and on the available data and theory, the second part of the analysis will consist of developing a path analysis model
of natural decrease (increase). This model will at first include components of the population system as determinants of natural decrease (increase), namely measures of net migration, fertility and the age structure of counties. Subsequently the model will be expanded to include socioeconomic variables influencing natural decrease indirectly through the elements of the population system. The selection of these variables will be guided by the Theory of the Demographic Response, ecological theory, suggestions in other literature, the available data, as well as peculiarities of the region and of the approach followed. A more detailed discussion of the path model developed and the variables involved is presented in the next chapter following the comparisons of county groups.

III. Hypotheses

Based on the findings and suggestions of previous studies, the following hypotheses will be tested through comparisons of county groups:

1. The natural decrease counties in the region under study will be on the average much smaller in population than the increase counties. While more than a fourth of the region's 406 counties are natural decrease counties they will include a much smaller percentage of the total population of the region.
2. The natural decrease counties will be primarily rural with many of them being entirely rural, while a much higher proportion of the increase counties will contain large urban populations.

3. The natural decrease counties will contain a higher proportion of rural-farm population than the increase counties.

4. Most natural decrease counties will show population declines during 1960-1970, while most of the high increase counties are expected to show population gains during the same period.

5. The natural decrease counties will be on the average much "older" than the increase counties as indicated by several measures of age.

6. While the majority of the counties are expected to show migration losses during 1960-1970, the rate of outmigration will be higher among the natural decrease counties. More importantly, the natural decrease counties are expected to show much higher rates of net-outmigration among persons in their child bearing years (15 to 29).

7. The natural decrease counties will be characterized by lower fertility than the natural increase counties, even though they are primarily rural in composition.

8. The natural decrease counties are expected to ex-
perience more "unfavorable socioeconomic conditions" than the natural increase counties as indicated by several measures.

Hypotheses to be tested through path analysis are given in chapter 4 where the path model is presented.

IV. Measures of important variables

1. Natural Decrease (Increase): Defined above.

2. Measures of age structure of county populations:
   a. Median age
   b. Index of Aging = (Population 65 years and over/Population under 15) X 100
   c. Youth-Dependency Ratio = (Population under 15/Population 15-64) X 100
   d. Aged-Dependency Ratio = (Population 65 years and over/Population 15-64) X 100
   e. Percent of total Population who are 65 years old and over

3. Net Migration
   b. Persons Aged 15-29: the above formula is utilized with persons aged 15-29 instead of the total population

4. Fertility Measures
   a. Children Ever Born per 1,000 Women Aged 35-44
b. Fertility Ratio = \( \frac{\text{Population under 5}}{\text{Population of Women Aged 15-44}} \times 1000 \)

c. General Fertility Rate = \( \frac{\text{Births in 1970}}{\text{Population of Women Aged 15-44}} \times 1000 \)

V. Sources of Data

The data utilized in this study are from primarily two sources: vital statistics for the states of Texas, Oklahoma and Arkansas, and the United States Census of Population. Vital Statistics for the years 1968 to 1974 will be used in order to compute the rate of natural decrease (increase) for each county in the region. Data on several socioeconomic variables will be drawn mainly from the 1970 Census of Population. Some 1960 Census data will also be used. The 1959 Census of Agriculture will supply some farm-related data. Finally, net migration rates are computed from data recently published in *Net Migration of the Population, 1960-1970, by Age, Sex, and Color*, by the U.S. Department of Agriculture, the University of Georgia and the National Science Foundation.

VI. Summary

This study draws on previous literature on natural population decrease and related theoretical literature and investigates the phenomenon in the 406 counties comprising the states of Texas, Oklahoma and Arkansas. It
follows Chang's methods of comparing natural decrease counties to natural increase counties, but also goes beyond that by looking at natural decrease from a multi-stage-multivariate perspective. Several hypotheses were presented in this chapter and others to be tested by path analysis will be presented in the next chapter. This study investigates the effect of demographic factors (migration, fertility, age structure) on natural decrease and, also, tests the viability of the Theory of the Demographic Response by incorporating relevant socioeconomic indicators into the analysis.

Like most sociological analyses this investigation is bound by many limitations. These are discussed in the final chapter. One limitation that deserves some attention at this point, is the use of path analysis. Path analysis is a multivariate technique currently enjoying wide popularity among sociological researchers. Its chief advantage over other multivariate techniques such as multiple regression is its ability to decompose linear relationships among a set of variables into direct, indirect and joint effects (Finney, 1972; Alwin and Hauser, 1975). Its use in sociological analyses, however, is limited by its assumptions: known causal order among variables, interval measurement, linearity, additivity, etc. (Heise, 1968; Nygreen). Since most analyses do not meet all assumptions, caution is required in interpreting results yielded by path analysis.
CHAPTER 4
FINDINGS

I. The three county groups compared

The 111 natural decrease counties constitute 27.3 percent of the region's 406 counties, but their combined 1970 population of 1,117,659 makes up only about 6 percent of the region's total population. Thus, the natural decrease counties are small when compared to the natural increase counties. In 1970 they had a median population of 8,048. The low increase counties had a median population of 16,222 while the high increase counties were even larger with a median population of 24,166 (Table 3). In general, the decrease counties are primarily rural while the increase counties are primarily urban. In 1970 the decrease counties had a median percentage of urban population of only about 27.3, while the figures for the low increase and high increase counties were 38.0 and 61.0 respectively. Of the 111 decrease counties 49 were completely rural. The proportion of the population that was of rural-farm residence was much higher in the decrease than in the increase counties (Table 3).

As one would expect, the natural decrease counties show higher rates of population decline. Their median percentage decrease during 1960-1970 was -8.7. The low
Table 3.- Demographic Characteristics of Counties by County Groups: 1970

<table>
<thead>
<tr>
<th>Demographic Characteristics</th>
<th>Natural Decrease (N=111)</th>
<th>Low Increase (N=166)</th>
<th>High Increase (N=129)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median population</td>
<td>8,048</td>
<td>16,222</td>
<td>24,166</td>
</tr>
<tr>
<td>Median percentage of urban population</td>
<td>27.3</td>
<td>38.0</td>
<td>61.0</td>
</tr>
<tr>
<td>Median population change, 1960-1970</td>
<td>-8.7</td>
<td>-0.15</td>
<td>5.0</td>
</tr>
<tr>
<td>Median percent change in urban population 1960-1970</td>
<td>-2.4</td>
<td>7.1</td>
<td>17.2</td>
</tr>
<tr>
<td>Median percentage of rural-farm population</td>
<td>17.9</td>
<td>11.4</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Source: U.S. Bureau of the Census (1973)
increase counties also had a median percentage decrease, but it was only -.15. The high increase counties, on the other hand, experienced a median population increase of 5.0 percent (Table 3). Large differences are also evident in the changes of the urban components of the county groups during 1960-1970. While increase counties in general showed large gains in their urban populations, those decrease counties with urban populations (62) showed a median decline of -2.4 percent.

One marked difference between the three county groups is their populations' age structure. Several measures of age structure indicate that the natural decrease counties are generally much "older." Table 4 reveals, for example, that the median age in 1970 was 40.2 in the natural decrease counties, 32.7 in the low increase and only 26.3 in the high increase counties. This condition is confirmed by the proportion of the population 65 years old and over, the index of aging, the aged dependency ratio, and the youth dependency ratio (Table 4).

A. The importance of age

It was just demonstrated that the natural decrease counties are much "older" than the natural increase counties. Both Beale and Chang emphasized that natural population decrease occurs through a "distortion" in the age structure of a county's population (Beale, 1969:93; Chang, 1974:661).
Table 4.- Median Measures of Age Structure of Counties by County Groups: 1970

<table>
<thead>
<tr>
<th>Measures of Age</th>
<th>Natural Decrease (N=111)</th>
<th>Low Increase (N=166)</th>
<th>High Increase (N=129)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age</td>
<td>40.2</td>
<td>32.7</td>
<td>26.3</td>
</tr>
<tr>
<td>Percent of population 65 yrs. and older</td>
<td>19.2</td>
<td>14.2</td>
<td>8.6</td>
</tr>
<tr>
<td>Index of aging</td>
<td>80.2</td>
<td>53.6</td>
<td>30.5</td>
</tr>
<tr>
<td>Aged dependency ratio</td>
<td>33.5</td>
<td>23.6</td>
<td>14.3</td>
</tr>
<tr>
<td>Youth dependency ratio</td>
<td>40.2</td>
<td>45.3</td>
<td>52.4</td>
</tr>
</tbody>
</table>

Source: U.S. Bureau of the Census (1973)
Natural decrease counties typically have too many older persons and too few persons of child-bearing age so that the number of births is not large enough to compensate for the number of deaths occurring in the population.

In order to further examine the relationship between age structure and natural increase Pearson's zero order correlations were computed between the several measures of age and the rate of natural increase (decrease) with all 406 counties. The coefficients presented in Table 5 indicate the existence of strong relationships. The best predictor of natural increase (decrease) seems to be median age with an r of -.89. Thus, Beale and Chang were correct in emphasizing the importance of the age structure in producing natural population decrease. If a distorted age structure is the mechanism which produces natural decrease, then what are the forces behind such age structural changes? Beale and Chang clearly argue that the primary cause of changes in the age structure, and consequently natural decrease, is outmigration of young adults. They view fertility as playing a role, but only a minor one. The relative importance of these two processes is discussed next.

3. The role of migration

Beale and Chang both attributed the occurrence of natural decrease to changes in the age structure of county
Table 5.- Zero Order Correlation Coefficients between Measures of Age and Rate of Natural Increase:

All Counties

<table>
<thead>
<tr>
<th>Median Age</th>
<th>Percent 65+</th>
<th>Index of Aging</th>
<th>Aged D.R.</th>
<th>Youth D.R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>-.89</td>
<td>-.86</td>
<td>-.42</td>
<td>-.82</td>
<td>.65</td>
</tr>
</tbody>
</table>
populations produced by heavy outmigration of young adults. In Beale's words: "The major cause of the current and prospective natural decrease is the distortion of county age structures resulting from high rates of age-selective out-migration" (Beale, 1969:93). In a similar manner Chang proposes the same: "Net out-migration clearly was a dominant factor in bringing about natural decrease in Iowa. Because the out-migrants were predominantly young adults, the age structure of natural decrease counties became highly distorted, and death rates in these counties reached a level too high to be compensated for through reproduction" (Chang, 1974:668). Chang had estimated that the majority of outmigrants from Iowa's natural decrease counties were between 15 and 29 years old (Chang:661), but did not compare net migration rates of that age group for county groups. Rather his analysis consisted of comparisons of total net migration rates. The median net migration rate for the natural decrease counties was -12.2, for the low increase counties it was -9.5 and for the high increase -4.3. He concluded that "...the natural decrease counties had significantly higher rates of out-migration than did any other group" (Chang:662).

In order to see if the same relationship between total net migration and natural decrease also holds in Texas, Oklahoma, and Arkansas median rates of total net
migration were computed for the three county groups during the period 1960-1970. As in Iowa, all three county groups show median net outmigration, but the computed rates do not support Chang's finding that total net migration is related to natural decrease. Table 6 shows that the highest rate of total outmigration characterizes the high increase counties. It is clear that high rates of outmigration do not necessarily produce natural decrease. Apparently the pattern of outmigration in the increase counties did not lead to a "distorted" age structure indicating that it was not primarily selective of young adults. A Pearson's zero order correlation coefficient of .03 between total net migration and median age confirms the lack of a significant relationship between net migration and the rate of natural decrease (increase).

The recent publication of net migration data for counties by age permits the investigation of the relationship between the net migration rates of persons aged 15 to 29. Table 6 indicates that while all three county groups experienced high net outmigration of persons in this age group from 1960 to 1970 the median rate is much higher in the case of the natural decrease counties. For both sexes the rate was -63.6 for the decrease counties, -47.0 for the low increase and -38.2 for the high increase counties. The relationship also holds when the rates are computed for
Table 6.- Median Net Migration Rates by County Groups:

1960-1970

<table>
<thead>
<tr>
<th>Net Migration Rates</th>
<th>County Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Natural Decrease (N=111)</td>
</tr>
<tr>
<td>Total</td>
<td>-8.9</td>
</tr>
<tr>
<td>Males aged 15-29</td>
<td>-68.7</td>
</tr>
<tr>
<td>Females aged 15-29</td>
<td>-61.6</td>
</tr>
<tr>
<td>Both sexes aged 15-29</td>
<td>-63.6</td>
</tr>
</tbody>
</table>

Source: U.S. Dept. of Agriculture, University of Georgia, National Science Foundation (1975)
the two sexes separately. Thus, the distortion in the age structure of the natural decrease counties is due in large part to high rates of outmigration of persons of child-bearing age. The zero order correlation coefficients between the rate of net migration of all persons aged 15 to 29 and median age and the rate of natural increase are -.45 and .37 respectively. The role of migration will be further discussed later in this chapter.

C. The role of fertility

Beale and Chang both attributed the emergence of natural decrease to distortions of the county age structures through high rates of age-selective outmigration. Further, they both viewed the role of fertility as secondary. Beale argued that the existence of natural decrease "...does not stem from low, inadequate fertility rates, unlike the primary nature of the case in the 1930's. Fertility in the subject counties is not high...But, it is more than sufficient for population replacement in every natural decrease county..."(Beale,1969:93). Thus, Beale merely noted that fertility was not high in the natural decrease counties and attributed natural decrease almost exclusively to out-migration. He makes no attempt to answer the question why the primarily rural natural decrease counties are characterized by relatively low fertility. Chang, on the other hand, attempted to delineate the role fertility plays
in contributing to the development of natural decrease. He compared the three county groups in Iowa on several measures of fertility and found that natural decrease counties have lower fertility than natural increase counties. He concluded that "...although fertility was lower in natural-decrease counties than in natural-increase counties, it would be inaccurate to say that natural population decrease in Iowa counties was due to inadequate fertility. Low fertility, however, must have contributed to the imbalance between births and deaths in Iowa counties" (Chang:665).

Following Chang's example several fertility measures were computed for the three county groups in the subject area. Fertility is consistently lower in the natural decrease group giving support to Chang's findings in Iowa counties. Table 7 presents the computed median fertility ratios and general fertility rates for the three county groups.

An additional measure of fertility published in the census is the number of Children Ever Born per 1,000 women aged 35-44. The results are similar (Table 8). The median CEB in the natural decrease counties was 3,068; it was 3,155 in the low increase counties and 3308 in the high increase counties.

These fertility figures are quite similar to Chang's
Table 7.- Fertility Measures by County Groups: 1970

<table>
<thead>
<tr>
<th>Fertility Measures</th>
<th>Natural Decrease (N=111)</th>
<th>Low Increase (N=166)</th>
<th>High Increase (N=129)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median fertility ratio</td>
<td>331</td>
<td>352</td>
<td>395</td>
</tr>
<tr>
<td>Median general fertility rate</td>
<td>81.0</td>
<td>87.8</td>
<td>99.6</td>
</tr>
</tbody>
</table>

Source: U.S. Bureau of the Census (1973)
Table 8.- Median Number of Children Ever Born per 1,000 Women Aged 35-44 by Residence and by County Groups: 1970

<table>
<thead>
<tr>
<th>Median CEB</th>
<th>County Groups</th>
<th>Natural Decrease (N=111)</th>
<th>Low Increase (N=166)</th>
<th>High Increase (N=129)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total population</td>
<td>3,068</td>
<td>3,155</td>
<td>3,308</td>
<td></td>
</tr>
<tr>
<td>Rural Farm Population</td>
<td>3,103</td>
<td>3,156</td>
<td>3,383</td>
<td></td>
</tr>
<tr>
<td>Rural Non Farm population</td>
<td>3,292</td>
<td>3,427</td>
<td>3,515</td>
<td></td>
</tr>
</tbody>
</table>

Source: U.S. Bureau of the Census (1973)
findings in Iowa counties. The primarily rural natural decrease counties are characterized by substantially lower fertility than the primarily urban high increase counties. Since the Census Bureau also publishes the number of Children Ever Born for the rural-farm and rural-nonfarm populations of counties, the fertility differentials between the county groups can also be examined in terms of these components of the county populations. The respective median figures show consistently lower fertility in the natural decrease counties.

In order to further examine the effect of the degree of urbanization on fertility differentials median fertility measures were also computed by controlling for the percent of the population that was urban in 1970. The data in Table 9 indicate consistently lower fertility in the natural decrease counties regardless of the degree of urbanization. In addition, within the group of natural decrease counties there seems to be little variation in fertility by percent urban. The fertility ratio remains about the same; the number of Children Ever Born is somewhat lower in the primarily urban counties while the general fertility ratio is somewhat higher. Regardless of the level of urbanization, then, the occurrence of natural decrease is associated with low fertility. Within the low and high increase counties, the primarily urban coun-
ties show lower fertility with the exception of the general fertility rate. It should be noted here that the general fertility rate is not a very reliable measure of fertility since it takes into account the number of births occurring during one year (1970). Since many of the counties in the region have small populations and, therefore, few births such a measure of fertility can be expected to fluctuate from year to year. With this in mind, and the fact that the measure for the less than 30 percent urban high increase counties is computed for only 18 counties, the lower figure for these counties (86.8) can be expected to reflect chance fluctuations rather than the true picture. The more reliable fertility ratio and Children Ever Born measures suggest that the primarily urban high increase counties have considerably lower fertility. The figures are somewhat mixed if one compares the increase counties with less than 30 percent urban populations with those of 30 to 60 percent urban.

The data in Table 9 permit the following observations: First, within counties experiencing natural increase the traditional relationship between fertility and urbanization seems to hold, with exceptions. Second, within the natural decrease counties the degree of urbanization does not seem to make much difference. Fertility remains about the same at a relatively low level. Furthermore, fertility in the primarily rural natural decrease counties (less than
Table 9.- Median Fertility Measures by Percent Urban and by County Groups: 1970

<table>
<thead>
<tr>
<th>Fertility Measures</th>
<th>Natural Decrease</th>
<th>Low Increase</th>
<th>High Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 30 percent urban</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N=57)</td>
<td>(N=59)</td>
<td>(N=18)</td>
<td></td>
</tr>
<tr>
<td>Fertility Ratio</td>
<td>331</td>
<td>354</td>
<td>402</td>
</tr>
<tr>
<td>Children Ever Born</td>
<td>3057</td>
<td>3247</td>
<td>3508</td>
</tr>
<tr>
<td>General Fertility Rate</td>
<td>79.5</td>
<td>87.7</td>
<td>86.8</td>
</tr>
<tr>
<td>30 to 60 percent urban</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N=39)</td>
<td>(N=79)</td>
<td>(N=43)</td>
<td></td>
</tr>
<tr>
<td>Fertility Ratio</td>
<td>331</td>
<td>360</td>
<td>425</td>
</tr>
<tr>
<td>Children Ever Born</td>
<td>3093</td>
<td>3179</td>
<td>3516</td>
</tr>
<tr>
<td>General Fertility Rate</td>
<td>81.2</td>
<td>88.5</td>
<td>104.6</td>
</tr>
<tr>
<td>More than 60 percent urban</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N=15)</td>
<td>(N=28)</td>
<td>(N=68)</td>
<td></td>
</tr>
<tr>
<td>Fertility Ratio</td>
<td>332</td>
<td>326</td>
<td>379</td>
</tr>
<tr>
<td>Children Ever Born</td>
<td>2891</td>
<td>2930</td>
<td>3099</td>
</tr>
<tr>
<td>General Fertility Rate</td>
<td>83.7</td>
<td>86.2</td>
<td>98.6</td>
</tr>
</tbody>
</table>

Source: U.S. Bureau of the Census (1973)
30 percent urban) is lower than in the primarily urban (more than 60 percent urban) high natural increase counties, a finding also reported by Chang in Iowa counties (pp.665-666). All three measures employed confirm this. This raises an important question about the traditional negative relationship between urbanization and fertility (Duncan and Reiss,1956; Hathaway et.al.,1968;Smith and Zopf,1970). While the relationship holds in most cases, when areas of natural decrease are involved rural fertility can be lower than fertility in urban areas experiencing natural increase. In this region, where about a fourth of the counties are experiencing natural decrease, no negative relationship can be established between fertility and urbanization for all counties. Pearson's zero order correlations between percent urban and the three fertility measures support the absence of a negative relationship. While the relationship with Children Ever Born was negative it was only an insignificant -.01. The relationships, on the other hand, with the fertility ratio and the general fertility rate were positive but fairly low: .07 and.11 respectively.

One thing has been clearly established by the analysis of fertility measures: the occurrence of natural decrease is accompanied by relatively low fertility. Fertility as measured three different ways is related to natural de-
crease (increase). Zero order correlations between the rate of natural increase for all counties and the three fertility measures provide strong support for the above conclusions. The correlation coefficients are fairly strong: .40 with Children Ever Born, .56 with the fertility ratio, and .15 with the less reliable general fertility rate. Again the low correlation with the general fertility rate is probably due to its unreliability (See Shryock et al., 1971:513).

In addition to the effect of age-selective outmigration which indirectly influences natural population decrease by altering the population's age structure, fertility also must have a strong effect. The lower number of births resulting from lower fertility is a direct effect of fertility on natural decrease. While low fertility cannot alone produce natural decrease since it is above the level of replacement in the counties involved, it aids the occurrence of the phenomenon when it is combined with a fairly high rate of outmigration of young adults. Beale, who tended to underestimate the influence of low fertility, observed that the most likely reason natural decrease has not occurred in other cotton-belt areas of high outmigration such as the Delta and the Southeast was the presence of large black populations with higher fertility (Beale, 1969:97). Thus, indirectly he considers fertility an important determinant of natural
decrease.

In discussing fertility differentials, however, there are two variables traditionally related to fertility which cannot be ignored in this analysis: the proportion of persons of "spanish" origin and the proportion of blacks in the subject counties. Many counties, especially in south Texas, have very large proportions of Mexican Americans who are characterized by very high fertility levels (Grebler et al., 1970; U.S. Bureau of the Census, 1971; Table 2; Bradshaw and Bean, 1972; Lee et al., 1972; Alvirez, 1973). Blacks are also characterized by high fertility. Unlike the case of Mexican Americans, however, the evidence as to whether black-white fertility differences can be explained by socioeconomic differentials is inconclusive. Sly (1970) found that fertility differentials were largely due to socioeconomic status differences while Roberts and Lee (1973) found substantial differentials after controlling for socioeconomic status differences (See also, Bean and Wood, 1974). Zero order correlations between these two variables and the primary measures of fertility indicate that the traditional relationships are confirmed with the present data. It remains to be seen by this analysis whether these two ethnicity variables have a positive effect on fertility when socioeconomic differences are held constant.
Of interest here is the indirect impact of these two variables on the rate of natural increase. Table 10 shows that the median percentages of persons of Spanish mother tongue and Negroes for the three county groups are somewhat low. While no essential differences appear in the percentage of Negroes across county groups it is clear that the figure for "percent Spanish" is much higher in the high increase counties than in the decrease or low increase counties (13.0 versus 1.0 and 0.5 percent). This has implications regarding the relationship between fertility, urbanization and natural decrease (increase) established in Table 9. Table 11 shows that despite the level of urbanization the median "percent Spanish" is much higher in the high increase counties than in the other two groups. This leads to the suspicion that one of the important reasons high increase counties experience high fertility is their relatively high proportions of "Spanish" persons. This does not mean, however, that the relationship between fertility and natural decrease is any less important when one takes into consideration the proportion of persons of Spanish origin. On the contrary one could argue that the introduction of this variable strengthens our belief in the fertility differential between county groups. One could argue that the absence of large Spanish populations in many counties is one of
Table 10.- Percentage Spanish and Negro by County Groups: 1970

<table>
<thead>
<tr>
<th></th>
<th>Natural Decrease (N=111)</th>
<th>Low Increase (N=166)</th>
<th>High Increase (N=129)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexican</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median percent Spanish</td>
<td>1.0</td>
<td>0.5</td>
<td>13.0</td>
</tr>
<tr>
<td>Median percent Negro and other races</td>
<td>5.5</td>
<td>7.9</td>
<td>5.6</td>
</tr>
</tbody>
</table>

Source: U.S. Bureau of the Census (1973)
Table 11. - Median "percent Spanish" by county groups and level of urbanization: 1970

<table>
<thead>
<tr>
<th>Natural Decrease</th>
<th>Low Increase</th>
<th>High Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>(N=57)</td>
<td>(N=59)</td>
<td>(N=18)</td>
</tr>
<tr>
<td>1.0</td>
<td>0.2</td>
<td>21.1</td>
</tr>
</tbody>
</table>

Less than 30 percent urban

<table>
<thead>
<tr>
<th>(N=39)</th>
<th>(N=79)</th>
<th>(N=43)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>0.5</td>
<td>16.0</td>
</tr>
</tbody>
</table>

30 to 60 percent urban

<table>
<thead>
<tr>
<th>(N=15)</th>
<th>(N=28)</th>
<th>(N=68)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>0.9</td>
<td>10.0</td>
</tr>
</tbody>
</table>

More than 60 percent urban

Source: U.S. Bureau of the Census (1973)
the "causes" of their experience of natural decrease. Put in another way, if the natural decrease counties had large Spanish populations, most of them would not be natural decrease counties despite their socioeconomic conditions implying that the phenomenon of natural decrease would be absent in the region under study. The reason for the absence of the phenomenon in south Texas counties, where large populations of Mexican Americans reside, is essentially the same as the reason Beale (1969:97) supplied to explain the absence of the phenomenon in the heavily black-populated areas of the Delta and the Southeast--natural decrease does not occur despite unfavorable socioeconomic conditions if the areas under study contain large proportions of population characterized by high fertility.

The effect of the presence of large Spanish and Black populations on the occurrence of natural decrease indirectly through fertility while holding socioeconomic conditions constant can be better shown in a multivariate causal model. Such a model of natural decrease (increase) is developed in the next section of this chapter. First, a simple model including only demographic variables will be developed which will be subsequently expanded to include the determinants of these demographic variables and thus the indirect determinants of natural decrease (increase). The
implications of the findings relating to the influence of fertility and outmigration on natural population decrease will be further discussed after the presentation of the findings of the path analysis.

II. Path analysis of natural decrease

A. A proposed simple path model

The findings of this study and of the two previous analyses of natural population decrease illustrate that natural decrease is produced by "distortions" in a population's age structure. This is primarily the outcome of heavy outmigration of young adults. Fertility is also important since it directly affects a population's rate of natural increase (decrease). In addition, it can be hypothesized that fertility has also an indirect effect on natural decrease through the population's age structure. Prolonged low fertility can lead to a smaller proportion of young persons and have a similar effect on natural decrease as the effect of outmigration of young persons.

The level of measurement of the variables involved permits the restatement of these observations in terms of a simple causal model. A two-stage path model is proposed in which the dependent variable is the rate of natural increase (decrease). The direct and indirect effects of
migration and fertility through the population's age structure can thus be examined.

The proposed model includes essentially demographic variables or components of the "population system" or "population model" (Goldscheider, 1971; Ryder, 1964). Fertility and migration are the exogenous variables the total variation of which is assumed to be completely determined by variables outside the model (Land, 1969:6). Fertility is here measured by the fertility ratio in 1970, while migration refers to net-migration of persons 15-29 from 1960 to 1970. A county's age structure is taken as an intervening variable between fertility and migration on the one hand, and the rate of natural increase on the other hand. Median age in 1970 is taken as the measure of age structure. The fertility ratio was chosen over Children Ever Born since it measures recent fertility better than CEB which is a better measure of past or completed fertility. Median age was chosen over other measures of age structure because it captures better the components of age structure that directly influence natural increase (decrease)—the proportion of older persons and the proportion of persons of child-bearing age (15-29). The proportion of older persons effects the incidence of deaths and the proportion of persons aged 15 to 29 effects the incidence of births. Other measures of age could be used
but they are not as meaningful conceptually. Percent 65 years old and over, for example does not take into account persons aged 15-29. The same can be said about the index of aging, aged-dependency ratio as well as the youth-dependency ratio.

With such a model the direct and indirect effects of fertility and migration can be delineated. A path diagram with the postulated relationships is found in Figure 1. One-headed arrows indicate direct causal effects and two-headed arrows indicate an unanalyzed correlation between two exogenous variables (Duncan, 1966:3). The paths $P_{1w}$ and $P_{2u}$ represent the effects of residual variables on the model's dependent variables.

The diagram shows that what is proposed is a recursive system which does not involve "...instantaneous reciprocal action of variables..." (Duncan, 1966:5). The model proposes one-way causation from migration and fertility to median age and the rate of natural increase. Based on the previous literature (Beale, 1969; Chang, 1974) and on the findings of this study it is hypothesized that the rate of net migration for persons aged 15 to 29 will have a strong positive effect on the rate of natural increase only indirectly through median age. Thus its direct effect (path coefficient) should be expected to be near zero. Net migration will negatively influence median
FIGURE I
PROPOSED SIMPLE PATH ANALYSIS
MODEL OF NATURAL INCREASE
age which in turn has a negative effect on the rate of natural increase. On the other hand, fertility can be expected to have both a direct and an indirect effect on natural increase. First, fertility can influence the rate of natural increase directly by adding or subtracting births thereby increasing or decreasing the difference between a population's births and deaths. Fertility can also affect natural increase indirectly through median age. Prolonged low fertility can cause an increase in median age which in turn leads to a decline in the rate of natural increase. At this stage of explanation no causal demographic effect between fertility and migration is hypothesized.

As shown by Duncan (1966:5) the basic theorem of path analysis can be stated in the following formula:

\[ r_{ij} = \sum_{k} P_{ik} r_{kj} \]

where \( P_{ik} \) denotes the path from the \( k \)th variable to the \( i \)th variable, \( r_{kj} \) represents the zero order correlation between the \( k \)th and \( j \)th variables, and \( r_{ij} \) represents the zero order correlation between the \( i \)th and \( j \)th variables. Finney (1972) has shown that by using the above formula a zero order correlation coefficient between a predictor and a dependent variable can be decomposed into the following parts: (1) a direct effect; (2) an indirect effect through an intervening variable; and (3) an indeterminate or joint effect resulting from an unanalyzed correlation with another predictor variable in the model. (See, also, the recent efforts of Alwin and Hauser, 1975).
As an example the zero order correlation between natural increase and migration in the path model in Figure 1 can be decomposed as follows:

\[ r_{13} = P_{13} + P_{23}(P_{12}) + r_{34}(P_{14}) + r_{34}(P_{24})(P_{12}) \]

where \( P_{13} \) represents the direct effect of migration on natural increase, \( P_{23}(P_{12}) \) represents migration's indirect effect on natural increase through median age, and \( r_{34}(P_{14}) + r_{34}(P_{24})(P_{12}) \) represents migration's indeterminate effect which results from its unanalyzed correlation with fertility.

In a similar manner the correlation between natural increase and fertility can also be decomposed:

\[ r_{14} = P_{14} + P_{24}(P_{12}) + r_{34}(P_{13}) + r_{34}(P_{23})(P_{12}) \]

Such decompositions will permit the assessment of both the direct effects of the two predictor variables on natural increase and their indirect effects through median age.

For the recursive model employed here conventional least squares procedures are employed to calculate path coefficients. Path analysis requires the assumptions of an interval level of measurement, linearity, additivity, etc. (See Heise, 1968; Nygreen, 1971).

B. Findings

The intercorrelation matrix in Table 12 indicates that as expected migration and fertility are positively related with natural increase and negatively related to
Table 12.- Intercorrelation Matrix (Zero-order correlations) for simple path analysis model of natural increase

<table>
<thead>
<tr>
<th>Variable</th>
<th>Natural Increase ($X_1$)</th>
<th>Median Age ($X_2$)</th>
<th>Net Migration ($X_3$)</th>
<th>Fertility Ratio ($X_4$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X_1$</td>
<td>1.000</td>
<td>-.885</td>
<td>.366</td>
<td>.565</td>
</tr>
<tr>
<td>$X_2$</td>
<td>1.000</td>
<td></td>
<td>-.544</td>
<td>-.525</td>
</tr>
<tr>
<td>$X_3$</td>
<td></td>
<td></td>
<td>1.000</td>
<td>-.184</td>
</tr>
<tr>
<td>$X_4$</td>
<td></td>
<td></td>
<td></td>
<td>1.000</td>
</tr>
</tbody>
</table>
median age. The coefficients are fairly strong. Note also the very high negative correlation coefficient between median age and the rate of natural increase.

The main objective of this analysis, as stated previously, is to partition the effects of migration and fertility on natural increase into their direct and indirect effects. Figure 2 presents the estimated path coefficients for the path model from the regression of \( X_1 \) on \( X_2, X_3, \) and \( X_4 \), and the regression of \( X_2 \) on \( X_3 \) and \( X_4 \). Table 13 presents the decomposed effects of the predictor variables on the dependent variables.

Figure 2 and Table 13 permit several observations to be noted. First, the direct effects of migration and fertility on natural increase are relatively small. It was mentioned earlier that the path coefficient from migration to natural increase was expected to be near zero. The actual computed figure of .055 is quite close to zero. Migration affects natural increase indirectly through median age and not directly. Fertility, on the other hand, was expected to influence natural decrease both directly and indirectly. The direct path coefficient is .170.

The indirect effects of migration and fertility are also shown in Table 13. They are .431 and .484 respectively and are substantially larger than their direct effects. This supports the earlier findings that natural increase is produced primarily by changes in the popula-
FIGURE 2
ESTIMATED EFFECTS OF FERTILITY MIGRATION AND MEDIAN AGE ON NATURAL INCREASE
### Table 13: Decomposition Table of the Effects of Variables in Path Analysis Model of Natural Increase

<table>
<thead>
<tr>
<th>Bivariate Relationship</th>
<th>Total Effect (A)</th>
<th>Direct Effect (B)</th>
<th>Indirect Effect (C)</th>
<th>Joint Effect (D)</th>
<th>B+C+D (E)</th>
<th>Spurious Effect (A-E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X₂ X₃</td>
<td>( r_{23} = -0.559 )</td>
<td>( P_{23} = -0.559 )</td>
<td>None</td>
<td>( P_{24}(r_{34}) = 0.115 )</td>
<td>-0.444</td>
<td>None</td>
</tr>
<tr>
<td>X₂ X₄</td>
<td>( r_{24} = 0.525 )</td>
<td>( P_{24} = 0.525 )</td>
<td>None</td>
<td>( P_{23}(r_{34}) = 0.102 )</td>
<td>-0.526</td>
<td>None</td>
</tr>
<tr>
<td>X₁ X₃</td>
<td>( r_{13} = 0.366 )</td>
<td>( P_{13} = 0.055 )</td>
<td>( P_{23}P_{12} = 0.431 )</td>
<td>( (r_{34})P_{14} + (r_{34}) )</td>
<td>0.365b</td>
<td>None</td>
</tr>
<tr>
<td>X₁ X₄</td>
<td>( r_{14} = 0.565 )</td>
<td>( P_{14} = 0.170 )</td>
<td>( P_{24}P_{12} = 0.484 )</td>
<td>( (r_{34})P_{13} + (r_{34}) )</td>
<td>0.565</td>
<td>None</td>
</tr>
<tr>
<td>X₁ X₂</td>
<td>( r_{12} = -0.885 )</td>
<td>( P_{12} = -0.771 )</td>
<td>None</td>
<td>None</td>
<td>-0.771</td>
<td>0.114</td>
</tr>
</tbody>
</table>

---

\( a \) \( X_1 \) = Rate of natural increase, 1968-1974
\( X_2 \) = Median age, 1970

\( b \) Varies slightly from \( A \) due to rounding

\( \) \( X_3 \) = Net migration of persons aged 15-29, 1960-1970
\( X_4 \) = Fertility Ratio, 1970
tion's age structure.

As indicated by the paths from the residual variables, the model explains a substantial proportion of the variation in the two dependent variables: 80 percent in the rate of natural increase and 58 percent in median age.

It is also evident that fertility seems to have a slightly larger effect on natural increase than on migration. This implies that previous researchers might have underestimated the role of fertility. It also implies, however, that the effect of age-selective outmigration might not be totally captured by the model. The measure of age-selective outmigration employed here is the rate of net migration of persons aged 15 to 29 between 1960 and 1970. Even though this measure is strongly related to the rate of natural increase it has some shortcomings: first, a county can have a relatively small rate of outmigration during 1960-1970 and a high rate of natural decrease, because it had experienced high outmigration during the 1950's. Second, the distortion in the age structure which produces natural decrease can, in a few cases, result from inmigration of older rather than outmigration of young persons. These two factors combine to reduce the strength of the relationship between the rate of outmigration of young persons during the 1960's and the rate of natural decrease. Besides such short-
comings, however, the model still accounts for a fairly large proportion of the variation in natural increase and in median age.

The simple model set forth here provides only a demographic explanation of the phenomenon of natural decrease (increase). It shows how demographic variables such as migration, fertility, and the age structure interact to explain variation in the rate of natural increase. While it tells us a great deal, it does not tell why outmigration of young persons is high among the natural decrease counties and why fertility is low. In order to provide a more complete explanation of natural decrease the model must be expanded to incorporate determinants of outmigration and fertility.

Beale and Chang had attempted to explain why natural decrease counties experience high levels of outmigration and lower fertility. Beale, it was noted, emphasized primarily the role of outmigration and argued that "...the most common cause of heavy outmigration from (natural decrease) counties is declining agricultural employment, without offsetting increases in other industries..." (Beale, 1969:93). He does not try to explain why fertility is low in such counties. Chang seems to accept Beale's position on the main cause of outmigration and also attempts to explain why natural decrease counties are ex-
periencing relatively low fertility by referring to the work of Davis (1963) and Sly (1972). In essence he argues that the subject counties "have responded to their generally less favorable socioeconomic conditions by adjusting their demographic behavior, specifically migration and fertility" (Chang:670). Thus low fertility like high outmigration is seen as a response to an unfavorable socioeconomic situation.

This writer is in agreement with the above explanations of the causes of outmigration and low fertility, but as discussed in chapter 2 Chang wrongly attributes his explanations to theoretical work by Davis (1963). The problem now becomes one of empirically verifying the above hypotheses and of finding appropriate measures of agricultural decline without increases in other industries, or measures of "unfavorable socioeconomic conditions" which could serve as independent variables influencing migration and fertility to be included in a path analysis model of natural decrease.

The natural decrease counties were compared to natural increase counties in the region earlier in this paper. More comparisons will be made here in order to assess whether natural decrease counties are experiencing substantially less favorable socioeconomic conditions than the other counties. Table 14 presents data on a host of
socioeconomic variables for the three county groups which are published in the Census of Population and also in the 1959 Census of Agriculture. An attempt was made to select as many variables as possible on which data are available in the two censuses. These data indicate that indeed by many of these measures natural decrease counties are experiencing "unfavorable socioeconomic conditions", although, in many cases, the differences appear to be slight. Median years of school, income, earnings, and value of agricultural land are definitely lower than in natural increase counties. Unimportant differences are observed in such indicators as the percent of families below the poverty line, percent employed in manufacturing industries, and percent employed in white-collar occupations. Unemployment has been kept lower in natural decrease counties by the high rate of outmigration (Chang: 659). The proportion of persons of rural-farm residence was higher in natural decrease counties both in 1970 and in 1960. If we assume that counties with higher proportions of rural-farm populations and, consequently, with more persons employed in agriculture are disadvantaged when compared to other counties, then this variable should be a good indicator of socioeconomic conditions. (Frisbie and Poston, 1975:776). The observed differences
Table 14.- Selected Socioeconomic Characteristics (Medians) of County Groups

<table>
<thead>
<tr>
<th>Socioeconomic Characteristics</th>
<th>Natural Decrease (N=111)</th>
<th>Low Increase (N=166)</th>
<th>High Increase (N=129)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median years of school of persons 25 yrs. old and over in 1970</td>
<td>10.4</td>
<td>10.4</td>
<td>11.1</td>
</tr>
<tr>
<td>Median years of school of persons 25 yrs. old and over in 1960</td>
<td>9.3</td>
<td>8.9</td>
<td>9.9</td>
</tr>
<tr>
<td>Median family income in 1969</td>
<td>5744</td>
<td>6351</td>
<td>7111</td>
</tr>
<tr>
<td>Median family income in 1959</td>
<td>3324</td>
<td>3372</td>
<td>4245</td>
</tr>
<tr>
<td>Median earnings of males in 1969</td>
<td>4909</td>
<td>5265</td>
<td>5646</td>
</tr>
<tr>
<td>Percent of families below poverty level in 1969</td>
<td>22.0</td>
<td>21.3</td>
<td>18.1</td>
</tr>
<tr>
<td>Unemployment rate in 1970</td>
<td>3.3</td>
<td>4.0</td>
<td>4.1</td>
</tr>
<tr>
<td>Percentage of rural-farm population in 1970</td>
<td>17.9</td>
<td>11.4</td>
<td>4.9</td>
</tr>
<tr>
<td>Percent of rural-farm population in 1960</td>
<td>27.2</td>
<td>19.9</td>
<td>10.8</td>
</tr>
<tr>
<td>Median value of land in agriculture in 1959 (per acre)</td>
<td>69</td>
<td>82</td>
<td>95</td>
</tr>
</tbody>
</table>
### Table 14 continued

<table>
<thead>
<tr>
<th>Socioeconomic Characteristics</th>
<th>Natural Decrease (N=111)</th>
<th>Low Increase (N=166)</th>
<th>High Increase (N=129)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median number of tractors per farm in 1959</td>
<td>1.0</td>
<td>0.9</td>
<td>1.3</td>
</tr>
<tr>
<td>Median expenditure on gasoline per farm in 1959</td>
<td>313</td>
<td>278</td>
<td>732</td>
</tr>
<tr>
<td>Percent of farms operated by tenants in 1959</td>
<td>18.3</td>
<td>17.6</td>
<td>26.3</td>
</tr>
<tr>
<td>Percent employed in manufacturing occupations in 1970</td>
<td>11.1</td>
<td>21.4</td>
<td>11.3</td>
</tr>
<tr>
<td>Percent employed in white-collar occupations in 1960</td>
<td>29.1</td>
<td>30.2</td>
<td>32.4</td>
</tr>
<tr>
<td>Percent Negro in 1970</td>
<td>5.5</td>
<td>7.9</td>
<td>5.6</td>
</tr>
<tr>
<td>Percent Spanish in 1970</td>
<td>1.0</td>
<td>0.5</td>
<td>13.0</td>
</tr>
</tbody>
</table>

in socioeconomic conditions and lower fertility combined with higher outmigration of young persons in natural decrease counties provide some support to the Theory of the Demographic Response. The evidence supports the hypothesis that natural decrease counties are responding by outward migration but also by lowering their fertility (Chang:670). The extent of the existence of such a response is made more difficult to assess by the existence of nonwhite and especially Spanish populations. In addition many variables do not indicate substantially worse socioeconomic conditions in natural decrease counties. While this might be the case, such variables can be useful in an expanded model of natural decrease (increased) since they do not influence natural decrease directly; their effect is rather indirect through migration and fertility.

C. Expanding the path model of natural decrease

The above observations and findings imply that to reach a better explanation of natural decrease, the simple path analysis model presented earlier must be expanded to include the determinants of migration and fertility. This writer originally intended to develop an "ecological" model of migration and fertility incorporating especially components of "sustenance organization". Sly (1972) was successful in developing such a model explaining outmigra-
tion. That task was easier however, since Sly avoided the effects of such variables as race by studying out-migration of blacks only. In addition the counties he studied were primarily rural where their "sustenance organization" was mainly agricultural. This was especially the case in 1940 and 1950 (the census years for which Sly computed "sustenance" indicators) when a larger proportion of the labor force was employed in agriculture. Since those years we have seen drastic declines in the proportions employed in agriculture and the proportions of persons of rural-farm residence. In the subject counties, for example, the 1970 proportions of the population of rural-farm residence were very small: 17.9 in the natural decrease counties, 11.4 in the low increase, and 4.9 in the high increase counties. This hardly justifies the inclusion of agricultural "sustenance" indicators alone in a model. Even in the primarily rural natural decrease counties most of the labor force is employed in nonagricultural activities. The existence of nonwhite and especially very large Spanish populations in some counties makes the development of an ecological model very difficult.

It became obvious that a path model of natural decrease should include indicators of all major "sustenance activities" but also the proportions of Spanish and non-
white populations. This task becomes even more complex when both fertility and migration are endogenous variables influenced by the same set of variables. This is so, since one could argue that the determinants of fertility and migration are different. Their inclusion in one single model, however, is justified by the theoretical framework employed—the Theory of the Demographic Response. As previously mentioned, this framework predicts that populations respond to unfavorable socioeconomic conditions by adjusting both their migratory and fertility behaviors. If this is the case the same determinants of both demographic processes should be included in the model.

One further complication exists when the same determinants of migration and fertility are to be captured in one model: this involves the problem of the point in time for which a measure is to be taken. As an example, the variable median "earnings" can influence both migration and fertility. But in the case of migration it should be measured at the beginning of the period (1960) while it makes more sense to take a measure of earnings in 1970 in the case of fertility. Since, presumably, the two measures are very highly intercorrelated, in the case of this variable the 1960 measure is arbitrarily chosen in order to avoid problems of multicollinearity and unnecessary complexity of the model. The same applies for the
variables indicating sustenance organizations; percent employed in white-collar occupations, percent employed in manufacturing occupations, and percent rural-farm. Measures on these variables were taken for 1960.

The above mentioned variables, along with median earnings of males (in 1959), median years of school completed by all persons 25 years old and over in 1960 and the proportions of Negro and persons of Spanish mother tongue(1970) are included in the model as determinants of migration and fertility. This expanded model of natural increase (decrease) with the computed path coefficients is presented in Figure 3.

Demographers have long argued that migration and fertility are interrelated demographic processes. Few, however, have attempted to indicate the direction of that relationship. One of these demographers is Friedlander (1969) who expanded Davis' (1963) version of the Theory of the Demographic Response and who also criticized the Theory of the Demographic Transition for not taking into consideration the role of migration. In that study, Friedlander argued that "...an adjustment in reproductive behavior of a community in response to a rising 'strain' ...may differ depending upon the ease with which the community can relieve the 'strain' through outmigration" (p.360). To support this point Friedlander supplied
evidence from England and France during their early indus­trialization. His argument implied that where large outmigration can take place, fertility may remain relatively high. Therefore, in our model the path from migration to fertility is changed to indicate a negative relationship between the two variables: the higher the rate of net migration the lower the fertility. This relationship was unanalyzed in the simple path model which supplied a demographic explanation of natural increase only. That is, there was no theoretical reason justifying a causal demographic effect between migration and fertility. Following Friedlander's suggestion, however, the relationship between migration and fertility becomes a sociological one in the expanded model predicting a causal effect from migration to fertility.

D. Findings

The computed path coefficients from the determinants of migration and fertility are shown in Figure 3. Of interest here, is the degree to which hypotheses implied by the Theory of the Demographic Response are supported. A glance at the model reveals that the two ethnicity variables (percent Negro and percent Spanish) emerge as strong predictors especially of fertility. Table 15 presents the indirect effects of four important exogenous variables on the rate of natural increase. No direct effects are indicated from the exogenous variables to the
rate of natural increase. They can only effect natural increase indirectly by influencing the demographic components of the model—migration and fertility.

The seven exogenous variables together succeed in explaining about 49 percent of the variation in fertility and 31 percent in migration. Percent Spanish is by far the most significant predictor of fertility ($P_{45} = .704$) followed by percent nonwhite ($P_{46} = .375$). With other factors held constant these two variables have strong positive effects on fertility, thus positively influencing the rate of natural increase indirectly. The effect of the other variables is relatively small. Do these other effects, however, indicate the existence of a fertility response? The very small positive effect of percent rural-farm is one such indication. It implies that the traditional relationship between the proportion rural-farm and fertility is rather weak suggesting that, in at least some of the counties, fertility is lower than would be expected. It is suspected that these counties are the natural decrease counties with high proportions of rural-farm population and with fairly low fertility. If the fertility response is taking place in these counties (assuming that the counties are responding to an unfavorable socioeconomic condition indicated by higher proportions of rural-farm population) then the traditional strong re-
FIGURE 3
EXPANDED PATH ANALYSIS MODEL
OF NATURAL INCREASE
relationships between rural-farm and fertility could be expected to be rather small.

The existence of a fertility response is also supported by the positive path from earnings to fertility ($P_{48} = 0.208$). Earnings again has been traditionally directly related to fertility (earnings presumably standing for family income). But, again, in an area which contains a large proportion of counties experiencing natural decrease and which are, presumably, responding demographically by adjusting their fertility behavior, in such an area when other factors are controlled, a small negative or even a positive relationship can be expected. If the median earnings of a county indicate an unfavorable socio-economic condition, then its positive effect on fertility indicates the operation of a strong fertility response in at least some of the counties. It should be noted, in addition, that while many studies report negative relationships between earnings or income and fertility, a few studies following the "economic model" of fertility have found positive relationships (For a discussion of this problem see Bean, 1973).

The fairly strong negative effect of percent employed in white-collar occupations does not support the existence of a fertility response ($P_{47} = -0.273$). This, however, seems to be balanced by the strong positive effect of "White-
collar” on migration. Apparently the demographic response to this indicator goes through outmigration rather than fertility, indicating the higher importance of this occupational measure for migration. The effects of the other variables on either fertility or migration are fairly small. As expected negative coefficients are shown from percent Spanish and percent Negro to migration. Both these populations have been traditionally more migratory than the white or anglo populations.

One hypothesis of the demographic response theory is not empirically supported by the model. The hypothesized negative effect of migration on fertility implied by Friedlander (1969) is not supported. Rather, an insignificant positive effect is found when other variables are controlled despite the fact that the zero order correlation between the two variables was negative (r = -.184). This implies that the existence of high rates of outmigration is not a very good indicator of what Friedlander meant by migration outlet that would permit fertility to remain high.

While some support of the Theory of the Demographic Response is supplied by the model, the greatest contribution to the variance, especially in the case of fertility, is provided by the two ethnicity variables. These two variables, consequently have a larger indirect effect on the rate of natural increase, than the indicators of unfavorable socio-
economic conditions. The model is, therefore, far from being a perfect operationalization of the Theory of the Demographic Response.

E. Discussion

The expanded path analysis model of natural increase just presented was intended to supply a sociological explanation of the demographic factors influencing natural population increase (decrease). The selection of the exogenous variables was guided by several considerations:

(1). Indicators of sustenance activities. It was felt that all three major sustenance activities should have been represented rather than the agricultural sustenance activities alone. Even in the very rural counties a rather small proportion of the labor force is employed in agriculture. Thus, indicators of the proportion of the labor force employed in white-collar, agricultural, and manufacturing sustenance activities were included as predictor variables of migration and fertility. Of the three, only percent employed in white-collar occupations emerges as a significant predictor of fertility and migration. It affects fertility negatively and migration positively. This variable's indirect effects on the rate of natural increase are presented in table 15. The proportion employed in manufacturing industries fails to
emerge as a significant variable in the model. The pro-
nportion of the population of rural-farm residence also
failed to contribute much to the model. Its small ef-
fect on fertility, however, was deemed an important in-
dicator of the operation of a possible fertility response.

(2). Indicators of unfavorable socioeconomic con-
ditions. The above sustenance indicators were also used
as possible indicators of unfavorable socioeconomic
conditions thus, permitting an empirical assessment of the
operation of a demographic response on the part of some
county populations. Median earnings was also introduced
as an additional indicator of the degree to which coun-
ties experience unfavorable socioeconomic conditions.
It was earlier said that the positive effect of median
earnings on fertility might reflect the operation of a fer-
tility response. It also suggests that the hypothesis de-

erived from the "economic model" of fertility (Bean, 1973)
predicting a positive relationship between earnings (or
income) and fertility when other socioeconomic factors
are held constant, might have some merit. One such other
socioeconomic factor which was introduced as a control
for testing the above hypothesis was median years of school-
ing. This variable was also introduced because it has been
traditionally negatively related to fertility (Matras: 355).
While the effect of "schooling" on fertility is negative
it is quite small ($P_{49} = .034$).
Table 15.- Indirect effects of important exogenous variables in the expanded path model on the rate of natural increase

<table>
<thead>
<tr>
<th>Exogenous Variable</th>
<th>Indirect effect through Net Migration $(X_3)$</th>
<th>Indirect effect through fertility $(X_4)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent Spanish $(X_5)$</td>
<td>$P_{35}(P_{13}) + P_{35}(P_{23})P_{12} + P_{35}(P_{43})P_{14} + P_{35}(P_{43})$</td>
<td>$P_{45}(P_{14}) + P_{45}(P_{24})$</td>
</tr>
<tr>
<td></td>
<td>$P_{24}(P_{12}) = -0.054$</td>
<td>$P_{12} = 0.461$</td>
</tr>
<tr>
<td>Percent Negro $(X_6)$</td>
<td>$P_{36}(P_{13}) + P_{36}(P_{23})P_{12} + P_{36}(P_{43})P_{14} + P_{36}(P_{43})$</td>
<td>$P_{46}(P_{14}) + P_{46}(P_{24})$</td>
</tr>
<tr>
<td></td>
<td>$P_{24}(P_{12}) = -0.056$</td>
<td>$P_{12} = 0.246$</td>
</tr>
<tr>
<td>White-collar $(X_7)$</td>
<td>$P_{37}(P_{13}) + P_{37}(P_{23})P_{12} + P_{37}(P_{43})P_{14} + P_{37}(P_{43})$</td>
<td>$P_{47}(P_{14}) + P_{47}(P_{24})$</td>
</tr>
<tr>
<td></td>
<td>$P_{24}(P_{12}) = 0.237$</td>
<td>$P_{12} = -0.179$</td>
</tr>
<tr>
<td>Earnings $(X_8)$</td>
<td>$P_{38}(P_{13}) + P_{38}(P_{23})P_{12} + P_{38}(P_{43})P_{14} + P_{38}(P_{43})$</td>
<td>$P_{48}(P_{14}) + P_{48}(P_{24})$</td>
</tr>
<tr>
<td></td>
<td>$P_{24}(P_{12}) = 0.023$</td>
<td>$P_{12} = 0.136$</td>
</tr>
</tbody>
</table>
Ethnicity Variables. It was felt that an analysis of migration and fertility differentials in the subject area could not ignore the possible effects of the proportion of Blacks and Mexican Americans. These two population groups have traditionally been more migratory and, as was indicated earlier, past studies have suggested that even after socioeconomic status differentials are held constant their fertility remains higher than the white or Anglo population. This analysis supports both these hypotheses, especially in the case of Mexican Americans. The effect of "percent Spanish" on fertility is quite substantial. The indirect effects of the two ethnicity variables on the rate of natural increase are shown in Table 15. They emerge as rather strong factors in the analysis and cloud the empirical assessment of the viability of the Theory of the Demographic Response. Their impact on the ability of the analysis to operationalize propositions from the Theory of the Demographic Response is discussed in Chapter 5 where an attempt is made to revisit theoretical propositions in the light of this study's empirical findings.

III. Summary

In this chapter findings of the analysis of the data were presented. Part I presented findings yielded by comparisons between county groups. Such comparisons gave sup-
port to Beale's (1964:1969) and Chang's (1974) suggestions that natural decrease is primarily produced by age structural distortions resulting from outmigration of persons of child-bearing age. Comparisons between county groups also indicated consistently lower fertility in the primarily rural natural decrease counties even after controlling for the degree of urbanization. These findings are quite similar to those reported by Chang (1974) in Iowa counties.

In the second part of the analysis the investigator went beyond past research in the area by engaging in more sophisticated statistical analysis. A simple four-variable path model was developed with the rate of natural increase for all counties as the dependent variable, fertility and net migration as exogenous variables, and median age as the intervening variable. The model succeeded in explaining 80 percent of the variation in the rate of natural increase and 58 percent in the median age. It provided additional support for the importance of the age structure of county populations and for the indirect impact of net migration of persons of child-bearing age. In addition, fertility emerges as a strong predictor of natural increase with a substantial indirect effect through median age and a moderate direct effect. This suggests that Beale and Chang might have underesti-
mated the contribution of low fertility to the experience of natural decrease.

The simple path model was subsequently expanded to include socioeconomic determinants of fertility and net migration in order to provide a sociological in addition to a demographic explanation of natural population increase. The socioeconomic variables succeeded in accounting for 49 percent of the variation in fertility and 31 percent in net migration.

The implications of these findings for theory, future research and policy are discussed in the next chapter.
CHAPTER 5

CONCLUSIONS

I. Summary

This was an investigation of the phenomenon of natural population decrease in one region of the United States where it is concentrated. Natural population decrease, being a fairly recent phenomenon, has not received much research attention by demographers. In addition to a short research note by Dorn (1939) examining natural decrease in the 1930's the reemergence of the phenomenon since the 1950's has only been studied by Beale (1969) and Chang (1974) who focused his investigation on Iowa counties.

This investigation was primarily inspired by the lack of research attention to a phenomenon which is likely to affect more and probably larger areas in the United States. The approach utilized was guided by the findings of past literature on natural decrease, a theoretical framework called the Theory of the Demographer Response, and, to an extent, human ecological theory. Its purpose was to examine the relative importance of outmigration and low fertility in producing natural decrease, and to develop a multivariate model of natural increase. This model was expanded to include in addition to demographic variables, socioeconomic variables influencing natural increase (decrease) indirectly. In the selection of these
socioeconomic variables attention was paid to including indicators of "unfavorable socioeconomic conditions" in order to empirically test the viability of the Theory of the Demographic Response as a theoretical framework within which natural population decrease could be explained.

The analysis of the data generally gave strong support to the hypothesis that heavy outmigration of young persons may alter the age structure of county populations and lead to the experience of natural decrease (Beale, 1969; Chang, 1974). It was also found that outmigration alone does not necessarily lead to natural decrease. Generally it must be accompanied by relatively low fertility before a county can begin experiencing an excess of deaths over births. The analysis indicated that even though Beale (1969) and Chang (1974) had acknowledged the role of low or moderate fertility, they tended to under-emphasize its contribution to the emergence of natural decrease. No doubt, in the subject counties, low fertility could not alone lead to natural decrease since fertility is above the level required for population replacement (Beale, 1969). It seems obvious from this analysis that the two processes work simultaneously in most cases to bring about natural decrease. Beale (1964:1969) pointed out that other areas of heavy outmigration of young persons such as the Delta and Southeast did not experience na-
atural decrease because of higher fertility. Thus, the ef-
flect of low fertility, even if above replacement, cannot
be overemphasized, since in most cases it must combine
with the effect of high outmigration before natural de-
crease can occur. The fact that fertility has a strong
fluence on natural decrease was established both by
comparisons between county groups and by the path analysis.
Actually the path analysis yielded a stronger fertility
effect than a migration effect. As discussed in the pre-
vious chapter, however, the effect of outmigration is
probably higher than what is indicated by the path analysis.
The path analysis also indicated the absence of a direct
migration effect (as hypothesized) and the presence of a
moderate direct effect of fertility. Both fertility and
migration, however, have strong indirect effects on the
rate of natural increase through the population's age
structure. The importance of the age structure cannot be
overestimated. Comparisons of county groups indicated
that the natural decrease counties are much older by
several measures of age. This was confirmed by the path
analysis which showed a very strong effect of median age
on the rate of natural increase.

Hypotheses 1 through 8 stated on pages 45-46 are
given substantial support through comparisons between
county groups and/or through the path analysis with the
exception of the first part of hypothesis 6. The analysis indicated that total net migration is not related to natural decrease as was the case in Iowa (Chang, 1974). This implied that total net migration can only be related to natural decrease if it is selective of persons of childbearing age.

What the analysis failed to establish clearly was the degree to which natural decrease counties responded to "unfavorable socioeconomic conditions" through outmigration and lower fertility. While outmigration of persons aged 15-29 was higher and fertility lower in the natural decrease counties—providing support to the Theory of the Demographic Response—, the impact of the indicators of "unfavorable socioeconomic conditions" on migration and fertility in the path analysis model suggests the difficulty of empirically assessing the theory's applicability to the study of natural population decrease. This difficulty was heightened by the effects of the two ethnicity variables. This problem is specifically discussed in the following part of this chapter which attempts to tie the study's empirical findings to the theoretical framework sketched in Chapter 2.

II. Implications for Demographic Theory

In chapter 2 an attempt was made to integrate related theoretical ideas into a framework called the Theory
of the Demographic Response. That task relied heavily on studies by Davis (1963), Friedlander (1969), Sly (1972), and Frisbie and Poston (1975). After a critical evaluation of those works a key theoretical proposition was derived which is restated here: Populations adjust their demographic behavior in response to a "strain" which threatens their standard of living viewed subjectively from the point of view of the individual and when there is sufficient knowledge and a belief that one's standard of living can be improved through changes in his demographic behavior. The existence of such a "strain" could lead, under certain circumstance, to outmigration or lower fertility or both. Sly (1972) suggested that outmigration is the most efficient response. Friedlander, however, proposed that the extent of the operation of a fertility response depends on the degree to which excess population growth can be relieved through outmigration. Our findings do not disprove neither Sly's nor Friedlander's propositions although empirical support of the latter is not provided. This failure to support Friedlander's hypothesis reflects the inability to measure the "...the ease with which (a) community can relieve (a) 'strain' through out-migration" (Friedlander:360). High outmigration (negative net migration) is apparently not a good indicator of the above variable. The existence of high outmigration does not always
permit fertility in the sending population to remain high, even though the zero order correlation between net migration (of persons 15-29) and fertility was negative (-.184). The resulting path coefficient from net migration to fertility shown in Figure 3 ended up being an insignificant .021. Apparently this way of testing Friedlander's hypothesis is too simplistic and future researchers may consider developing a better operationalization of the hypothesis.

The "strain" indicated in the key hypothesis of the Theory of the Demographic Response could be one of several factors depending upon the population under study and sociocultural and historical circumstances. In this investigation of natural decrease counties the hypothesized "strain" to which populations have presumably responded demographically was what has been called throughout "unfavorable socioeconomic conditions". Evidence was found that indeed the natural decrease counties have been experiencing less favorable socioeconomic conditions. Difficulty was encountered in empirically linking indicators of such conditions to lower fertility and migration through path analysis. In addition the degree of the above "strain" is not substantially larger in the natural decrease counties. Moreover, there are indications that many of the natural increase counties have been experiencing socioeconomic conditions that are at least equal to or more unfavorable than
those experienced by many natural decrease counties. Does this disprove the key hypothesis of the Theory of the Demographic Response? I believe not. To this important question we turn next.

As was discussed in Chapter 2 and as implied by the above key hypothesis, a "strain", such as the experience of unfavorable socioeconomic conditions, can only be effective in producing demographic adjustments if it is accompanied by what Glass calls a "conflict between levels of living and aspirations" (1965). Stated differently, the experience of unfavorable socioeconomic conditions does not always lead to outmigration and especially to lower fertility. The higher fertility of the world's poor nations and of the lower classes within nations is indeed strong evidence supporting the above statement. The higher fertility among underprivileged populations of natural increase counties is additional such evidence. Again demographic adjustments will not take place unless accompanied by the experience of a "conflict between levels of living and aspirations" or what is practically the same thing unless "...there is sufficient knowledge and a belief that one's standard of living can be improved", or stopped from being lowered, "through changes in his demographic behavior" (See key hypothesis of the Theory of the Demographic Response, Chapter 2:35; also restated earlier in
Thus, it is important to answer why some counties in the region (or other parts of the country) do not experience natural decrease even though they experience unfavorable socioeconomic conditions. Many of these populations respond demographically through outmigration (a more efficient response, Sly, 1972) but not by lowering their fertility. The outcome is the continued experience of natural increase. Many of these counties are located in south Texas and are heavily populated by Mexican Americans. One of the possible reasons why these counties continue to experience very high fertility is their ability to relieve "excess" natural increase through outmigration (Friedlander, 1969) despite the fact that this hypothesis was not empirically supported by the path analysis. That analysis, however, was conducted with all of the regions counties. In a previous preliminary study of natural decrease in Texas counties it was shown that heavy outmigration in the largely Mexican American-populated counties was accompanied by very high fertility (Koebernick and Markides, 1975). But appealing to Friedlander in order to explain the very high fertility of Mexican Americans in south Texas is too simplistic. Mexican Americans experience higher fertility regardless of their socioeconomic status (See Alvirez, 1973), or regardless of the experience of unfavorable socio-
economic conditions. Their higher fertility is explained in the literature (Bradshaw and Bean, 1972; Lee et al., 1972; Alvirez, 1973; Bean, 1973; Bean and Wood, 1974) by referring to their religion (Catholicism), and more importantly to their cultural background, both of which favor larger family size. Their higher fertility, then, is attributed to an "ethnicity" effect rather than a socioeconomic status effect. Ethnicity is a rather broad variable incorporating many things which are not clearly understood and the effects of which on fertility cannot easily be conceptualized. In addition to their socioeconomic status and religion then, there are several aspects of the Mexican American ethnicity (culture) which may influence their fertility behavior and which may have implications on their lack of a fertility response. First, Mexican Americans experience high infant mortality (Moustafa and Weiss, 1968; Weaver, 1973) even though recent evidence suggests that their higher infant mortality might be due to their lower socioeconomic status (Markides and Barnes, forthcoming). Nevertheless, their high infant death rates might partially explain their higher fertility in the same manner that high fertility in underdeveloped counties is partially attributed to the incidence of high infant mortality (Teitelbaum, 1975). From Davis' (1963) perspective the absence of lower mortality indicates the lack of a possible stimulus (lower mortality) that would lead to a demographic response (lower fertility).
But this again might be too simplistic an explanation of higher fertility among Mexican Americans given the shortcomings of Davis' hypothesis, and the fact that while the infant mortality of Mexican Americans is high, it has been declining along with the infant mortality of the Anglo population. In fact, it is not much higher than the infant mortality of Anglos as is the case with Blacks (Markides and Barnes, forthcoming).

Relatively high infant mortality among Mexican Americans may contribute very little to the explanation of their high fertility. Other aspects of the Mexican American culture must be examined before a more complete explanation can be reached. The Mexican American population of south Texas resembles in many ways populations of many underdeveloped counties. No doubt, their generally rural background favors high fertility as in many underdeveloped countries. But why do the Anglo populations of rural background show much lower fertility, and why do even urban Mexican Americans still have very high fertility (Alvirez, 1973). Alvirez suggested that "the more obvious answer" to the high fertility of Mexican Americans is that it "is related to the lack of assimilation and the low socioeconomic status occupied by many Mexican Americans" (1973:19). He goes on to argue, however, that such an explanation is neither satisfactory, nor is it completely accurate" (p.19). He
cited studies (Grebler et al. 1970; Lee et al., 1972) which have found that high fertility persists even after their low socioeconomic status (and by implication, he argues, their low assimilation in American society) is controlled for (Alvirez, p. 20). In order to find a more satisfactory explanation, Alvirez examined the effects of religion (Catholicism) on fertility patterns in a sample of Mexican American couples in Austin, Texas and found that religion (formal church affiliation and religiosity) has little impact on their fertility behavior. In this regard, he argued that they are different from other American Catholics (pp. 30-32). He concluded that:

Given the higher fertility of Mexican Americans, one can hypothesize that religion, if it has any impact on fertility, has such a generally pervasive effect on all Mexican Americans that it simply does not differentiate between Mexican Americans with different fertility patterns. That is, the fusion of religion with culture makes it difficult to distinguish a religious effect from a cultural one (Alvirez, 1973: 33). Emphasis added).

Unfortunately, Alvirez does not go on to explain what he meant by a "cultural" effect on fertility. A satisfactory answer to this problem has not been given yet. Can the Theory of the Demographic Response as presented in this study provide a possible answer to the high fertility of Mexican Americans? One thing is clear—Mexican Americans
have not responded demographically by lowering their fertility even though evidence suggests that they are experiencing "unfavorable socioeconomic conditions". The Theory of the Demographic Response predicts that a "strain" (unfavorable socioeconomic conditions) will not lead to lower fertility unless it threatens one's "subjective" standard of living and when there is knowledge and a belief that lower fertility would improve one's standard of living or stop it from worsening (See earlier discussion in this chapter, p.109). It is strongly suspected that this is not the case with the Mexican Americans especially those residing in south Texas. To use Glass' words, they are not experiencing a "conflict between levels of living and aspirations" (1965) to the same extent that the Anglo populations of the natural decrease counties in the area are. First, even though most Mexican Americans in the area are indeed very poor, their "subjective" standard of living has not been threatened much by their poverty. In other words their socioeconomic conditions have been improving relative to what they have been accustomed to—if not relative to the larger society. This is especially the case since many of them are recent immigrants from Mexico, a much poorer region than south Texas. Even many of those born in the United States continue to retain their ties with Mexico and frequently visit relatives residing
there (Grebler et al., 1970). These factors are constantly reminding them of how much better off they are than what they used to be or what they could have been.

To sum up, a possible explanation for the continued very high fertility of Mexican Americans can be derived from the Theory of the Demographic Response--their continued high fertility can be partially attributed to the absence of a "strain" which threatens their subjective standard of living. This is probably combined with a lack of a belief that by reducing their family size they would improve their standard of living. Friedlander's hypothesis that fertility may remain high in an area which can easily relieve excess population growth--as is the case in many south Texas counties--is another possible complementary explanation.

The fertility behavior of Mexican Americans has been discussed extensively because the variable "percent Spanish" emerged as a strong factor in the empirical analysis conducted, and, because this discussion has helped clarify the theoretical framework employed in this study.

The above discussion and the empirical findings of this study have implications for demographic theory specifically related to fertility behavior. First, the explanation of the high fertility of Mexican Americans given here might provide a partial answer to the continued high fertility
in developing nations, such as Brazil, despite their rapid development—growth in per capita income, industrialization, urbanization, etc.—(See Carvalho, 1974; Merrick, 1974). Such implications raise additional questions regarding the relevance of the Theory of the Demographic Transition for developing countries (Teitelbaum, 1975). This theory is also questioned by the findings of lower fertility in the poor ("underdeveloped") natural decrease counties in the region than in the richer (more "developed") natural increase counties. This same empirical finding also suggests that, under certain circumstances, rural areas may experience lower fertility than urban areas (Chang, 1974), thus having implications for the traditional relationship between fertility and urbanization within developed or posttransitional societies.

III. Implications for future research and policy

Besides the implications of this investigation's findings and interpretation for theoretical development, this study has implications for future research and social policy.

The literature on natural population decrease is quite limited despite the fact that the phenomenon has been spreading to affect increasingly more areas. The finding that fertility is strongly related to natural decrease is an indication that the phenomenon might spread even more
to affect larger and urban areas if the recent national
trend toward replacement level fertility continues (See
Chapter 1: 6-7). This is a matter both demographers and
policy makers might want to seriously consider.

While natural decrease in the three states of Texas,
Oklahoma and Arkansas--as in most other parts of the United
States where it is concentrated--is to a large extent
the outcome of outmigration of young adults, in some
cases it is the product of immigration of older persons.
This type of natural population decrease is concentrated
in central Florida and is also found in isolated "retire­
ment" counties scattered throughout the country. Future
researchers might investigate natural decrease in this
area by employing a different theoretical framework and
different methods.

The occurrence of natural population decrease, while
not necessarily an undesirable phenomenon, largely re­
fects the problem of rural underdevelopment in many parts
of the United States. The outmigration of young adults
reduces the tax base and leads to more underdevelopment.

Finally more understanding of the dynamics of natural
population decrease might aid in easing the transition to
a stationary population characterized by zero population
growth which could occur within six or seven decades if
present fertility trends continue (See Chapter 1).
IV. Limitations

This study has demonstrated some advantages over past related research by employing more rigorous methodology and a more satisfactory theoretical framework. It is still bound by some limitations which readers should take into consideration in interpreting its findings:

1. The units of observation employed in the analysis are counties which are political units rather than communities or ecological units. Their utilization in this type of research introduces error especially in the verification of sociological rather than demographic relationships. While this might be an inescapable problem, caution is required in interpreting the findings.

2. While the Theory of the Demographic Response, as discussed in this study, proved to be a more satisfactory theoretical framework than what previous researchers utilized, it failed to provide a satisfactory explanation of fertility and migration behaviors and, consequently, natural population decrease.

3. Part of the reason for the limitation of the theoretical framework stems from the fact that, in at least a few counties in the area, natural decrease is the product of immigration of older persons rather than of low fertility and outmigration of young persons.
4. The occurrence of natural decrease due to in-migration of older persons in a few counties is partially responsible for the computed lower effect of outmigration of young persons than the effect of fertility on the rate of natural increase (decrease). The lower effect of outmigration is also partially due to the fact that some natural decrease counties experienced relatively low rates of outmigration during the 1960's. In these counties natural decrease resulted from heavier outmigration in previous decades. Future researchers might want to look at longer time intervals in order to get a more complete understanding of the effect of outmigration on natural decrease.

5. Another unavoidable limitation of this kind of research is the utilization of aggregate data to make inferences regarding individuals. Again, caution is needed in interpreting some of the findings.

6. The nature of this research precludes the empirical assessment of the impact of "subjective" variables on fertility and migration. As previously discussed, these are important intervening variables between the predictor variables employed in the analysis on the one hand, and fertility and migration on the other.

7. Finally, better indicators of "strains" or "unfavorable socioeconomic conditions" could be selected or constructed in order to provide for a more satisfactory ex-
planation of variance by the path analysis model.

Despite its shortcomings this investigation has demonstrated some advantages over previous research, and has yielded interesting and significant findings. For example, it was shown that, under certain circumstances, the traditional relationship between urbanization and fertility does not hold. It was also shown that the findings and given interpretation have implications for research and theory regarding the relationship between fertility and underdevelopment, a question on which widespread disagreement exists (Teitelbaum, 1975).

Even though natural population decrease effects only a small proportion of the United States population, the evidence suggests that it is likely to affect more and larger areas given, especially, the current trend toward replacement level fertility. In light of this, the phenomenon of natural population decrease will demand more research attention by demographers and other social scientists. It is hoped that this investigation will stimulate more research in this area along with further theoretical development in social demography.
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