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A DEMOGRAPHIC ANALYSIS OF THE POPULATION GROWTH OF STATES, 1950–1980*

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ABSTRACT. State populations in the United States are characterized by large differences in current growth rates and historical growth trends. What demographic factors account for these differences? Population growth has only three components: births, deaths, and migration. In this study, we estimated the contributions of births, deaths, and migration to changes in population size between 1950 and 1980 for the 48 contiguous states in the United States. We found that population momentum (i.e., the growth that would occur in a closed population if fertility and mortality rates remained constant) had the largest effect on population growth in most states, but that differences in net migration were the major cause of state-to-state differences in growth rates. We also found that net migration has been gaining in importance compared to natural increase as a component of population growth. We expect this trend to continue in coming decades.

1. INTRODUCTION

Throughout their histories, states in the United States have been characterized by widely varying rates of population growth. For example, Nevada's population grew by 64 percent between 1970 and 1980 but Pennsylvania's grew by less than 1 percent. States have also been characterized by large changes in growth rates over time. New York's population grew by 13 percent between 1950 and 1960 but declined by 4 percent between 1970 and 1980, whereas Arkansas' population declined by 7 percent between 1950 and 1960 but grew by 19 percent between 1970 and 1980 (U.S. Bureau of the Census, 1983a, Table 9).

What demographic factors account for differences in growth rates and for changes in growth rates over time? Population growth has only three components: births, deaths, and migration. Differences in growth rates among states and changes over time must therefore be caused by differences or changes in birth, death, and migration rates; or, as expressed in this study, by differences or changes in levels of net migration, age-sex-specific fertility and mortality rates, and the population age-sex structures to which those rates are applied.

A number of studies have analyzed the effects of changing fertility and mortality rates on population growth rates and age structures [e.g., see Coale (1956), Keyfitz (1968), Lorimer (1951)]. These studies, however, relied on stable

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population theory for their analyses and did not consider the important role played by migration in affecting population change. Other studies have considered the effects of migration on population change, but have not compared those effects with the effects of changing fertility and mortality rates [e.g., see Carlino and Mills (1987), Mathur et al. (1988), Smith (1986)]. Only a few studies have investigated the effects of all three components of population growth [e.g., see Hermalin (1966), Notestein (1960), Sivamurthy (1982)]. These studies focused on national population growth, in which migration generally plays a minor role, and made no comparisons of the components of population growth in one place with those in another.

To our knowledge, no study has analyzed the effects of changes in all three components of population growth for states in the United States. The objective of the present study is to estimate the effects of population momentum (i.e., the population growth that would occur in a closed population if fertility and mortality rates remained constant), changes in fertility and mortality rates, and net migration on the population growth of states between 1950 and 1980. We believe this analysis will give us a clearer understanding of the causes of differences in population growth rates among states and of changes in growth rates over time. It will also provide insights into future demographic changes, thereby improving our ability to model and forecast regional population growth.

2. METHODOLOGY

Several different methods could be used to estimate the effects of fertility, mortality, and migration on a state's population growth [e.g., see Hermalin (1966) and Notestein (1960)]. The method employed here is called the factorial projections method (Sivamurthy, 1982). It is similar to those used previously in that it compares population growth under alternative fertility, mortality, and migration scenarios. It goes beyond previous methods, however, by providing a structural model which accounts for changes in each individual component of growth and for interactions among the changing components. Furthermore, the changes caused by these components sum to the total population change, making it possible to directly compare the effects of changes in one component of growth with the effects of changes in another. We believe the factorial projections method provides a useful framework for analyzing and comparing the components of population growth for states in the United States.

The factorial projections method uses a combination of assumptions regarding fertility rates, mortality rates, and net migration. It conforms to a $2 \times 2 \times 2$ factorial design, in which there are two alternative assumptions for each of the three causal factors (fertility, mortality, net migration). Consequently, there are $2 \times 2 \times 2 = 8$ possible combinations of assumptions under the factorial projections method.

Let P_t be the total population of a state at time t and P_0 be the total population at the start of the period under observation. The factors in the design are represented as follows:

A: 1—Age-specific mortality rates remain at the same levels as in year 0;
a—Age-specific mortality rates change as observed during the time period.

B: 1—Age-specific fertility rates remain at the same levels as in year 0;
b—Age-specific fertility rates change as observed during the time period.

C: 1—No migration;
c—Migration given by the net number of migrants by age and sex during the time period.

Let P_t(a, b, c) denote the projection of P_0 to time t with the observed values of mortality, fertility, and migration during the time period. $P_t(a, b, c)$ must therefore be equal to P_t, the actual population observed at time t, except for differences caused by variations in the sex ratio at birth, observational errors in P_0 and P_t, and errors in measuring changes in the components of growth over time. Under the $2 \times 2 \times 2$ factorial design, the eight factor combinations produce the following projections:

Factor Combinations	*Resultant Projections*
A = 1, B = 1, C = 1	P_t(1, 1, 1) = 1
A = a, B = 1, C = 1	P_t(a, 1, 1) = a
A = 1, B = b, C = 1	P_t(1, b, 1) = b
A = 1, B = 1, C = c	P_t(1, 1, c) = c
A = a, B = b, C = 1	P_t(a, b, 1) = ab
A = a, B = 1, C = c	P_t(a, 1, c) = ac
A = 1, B = b, C = c	P_t(1, b, c) = bc
A = a, B = b, C = c	P_t(a, b, c) = abc

The total change in population size during the time period 0 to t can be decomposed into changes caused by each factor combination, yielding the following formula:

(1) $TC = E(1) + E(\text{a}) + E(\text{b}) + E(\text{c}) + E(\text{ab}) + E(\text{ac}) + E(\text{bc}) + E(\text{abc})$

where

TC = total change in population size;

$E(1)$ = population change due to constant mortality and fertility rates and no migration; $E(1) = 1 - P_0$;

$E(\text{a})$ = population change due to change in mortality rates with no change in fertility rates and no migration; $E(1) = \text{a} - 1$;

$E(\text{b})$ = population change due to change in fertility rates with no change in mortality rates and no migration; $E(\text{b}) = \text{b} - 1$;

$E(\text{c})$ = population change due to net migration with no change in mortality and fertility rates; $E(\text{c}) = \text{c} - 1$;

$E(\text{ab})$ = population change due to interaction between changes in mortality and fertility rates with no migration; $E(\text{ab}) = (\text{ab} - \text{b}) - (\text{a} - 1)$;

$E(\text{ac})$ = population change due to interaction between changes in mortality rates and migration with no change in fertility rates; $E(\text{ac}) = (\text{ac} - \text{c}) - (\text{a} - 1)$;

$E(\text{bc})$ = population change due to interaction between changes in fertility rates and migration with no change in mortality rates; $E(\text{bc}) = (\text{bc} - \text{c}) - (\text{b} - 1)$; and

$E(\mathrm{abc})$ = population change due to interaction among changes in all three components; $E(\mathrm{abc}) = (\mathrm{abc} - \mathrm{c}) - (\mathrm{ac} - \mathrm{c}) - (\mathrm{bc} - \mathrm{c}) - E(\mathrm{ab})$.

The factorial projections method thus decomposes total population change into that caused by the continuation of the initial mortality and fertility rates and the aging of the initial age-sex structure, $E(1)$; that caused solely by changes in mortality and fertility rates and by net migration [E(a), E(b), and E(c), respectively]; and that caused by interactions among changes in mortality rates, fertility rates, and net migration [E(ab), E(ac), E(bc), and E(abc)]. These eight factor combinations account for all the population growth occurring during the study period. A more detailed description of the factorial projections method can be found in Sivamurthy (1982).

The construction of the interaction variables described above differs from the usual construction, in which one variable is multiplied or divided by another. To paraphrase Sivamurthy (1982, pp. 164–165), an interaction effect represents the joint effect of two or more components of population change, acting through each other and independently of their individual effects on population change. For example, suppose that both mortality and fertility rates are declining and there is no migration. The decline in mortality rates causes more women to be in the reproductive ages than there would have been if mortality rates had not declined. These extra women add to the number of births in the population, but not as much as they would have added if fertility rates had not declined. The net addition or subtraction to the population caused by the simultaneous declines in mortality and fertility rates is called an interaction effect. Similar effects are estimated for each combination of changes in mortality rates, fertility rates, and net migration.

The data needed to estimate these factor combinations are available from several sources. State population data by age and sex for 1950, 1960, 1970, and 1980 were taken from published reports of decennial census data (U.S. Bureau of the Census, 1952, 1961, 1972, 1983b). The empirical analysis covers the 48 contiguous states in the United States; Alaska and Hawaii were excluded because life-table mortality rates were not available for 1949–1951.

Age-specific mortality rates were available for males and females of all races in all states for 1969–1971 and 1979–1981 (National Center for Health Statistics, 1975, 1985). For 1949–1951 and 1959–1961, however, mortality rates were not available for persons of all races. Instead, age-specific mortality rates by sex were

TABLE 1: Life Expectancy at Birth and Total Fertility Rate, by State: 1950, 1960, 1970, and 1980

State	Life Expectancy at Birth (years)				Total Fertility Rate			
	1950	1960	1970	1980	1950	1960	1970	1980
Alabama	66.24	68.11	69.05	72.53	3.50	3.63	2.56	1.89
Arizona	67.31	68.91	70.55	74.30	3.97	4.23	2.87	2.13
Arkansas	69.19	70.16	70.66	73.72	3.69	3.71	2.57	1.99
California	69.26	70.82	71.71	74.57	3.03	3.63	2.36	1.90
Colorado	69.24	70.79	72.06	75.30	3.42	3.66	2.35	1.78
Connecticut	70.29	71.02	72.48	75.12	2.51	3.56	2.34	1.51

TABLE 1: Continued

State	Life Expectancy at Birth (years)				Total Fertility Rate			
	1950	1960	1970	1980	1950	1960	1970	1980
Delaware	67.36	69.38	70.06	73.21	3.03	3.86	2.49	1.76
Florida	67.92	69.84	70.66	74.00	3.07	3.67	2.47	1.74
Georgia	66.28	67.91	68.54	72.22	3.46	3.61	2.60	1.87
Idaho	69.70	71.13	71.87	75.19	3.79	4.18	2.89	2.52
Illinois	68.82	69.64	70.14	73.73	2.84	3.69	2.53	1.93
Indiana	69.16	70.37	70.88	73.84	3.12	3.69	2.53	1.84
Iowa	70.95	71.91	72.56	75.81	3.36	3.86	2.51	1.96
Kansas	70.79	71.90	72.58	75.31	3.17	3.72	2.38	2.02
Kentucky	67.83	69.66	70.10	73.06	3.59	3.68	2.52	1.87
Louisiana	66.81	68.13	68.76	71.74	3.72	4.09	2.69	2.16
Maine	69.02	70.02	70.93	74.59	3.21	3.89	2.60	1.74
Maryland	67.61	68.72	70.22	73.32	2.85	3.72	2.26	1.58
Massachusetts	69.49	70.61	71.83	75.01	2.65	3.60	2.35	1.45
Michigan	69.13	70.13	70.63	73.67	3.22	3.84	2.59	1.77
Minnesota	70.78	71.84	72.96	76.15	3.49	4.20	2.53	1.89
Mississippi	65.71	67.70	68.09	71.98	4.00	4.26	3.05	2.22
Missouri	69.70	70.40	70.69	73.84	2.99	3.64	2.41	1.91
Montana	68.89	69.49	70.56	73.93	3.76	4.23	2.62	2.07
Nebraska	71.08	71.95	72.60	75.49	3.33	3.96	2.49	2.05
Nevada	66.88	67.42	69.03	72.64	3.15	3.78	2.53	1.85
New Hampshire	69.50	70.41	71.23	74.98	3.00	3.79	2.50	1.69
New Jersey	69.08	69.80	70.93	74.00	2.50	3.45	2.42	1.62
New Mexico	66.65	69.48	70.32	74.01	4.35	4.57	2.87	2.25
New York	68.85	69.61	70.55	73.70	2.54	3.30	2.39	1.63
North Carolina	67.31	68.40	69.21	72.96	3.27	3.40	2.43	1.63
North Dakota	70.44	71.72	72.79	75.71	3.95	4.40	2.73	2.13
Ohio	69.38	70.18	70.82	73.49	3.00	3.61	2.52	1.81
Oklahoma	69.84	70.89	71.42	73.67	3.12	3.42	2.37	2.02
Oregon	70.00	70.85	72.13	74.99	3.27	3.59	2.25	1.84
Pennsylvania	68.49	69.47	70.43	73.58	2.63	3.36	2.38	1.64
Rhode Island	69.24	70.60	71.90	74.76	2.56	3.50	2.41	1.52
South Carolina	64.73	66.41	67.96	71.85	3.68	3.60	2.54	1.84
South Dakota	70.91	70.94	72.08	74.97	3.92	4.37	2.75	2.35
Tennessee	67.55	69.43	70.11	73.30	3.16	3.34	2.37	1.73
Texas	67.83	70.12	70.90	73.64	3.44	3.81	2.67	2.14
Utah	70.13	71.61	72.90	75.76	4.01	4.33	3.31	3.22
Vermont	69.22	70.35	71.64	74.79	3.35	4.02	2.59	1.72
Virginia	66.92	68.80	70.08	73.43	3.12	3.48	2.36	1.63
Washington	69.72	70.95	71.72	75.13	3.21	3.71	2.35	1.83
West Virginia	67.76	69.53	69.48	72.84	3.37	3.30	2.52	1.81
Wisconsin	70.04	71.22	72.48	75.35	3.16	3.84	2.54	1.85
Wyoming	68.59	69.90	70.29	73.85	3.54	3.99	2.73	2.42
Mean	68.70	69.97	70.87	74.06	3.29	3.79	2.54	1.91
Standard Deviation	1.48	1.25	1.28	1.11	0.43	0.31	0.20	0.30

Note: Life expectancy at birth is the average lifespan of a group of newborn babies, if age-sex-specific death rates for a given year were to remain constant over time. The total fertility rate is the average number of children that would be born to a group of women if they were to pass through their childbearing years conforming to the age-specific fertility rates of a given year.

available for whites and nonwhites in 17 states for 1949–1951 and in 24 states for 1959–1961; in the other states, age-specific mortality rates were available only for white males and females (National Office of Vital Statistics, 1956; National Center for Health Statistics, 1966). For the states in which data were available for both whites and nonwhites, we calculated age-specific mortality rates for males and females of all races by taking a weighted average of the rates for whites and nonwhites. We determined the weights using proportions white and nonwhite in the relevant population. For the remaining states, age-specific mortality rates for white males and females were used as proxies for age-specific mortality rates for males and females of all races. Fortunately, data were available for both whites and nonwhites for states in which the number of nonwhites was substantial. Table 1 shows the life expectancy at birth for each state for 1950, 1960, 1970, and 1980, as calculated in the manner just described.

Age-specific fertility rates for all states were available in published form for 1950 and 1960 (National Center for Health Statistics, 1968) but not for 1970 and 1980. For the last two years, age-specific fertility rates were constructed by dividing the number of live births by age of mother by the number of females in each age group. Data on live births by age of mother were obtained from vital statistics reports (National Center for Health Statistics, 1975, 1984) and data on the number of females in each age group were obtained from decennial census reports. Table 1 shows the total fertility rates for each state for 1950, 1960, 1970, and 1980.

The effects of changing mortality and fertility rates on population growth can be estimated most accurately if data are available at frequent intervals. Unfortunately, age-sex-specific mortality and fertility rates for states are typically available only once every ten years. Rather than attempting to construct such rates on an annual basis, we estimated intradecade rates as an average of beginning-of-decade and end-of-decade rates. For mortality rates we used a simple average, which implies that rates changed linearly for each state over the course of the decade. This is a reasonable assumption, given the relatively high degree of stability in mortality trends.

For fertility rates, however, there has been no such stability. Nationally, fertility rates rose rapidly during the early 1950s but declined slightly during the late 1950s, declined fairly steadily throughout the 1960s, and declined rapidly during the early 1970s before rising slightly during the late 1970s. Under these circumstances, a simple average of rates from the beginning and end of the decade will not provide an accurate estimate of the average rates occurring throughout the decade. To solve this problem, we used a weighted average of beginning-of-decade and end-of-decade rates. We estimated the weights using the U.S. trend in fertility rates during the decade.[1] This approach implies that each state followed the same timing pattern as the nation as a whole in moving from its beginning-of-decade rates to its end-of-decade rates. Although this approach undoubtedly caused some

[1]The weights were obtained by finding values that would produce a weighted average of beginning-of-decade and end-of-decade rates equal to the average from all ten years in the decade. The resulting weights were .259 and .741 for 1950–1960, .484 and .516 for 1960–1970, and .147 and .853 for 1970–1980.

errors in the estimates of the components of growth, we believe these errors were small and had little effect on the empirical results.

Estimates of net migration by age and sex were available for all states for all three decades (Bowles and Tarver, 1965; Bowles, Beale and Lee, 1975; White, Meuser and Tierney, 1987).[2] These estimates were produced using well-known methods in which net migration is calculated as the residual after natural increase is subtracted from total population change (U.S. Bureau of the Census, 1973). They include the effects of international migration as well as interstate migration.

3. EFFECTS OF FACTOR COMBINATIONS

The effects of the eight factor combinations on population change were estimated for each state for each decade between 1950 and 1980. The results are shown in Tables 2–4. The absolute population changes caused by each factor combination are expressed as percentages of the total population existing at the beginning of the decade. Thus, they specify the decennial percentage changes in the initial population that would have occurred solely as the result of each factor combination. Dividing by the initial population accounts for differences in state population size and permits more useful state-to-state comparisons.

Interaction effects $E(\text{ab})$, $E(\text{ac})$, $E(\text{bc})$, and $E(\text{abc})$ were very small and are not reported separately in this article. Rather, these effects were added together and are shown in the tables as *INTERACT*. The term *INTERACT* also includes the effects of measurement errors for births, deaths, net migration, and census enumerations. It is thus a residual category, picking up both interaction effects and measurement errors. An analysis of the interaction effects and measurement errors showed that measurement errors had a greater effect on the residual than did the interaction effects.

For purposes of exposition, we use the following terminology in the empirical analysis:

MOMENTUM = percentage change in population caused by the continuation of initial mortality and fertility rates and no migration, $E(1)$.

MORT = percentage change in population caused by changes in mortality rates with no change in fertility rates and no migration, $E(\text{a})$.

FERT = percentage change in population caused by changes in fertility rates with no change in mortality rates and no migration, $E(\text{b})$.

MIGR = percentage change in population caused by net migration with no change in mortality and fertility rates, $E(\text{c})$.

INTERACT = percentage change in population caused by all interaction effects combined $[E(\text{ab}), E(\text{ac}), E(\text{bc}), E(\text{abc})]$ and by measurement errors.

Time Period: 1950–1960

Table 2 shows the empirical results for 1950–1960. Population size increased in all states except Arkansas and West Virginia. The average growth rate was 18.9

[2]It would also be interesting to analyze the separate effects of gross in-migration and gross out-migration on population change. Unfortunately, gross migration data by decade are not available for states.

TABLE 2: Demographic Causes of State Population Growth: Percentage Changes for 1950–1960

State	1950 Population (000's)	*MOMENTUM*	*MORT*	*FERT*	*MIGR*	*INTER-ACT*	Total Percent Change
Alabama	3,062	19.4	0.5	0.9	-12.0	-2.1	6.7
Arizona	750	21.5	0.7	1.4	45.1	5.0	73.7
Arkansas	1,910	19.4	0.3	0.2	-22.7	3.7	-6.5
California	10,586	10.3	0.5	2.8	29.7	5.2	48.5
Colorado	1,325	15.3	0.4	1.2	12.4	3.1	32.4
Connecticut	2,007	7.7	0.3	5.2	11.7	1.4	26.3
Delaware	318	11.0	0.9	4.2	20.1	4.1	40.3
Florida	2,771	11.6	0.6	3.0	58.3	5.2	78.7
Georgia	3,445	18.6	0.5	0.9	-6.2	0.7	14.5
Idaho	589	19.2	0.4	2.1	-6.8	1.6	13.3
Illinois	8,712	8.9	0.3	4.3	1.4	0.8	15.7
Indiana	3,934	12.2	0.3	2.9	1.6	1.5	18.5
Iowa	2,621	13.2	0.3	2.6	-8.9	-2.0	5.2
Kansas	1,905	12.2	0.4	2.8	-2.3	1.2	14.3
Kentucky	2,945	17.7	0.5	0.6	-13.2	-2.5	3.2
Louisiana	2,684	20.0	0.4	2.1	-1.9	0.8	21.4
Maine	914	12.2	0.3	3.7	-7.2	-2.9	6.1
Maryland	2,343	11.3	0.4	4.7	13.7	2.2	32.3
Massachusetts	4,691	7.7	0.4	4.9	-2.0	-1.2	9.8
Michigan	6,372	14.4	0.3	3.3	2.5	2.3	22.8
Minnesota	2,982	14.9	0.3	3.7	-3.2	1.2	14.5
Mississippi	2,179	22.2	0.6	1.5	-19.9	-4.4	0.0
Missouri	3,955	10.1	0.2	3.3	-3.3	-1.1	9.2
Montana	591	15.6	0.4	2.3	4.3	0.2	14.2
Nebraska	1,326	13.7	0.3	3.3	-.8.8	-2.0	6.5
Nevada	160	10.3	0.4	2.8	53.8	10.9	78.2
New Hampshire	533	9.1	0.3	4.0	2.4	2.0	13.8
New Jersey	4,835	7.2	0.3	4.6	11.9	1.5	25.5
New Mexico	681	26.9	0.8	1.4	8.5	2.0	39.6
New York	14,830	7.1	0.3	3.8	1.4	0.6	13.2
North Carolina	4,062	19.4	0.3	0.9	-8.1	-0.3	12.2
North Dakota	620	20.3	0.4	2.6	-17.0	4.2	2.1
Ohio	7,947	11.3	0.2	3.1	5.1	2.4	22.1
Oklahoma	2,233	14.0	0.3	1.7	-9.8	1.9	4.3
Oregon	1,521	12.5	0.3	1.5	1.0	1.0	16.3
Pennsylvania	10,498	9.0	0.3	3.9	-4.5	0.9	7.8
Rhode Island	792	7.9	0.5	4.8	-3.3	-1.4	8.5
South Carolina	2,117	22.2	0.5	-0.4	-10.5	0.7	12.5
South Dakota	653	19.2	0.3	2.5	-14.4	3.3	4.3
Tennessee	3,292	16.0	0.5	1.1	-8.3	-0.9	8.4
Texas	7,711	17.5	0.6	2.0	1.5	2.6	24.2
Utah	689	24.3	0.4	1.9	1.5	1.2	29.3
Vermont	378	12.9	0.3	3.6	10.0	-3.6	3.2
Virginia	3,319	15.1	0.5	2.0	0.1	1.8	19.5
Washington	2,379	11.6	0.4	2.3	3.7	1.9	19.9
West Virginia	2,006	18.2	0.5	-0.4	-22.3	3.2	7.2
Wisconsin	3,435	12.2	0.4	3.5	-1.6	0.6	15.1
Wyoming	291	16.7	0.4	2.2	6.8	1.1	13.6
Mean	3,123	14.6	0.4	2.6	1.0	0.3	18.9
Standard Deviation	3,101	4.9	0.1	1.4	16.9	2.9	18.9

Note: Total Percent Change = total percentage change in population during the decade.

percent, and eleven states had growth rates of 25 percent or more. The highest growth rates were for Florida (78.7 percent), Nevada (78.2 percent), and Arizona (73.7 percent).

Mortality rates declined in every state between 1950 and 1960, making *MORT* positive for all states. The effects of declining mortality rates were very small, however. *MORT* values were less than 1 percent in every state, and the mean value was only 0.4 percent.

In almost all states, changes in fertility rates had a larger effect on population growth than did changes in mortality rates. Total fertility rates rose between 1950 and 1960 in every state except South Carolina and West Virginia, making *FERT* positive in all but these two states. Increases in total fertility rates were often substantial (e.g., from 2.51 to 3.56 in Connecticut), but the effects of *FERT* on population growth were not particularly large. The mean *FERT* value was only 2.6 percent; in no state was it greater than 5.2 percent.

The effect of constant mortality and fertility rates applied to the initial age-sex structure (*MOMENTUM*) was considerably greater than the effects of changes in mortality and fertility rates. *MOMENTUM* values were larger than *MORT* and *FERT* values in all 48 states; they were larger that *MIGR* values in 28 states. The mean *MOMENTUM* value was 14.6 percent, but values ranged from 7.1 percent in New York to 26.9 percent in New Mexico. As would be expected, values were largest in states with high fertility rates and young populations, and smallest in states with low fertility rates and old populations. Eight states (all in the Midwest or Northeast regions of the United States) had values of less than 10 percent, and six states (all but one in the South and West regions) had values of 20 percent or more.

Although population momentum had the greatest effect on growth rates in most states, migration was apparently the most important cause of state-to-state differences in population growth rates. *MIGR* values ranged from −22.7 percent in Arkansas to 58.3 percent in Florida. The mean value was only 1.0 percent (positive and negative values offset each other), but the standard deviation was 16.9 percent, much larger than for any other factor combination. If we disregard its sign, *MIGR* was 10 percent or more in 18 states. For rapidly growing states, *MIGR* generally had a greater effect on population growth than *MOMENTUM*: of the eleven states that grew by more than 25 percent, *MIGR* values were larger than *MOMENTUM* values in eight.

Net migration was positive for 21 states between 1950 and 1960, and negative for 27 states. Most states in the West had net in-migration and most states in the South had net out-migration (Florida was a notable exception.) States in the Northeast and Midwest were about evenly divided by direction of net migration.

Time Period: 1960–1970

Table 3 shows the results for 1960–1970. Population size increased in all states except North Dakota, South Dakota, and West Virginia. The average growth rate (13.1 percent) was considerably smaller than in the previous decade, but six states had growth rates of 25 percent or more. Nevada had the highest rate (71.3 percent), followed by Florida (37.2 percent) and Arizona (36.0 percent).

TABLE 3: Demographic Causes of State Population Growth: Percentage Changes for 1960–1970

State	1960 Population (000's)	*MOMENTUM*	*MORT*	*FERT*	*MIGR*	*INTER-ACT*	Total Percent Change
Alabama	3,267	18.1	0.2	−4.0	−7.0	−1.9	5.4
Arizona	1,302	22.5	0.2	−5.0	18.4	−0.1	36.0
Arkansas	1,786	16.1	0.1	−4.0	−2.8	−1.7	7.7
California	15,717	15.1	0.2	−4.4	13.6	2.5	27.0
Colorado	1,754	16.7	0.2	−4.7	12.0	1.6	25.8
Connecticut	2,535	12.7	0.3	−4.0	8.3	2.3	19.6
Delaware	446	17.5	−0.2	−4.8	8.4	1.9	22.8
Florida	4,952	13.8	0.2	−4.0	26.9	0.3	37.2
Georgia	3,943	18.4	0.1	−3.8	1.7	0.0	16.4
Idaho	667	21.1	0.1	−4.7	−6.2	−3.5	6.8
Illinois	10,081	13.6	0.1	−3.9	−0.5	0.9	10.2
Indiana	4,662	15.9	0.1	−4.1	−0.3	−0.2	11.4
Iowa	2,758	14.9	0.2	−4.6	−6.7	−1.4	2.4
Kansas	2,179	15.0	0.1	−4.6	−6.1	−1.3	3.1
Kentucky	3,038	16.5	0.0	−4.1	−5.1	−1.4	5.9
Louisiana	3,257	21.1	0.1	−5.2	−3.8	−0.4	11.8
Maine	969	15.3	0.2	−4.4	−7.2	−1.5	2.4
Maryland	3,101	16.5	0.4	−5.2	12.3	2.5	26.5
Massachusetts	5,149	11.8	0.3	−4.1	1.4	1.1	10.5
Michigan	7,823	17.1	0.1	−4.3	0.4	0.1	13.4
Minnesota	3,414	18.1	0.3	−5.6	−0.8	−0.5	11.5
Mississippi	2,178	21.4	0.2	−4.3	−12.3	−3.2	1.8
Missouri	4,320	12.7	0.1	−4.1	0.1	−0.5	8.3
Montana	675	18.8	0.2	−5.6	−8.7	−1.8	2.9
Nebraska	1,411	15.7	0.1	−5.0	−5.2	−0.5	5.1
Nevada	285	16.5	0.2	−4.3	50.9	8.0	71.3
New Hampshire	607	13.4	0.2	−4.3	11.3	0.9	21.5
New Jersey	6,067	11.1	0.3	−3.3	8.0	2.1	18.2
New Mexico	951	28.0	0.1	−6.6	−12.6	−2.1	6.8
New York	16,782	10.0	0.3	−3.0	−0.4	1.8	8.7
North Carolina	4,556	17.8	0.1	−3.7	−1.8	−0.9	11.5
North Dakota	632	21.1	0.2	−5.8	−15.1	−2.7	−2.3
Ohio	9,706	14.8	0.1	−3.8	−1.3	−0.1	9.7
Oklahoma	2,328	14.0	0.1	−3.8	0.7	−1.1	9.9
Oregon	1,769	14.1	0.2	−4.7	9.0	−0.4	18.2
Pennsylvania	11,319	11.0	0.3	−3.3	−3.3	−0.5	4.2
Rhode Island	859	11.3	0.4	−3.5	1.3	0.6	10.1
South Carolina	2,383	19.4	0.3	−4.0	−5.6	−1.4	8.7
South Dakota	681	19.4	0.1	−5.6	−13.8	2.3	−2.2
Tennessee	3,567	15.4	0.1	−3.6	−1.3	−0.6	10.0
Texas	9,580	19.2	0.1	−4.2	2.1	−0.3	16.9
Utah	891	25.7	0.2	−4.1	−1.2	−1.7	18.9
Vermont	390	16.1	0.3	−4.9	4.0	−1.5	14.0
Virginia	3,967	16.6	0.3	−4.2	3.9	0.6	17.2
Washington	2,853	15.2	0.1	−4.7	8.8	0.1	19.5
West Virginia	1,860	14.3	−0.2	−2.9	−14.1	−3.3	−6.2
Wisconsin	3,952	14.9	0.3	−4.2	0.0	0.8	11.8
Wyoming	330	19.3	0.0	−4.6	−11.9	−2.1	0.7
Mean	3,702	16.6	0.2	−4.4	1.0	−0.3	13.1
Standard Deviation	3,785	3.7	0.1	0.7	11.4	1.9	12.6

Mortality rates declined in 46 states, making *MORT* values positive in all but two states. *MORT* values were negative in Delaware and West Virginia, most likely because of the switch from life tables for whites to life tables for persons of all races in the calculation of changes in mortality rates. *MORT* values were very small in all states, and the mean value was only 0.2 percent.

Total fertility rates declined in all states between 1960 and 1970, often by large amounts (e.g., from 4.40 to 2.73 in North Dakota). As a consequence, *FERT* values were negative in all states. The effects of declining fertility rates on population growth during the 1960s were considerably greater than the effects of increasing fertility rates during the 1950s. *FERT* values ranged from −2.9 to −6.6 percent; the mean value was −4.4 percent.

MOMENTUM values were larger for most states in the 1960s than in the 1950s. The mean value was 16.6 percent for 1960–1970, compared to 14.6 percent for 1950–1960. These larger values were caused primarily by higher fertility rates in 1960 than 1950. As in the 1950s, most states with high *MOMENTUM* values were in the South and West, and most states with low values were in the Northeast. The range and standard deviation were slightly smaller for the 1960s than the 1950s, indicating a slight convergence in *MOMENTUM* values over time. In all but two states, *MOMENTUM* had a greater effect on population change than any other factor combination.

MIGR again displayed the largest amount of state-to-state variation of any factor combination. *MIGR* values ranged from −15.1 percent in North Dakota to 50.9 percent in Nevada. Thirteen states had *MIGR* values of 10 percent or more (sign excluded). The mean value was only 1.0 percent, but the standard deviation was 11.4, much larger than for any other factor combination. The distribution of states by direction of net migration was almost identical to that of the 1950s: 22 states had positive *MIGR* values and 26 states had negative values. As in the 1950s, most states in the West had net in-migration and most states in the South had net out-migration.

Time Period: 1970–1980

The results for 1970–1980 are shown in Table 4. Population size increased in every state except New York. The average growth rate (15.8 percent) was higher than in the previous decade, and ten states had growth rates of 25 percent or more. The highest growth rates were for Nevada (63.8 percent), Arizona (53.5 percent), Florida (43.5 percent), and Wyoming (41.3 percent).

Mortality rates declined in every state, making *MORT* values positive in every state. *MORT* values were generally larger than in previous decades, but were still very small when compared with the values for the other factor combinations. *MORT* had a mean value of 0.7 percent, and ranged only between 0.5 and 0.9 percent.

Fertility rates also declined in every state. The effect of declining fertility rates on population growth was about the same as during the 1960s. The mean *FERT* value was −4.5 percent; the standard deviation was 1.2. *FERT* values ranged from −0.9 percent in Utah to −6.4 percent in Vermont.

The effect of population momentum on population growth was smaller in the

TABLE 4: Demographic Causes of State Population Growth: Percentage Changes for 1970–1980

State	1970 Population (000's)	*MOMENTUM*	*MORT*	*FERT*	*MIGR*	*INTER-ACT*	Total Percent Change
Alabama	3,444	11.6	0.8	−4.9	3.3	2.3	13.1
Arizona	1,771	14.9	0.8	−5.2	39.2	3.8	53.5
Arkansas	1,923	9.7	0.7	−3.9	10.4	2.0	18.9
California	19,953	10.5	0.6	−3.3	9.0	1.8	18.6
Colorado	2,207	12.4	0.7	−4.4	19.1	3.1	30.9
Connecticut	3,032	9.0	0.6	−5.6	−3.4	1.9	2.5
Delaware	548	12.0	0.7	−5.3	−0.4	1.4	8.4
Florida	6,791	6.6	0.8	−4.7	38.6	2.2	43.5
Georgia	4,590	13.2	0.8	−5.5	7.9	2.6	19.0
Idaho	713	15.1	0.7	−2.9	16.9	2.7	32.5
Illinois	11,114	10.0	0.8	−4.1	−5.4	1.5	2.8
Indiana	5,194	11.7	0.7	−4.9	−3.3	1.5	5.7
Iowa	2,824	9.4	0.8	−3.8	−3.6	0.4	3.2
Kansas	2,247	9.2	0.6	−2.5	−2.4	0.3	5.2
Kentucky	3,219	10.3	0.7	−4.4	4.9	2.2	13.7
Louisiana	3,641	13.8	0.7	−3.9	3.3	1.6	15.5
Maine	992	9.7	0.9	−5.8	6.2	2.4	13.4
Maryland	3,922	10.1	0.7	−5.0	−0.3	2.0	7.5
Massachusetts	5,689	8.2	0.8	−6.1	−4.0	1.9	0.8
Michigan	8,875	12.9	0.7	−6.0	5.0	1.8	4.4
Minnesota	3,805	11.5	0.7	−4.4	−1.2	0.5	7.1
Mississippi	2,217	15.4	0.8	−5.7	1.7	1.5	13.7
Missouri	4,677	8.0	0.8	−3.4	−1.5	1.2	5.1
Montana	694	11.7	0.7	−4.1	3.3	1.7	13.3
Nebraska	1,483	9.7	0.7	−3.2	−2.4	1.0	5.8
Nevada	489	11.9	0.8	−4.8	52.0	3.9	63.8
New Hampshire	738	9.5	0.9	−5.5	17.1	2.8	24.8
New Jersey	7,168	8.0	0.8	−5.2	−3.3	2.4	2.7
New Mexico	1,016	17.4	0.8	−4.6	12.8	1.8	28.2
New York	18,237	7.8	0.8	−5.1	−9.7	2.5	−3.7
North Carolina	5,082	11.7	0.8	−5.9	6.1	3.0	15.7
North Dakota	618	12.3	0.7	4.0	−4.3	1.0	5.7
Ohio	10,652	11.3	0.6	−5.0	−6.8	1.3	1.4
Oklahoma	2,559	8.9	0.5	−2.5	10.0	1.3	18.2
Oregon	2,091	9.0	0.7	−3.1	17.7	1.6	25.9
Pennsylvania	11,794	7.2	0.8	−4.9	−4.3	1.8	0.6
Rhode Island	947	8.1	0.7	−5.8	5.1	2.1	0.0
South Carolina	2,591	13.3	0.9	−5.4	8.8	2.9	20.5
South Dakota	666	11.5	0.7	−2.8	−5.4	−0.2	3.8
Tennessee	3,924	9.9	0.7	−4.6	8.4	2.6	17.0
Texas	11,197	13.9	0.6	−3.8	14.5	1.9	27.1
Utah	1,059	23.1	0.6	−0.9	12.9	2.2	37.9
Vermont	444	11.7	0.8	−6.4	7.2	1.8	15.1
Virginia	4,648	11.1	0.7	−5.4	5.9	2.7	15.0
Washington	3,409	10.5	0.8	−3.8	12.6	1.1	1.2
West Virginia	1,744	8.9	0.8	−4.7	4.9	1.9	11.8
Wisconsin	4,418	10.8	0.7	−4.7	−1.2	0.9	6.5
Wyoming	332	13.3	0.8	−2.2	27.4	2.0	41.3
Mean	4,196	11.2	0.7	−4.5	6.4	1.9	15.8
Standard Deviation	4,361	2.9	0.1	1.2	12.7	0.8	14.4

1970s than in previous decades, primarily because fertility rates were lower in 1970 than in 1960 or 1950. *MOMENTUM* had a mean value of 11.2 percent, compared to 16.6 percent for the 1960s and 14.6 percent for the 1950s. *MOMENTUM* values ranged from 6.6 percent in Florida to 23.1 percent in Utah, but 32 states had values between 8 and 12 percent. The range and standard deviation were smaller than in either previous decade, reflecting the continued convergence of *MOMENTUM* values over time. In spite of generally smaller values than in previous decades, *MOMENTUM* still had a greater effect on population growth than any other factor combination in 35 states.

As in previous decades, net migration was apparently the major cause of state-to-state differences in population growth rates. *MIGR* values ranged from −9.7 percent in New York to 52.0 percent in Nevada. Fourteen states had values of 10 percent or more (sign excluded). Of the ten states that grew by more than 25 percent between 1970 and 1980, *MIGR* values were larger than *MOMENTUM* values in eight. The standard deviation was 12.7, larger than in the previous decade and much larger than for any other factor combination.

Twenty-eight states had positive net migration during the 1970s and 20 had negative net migration, reversing the pattern of the previous two decades. This was caused in part by higher levels of foreign immigration during the 1970s than during previous decades. The mean *MIGR* value of 6.4 percent was considerably larger than in previous decades. In contrast to previous decades, most states in the South had net in-migration during the 1970s and most states in the Northeast and Midwest had net out-migration. All states in the West had net in-migration.

Correlation Analysis

Tables 2–4 show that in most states population momentum had the greatest effect on decennial population growth rates between 1950 and 1980, followed in order by net migration, changes in fertility rates, and changes in mortality rates. This does not imply, however, that population momentum was the factor combination most responsible for explaining *differences* in population growth rates among states. In fact, Tables 2–4 show that *MIGR* had the widest range and largest standard deviation in every decade, suggesting that net migration was the factor combination most responsible for differences in population growth rates among states.

This hypothesis can be tested formally using correlation analysis. For each decade, population changes associated with each of the five factor combinations were correlated with total population change. The resulting Pearson correlation coefficients are shown in Table 5. The coefficients for *MOMENTUM, FERT*, and *MORT* were small for every decade. They were statistically significant at a 5 percent level only for *MORT* in 1950–1960 and for *MOMENTUM* in 1970–1980. For *MIGR*, on the other hand, the coefficients were very large and were statistically significant in all three decades. Based on the evidence regarding ranges, standard deviations, and correlation analysis, it is clear that net migration was much more important than any other factor combination in explaining state-to-state differences in population growth rates.

TABLE 5: Correlations of Factor Combinations with Total Population Change: 1950–1960, 1960–1970, and 1970–1980

Factor Combination	Pearson Correlation Coefficients		
	1950–1960	1960–1970	1970–1980
MOMENTUM	−.08	−.04	.45**
MORT	.42**	.21	.12
FERT	.14	.01	.24
MIGR	.98***	.97***	.98***
INTERACT	.90***	.81***	.59***

Note: *, **, and *** indicate that the coefficient is significant at .05, .01, and .001, respectively.

INTERACT was also highly correlated with population change. This was due primarily to the high correlation between population growth rates and measurement errors: states that grew rapidly generally had larger measurement errors than other states. Measurement errors were particularly large for net migration; as a consequence, *MIGR* and *INTERACT* were highly correlated in all three decades (not shown here).

4. NATURAL INCREASE AND NET MIGRATION

MORT and *FERT* represent the effects of decennial *changes* in mortality and fertility rates; they do not represent the total contributions of deaths and births to population growth. However, the factorial projections method can be used to estimate the separate contributions of natural increase and net migration to population change. The sum of $E(1)$, $E(\mathrm{a})$, $E(\mathrm{b})$, and $E(\mathrm{ab})$ provides an estimate of natural increase, whereas the sum of $E(\mathrm{c})$, $E(\mathrm{ac})$, $E(\mathrm{bc})$, and $E(\mathrm{abc})$ provides an estimate of net migration.[3]

Table 6 shows estimates of natural increase and net migration by state for each decade between 1950 and 1980. As in Tables 2–4, values are expressed as percentages of the population at the beginning of the decade. The mean values for net migration in Table 6 are based on absolute percentage changes; that is, the sign of net migration is ignored.

During the 1950s, natural increase was greater than net migration (sign excluded) in 39 states; natural increase as a proportion of the state's initial population had a mean value of 17.6 percent, whereas net migration had a mean value of 12.9 percent. During the 1960s, natural increase was greater than net migration in 36 states; it had a mean value of 12.4 percent, compared to 8.7 percent for net migration. During the 1970s, natural increase was greater than net migration in only 24 states. The mean value declined to 7.5 percent; for net migration the mean value increased to 10.3 percent.

Table 6 shows that in most states during the 1950s and 1960s, natural increase

[3]Under this formulation, births and deaths to migrants are classified as part of net migration rather than natural increase. The effects of measurement errors are also included in the estimates of net migration.

TABLE 6: Percentage Changes in Population Caused by Natural Increase and Net Migration, 1950–1980

State	Natural Increase			Net Migration		
	1950–1960	1960–1970	1970–1980	1950–1960	1960–1970	1970–1980
Alabama	20.8	14.3	7.5	−14.1	−8.9	5.6
Arizona	23.6	17.7	10.5	50.1	18.3	43.0
Arkansas	19.9	12.2	6.5	−26.4	−4.5	12.4
California	13.6	10.9	7.8	34.9	16.1	10.8
Colorado	16.9	12.2	8.7	15.5	13.6	22.2
Connecticut	13.2	9.0	4.0	13.1	10.6	−1.5
Delaware	16.1	12.5	7.5	24.2	10.3	1.0
Florida	15.2	10.0	2.7	63.5	27.2	40.8
Georgia	20.0	14.7	8.5	−5.5	1.7	10.5
Idaho	21.7	16.5	12.9	−8.4	−9.7	19.6
Illinois	13.5	9.8	6.7	2.2	0.4	−3.9
Indiana	15.4	11.9	7.5	3.1	−0.5	−1.8
Iowa	16.1	10.5	6.4	−10.9	−8.1	−3.2
Kansas	15.4	10.5	7.3	−1.1	−7.4	−2.1
Kentucky	18.8	12.4	6.6	−15.6	−6.5	7.1
Louisiana	22.5	16.0	10.6	−1.1	−4.2	4.9
Maine	16.2	11.1	4.8	−10.1	−8.7	8.6
Maryland	16.4	11.7	5.8	15.9	14.8	1.7
Massachusetts	13.0	8.0	2.9	−3.2	2.5	−2.1
Michigan	18.0	12.9	7.6	4.8	0.5	−3.2
Minnesota	18.9	12.8	7.8	−4.4	−1.3	−0.7
Mississippi	24.3	17.3	10.5	−24.3	−15.5	3.2
Missouri	13.6	8.7	5.4	−4.4	−0.4	−0.3
Montana	18.3	13.4	8.3	−4.1	−10.5	5.0
Nebraska	17.3	10.8	7.2	−10.8	−5.7	−1.4
Nevada	13.5	12.4	7.9	64.7	58.9	55.9
New Hampshire	13.4	9.3	4.9	0.4	12.2	19.9
New Jersey	12.1	8.1	3.6	13.4	10.1	−0.9
New Mexico	29.1	21.5	13.6	10.5	−14.7	14.6
New York	11.2	7.3	3.5	2.0	1.4	−7.2
North Carolina	20.6	14.2	6.6	−8.4	−2.7	9.1
North Dakota	23.3	15.5	9.0	−21.2	−17.8	−3.3
Ohio	14.6	11.1	6.9	7.5	−1.4	−5.5
Oklahoma	16.0	10.3	6.9	−11.7	−0.4	11.3
Oregon	14.3	9.6	6.6	2.0	8.6	19.3
Pennsylvania	13.2	8.0	3.1	−5.4	−3.8	−2.5
Rhode Island	13.2	8.2	3.0	−4.7	1.9	−3.0
South Carolina	22.3	15.7	8.8	−9.8	−7.0	11.7
South Dakota	22.0	13.9	9.4	−17.7	−16.1	−5.6
Tennessee	17.6	11.9	6.0	−9.2	−1.9	11.0
Texas	20.1	15.1	10.7	4.1	1.8	16.4
Utah	26.6	21.8	22.8	2.7	−2.9	15.1
Vermont	16.8	11.5	6.1	−13.6	2.5	9.0
Virginia	17.6	12.7	6.4	1.9	4.5	8.6
Washington	14.3	10.6	7.5	5.6	8.9	13.7
West Virginia	18.3	11.2	5.0	−25.5	−17.4	6.8
Wisconsin	16.1	11.0	6.8	−1.0	0.8	−0.3
Wyoming	19.3	14.7	11.9	−5.7	−14.0	29.4
Mean	17.6	12.4	7.5	12.9	8.7	10.3
Standard Deviation	3.9	3.2	3.3	19.3	13.0	13.1

Note: Numerical values for natural increase and net migration are percentages of beginning-of-decade populations. Mean values for net migration are based on absolute values (i.e., the direction of net migration is ignored).

contributed more than net migration to population growth. During the 1970s, their contributions were about equal. The ranges and standard deviations, however, suggest that in all three decades net migration was more important than natural increase in explaining differences in population growth rates among states. This hypothesis can be tested by correlating population growth with natural increase and net migration.

Pearson correlation coefficients from these correlations are shown in Table 7. As expected, the coefficients for net migration were much larger and had higher levels of significance than the coefficients for natural increase. This was true even for the 1950s and 1960s, when natural increase contributed more than net migration to population growth in most states. Clearly, differences in net migration were much more important than differences in natural increase in explaining differences in population grwoth rates among states between 1950 and 1980. The same result was found in a previous study of states, covering the decades from 1870 to 1950 (Eldridge and Thomas, 1964).

5. DISCUSSION AND CONCLUSIONS

What can be learned from this analysis of the population growth of states? Can any consistent patterns be observed, or are there too many differences from state to state and too many changes over time? Although causes of population growth clearly differ from state to state and change over time, we believe several consistent patterns can be noted and several conclusions can be drawn.

Mortality rates exhibited much less state-to-state variation than either fertility rates or net migration. Life expectancy at birth in 1980 was between 69.2 and 76.2 in every state; in most states it was between 73 and 75 (Table 1). Mortality rates also exhibited the least volatility over time, falling slowly but fairly steadily in every state between 1950 and 1980. (The increases in mortality rates observed for a few states between 1960 and 1970 were most likely caused by changes in the type of data used to construct the rates, rather than by increases in the rates themselves.) Of all the factor combinations, *MORT* values were by far the smallest in every decade between 1950 and 1980. Given the low levels of current mortality rates in the United States, it is doubtful that the effect of changing mortality rates on population growth rates will increase significantly in the near future.

Fertility rates varied more from state to state than did mortality rates. The mean total fertility rate for states was 1.90 in 1980, but rates varied from 1.45 in Massachusetts to 3.22 in Utah. Fertility rates were generally highest in the South

TABLE 7: Correlations of Natural Increase and Net Migration with Total Population Change: 1950–1960, 1960–1970, and 1970–1980

Component	Pearson Correlation Coefficients		
	1950–1960	1960–1970	1970–1980
Natural increase	−.04	.03	.47**
Net migration	.98***	.97***	.97***

Note: *, **, and *** indicate that the coefficient is significant at .05, .01, and .001, respectively.

and West, and lowest in the Northeast. Fertility rates were quite volatile between 1950 and 1980, rising in most states during the 1950s and falling dramatically in all states during the 1960s and 1970s. As a consequence, *FERT* values were positive for most states in the 1950s and negative for all states in the 1960s and 1970s. Although *FERT* values were generally larger than *MORT* values (especially during the 1960s), they were always considerably smaller than *MOMENTUM* values and frequently smaller than *MIGR* values. The rise in fertility rates during the Baby Boom and the decline since then were tremendous and are not likely to be repeated. It is therefore likely that *FERT* values will be even smaller in the future than they were in the past three decades.

For most states, the continuation of initial mortality and fertility rates and the aging of the initial age-sex structure (*MOMENTUM*) had the greatest effect on population growth between 1950 and 1980. Of all the factor combinations, *MOMENTUM* was the largest in 38 states for 1950–1960, in 46 states for 1960–1970, and in 34 states for 1970–1980. The mean *MOMENTUM* values for these three decades were 14.5 percent, 16.5 percent, and 11.1 percent, respectively. Although there was some variation in *MOMENTUM* values from state to state, this variation appears to be declining over time, as suggested by successive standard deviations of 4.9, 3.7 and 2.9 for the three decades. Since fertility rates in most states were quite low in 1980, *MOMENTUM* values will most likely be smaller during the 1980s than they were between 1950 and 1980. A continuation of low fertility rates and an aging population (with higher crude death rates) would cause *MOMENTUM* values to continue to decline in future decades.

Net migration was by far the most volatile component of population growth, in terms of both changes over time and state-to-state differences at a given time. Although the mean *MIGR* values were only 1.0 percent, 1.0 percent, and 6.4 percent for the three decades studied, the standard deviations were very large: 16.9, 11.4, and 12.7, respectively. *MIGR* values ranged from −22.7 percent to 58.3 percent during the 1950s, from −15.1 percent to 50.9 percent during the 1960s, and from −9.7 percent to 52.0 percent during the 1970s. Only 17 states had the same sign for net migration in all three decades (7 negative and 10 positive); in 31 states the sign changed at least once from decade to decade.

In many instances, changes in net migration from one decade to the next were dramatic. In Wyoming, for example, *MIGR* was −11.9 percent during the 1960s but 27.4 percent during the 1970s. Although *MIGR* was not the factor combination having the greatest effect on population growth in most states, it was the factor combination most responsible for differences in rates of population growth among states and for changes in state growth rates over time. For the most rapidly growing states, *MIGR was* usually the factor combination having the greatest effect on population growth.

Our analysis showed that differences in net migration were much more important than differences in natural increase in explaining differences in state population growth rates for each decade between 1950 and 1980. However, we also found that for most states in the 1950s and 1960s natural increase had a larger effect on population change than did net migration. This finding is consistent with that of a previous study, which reported that natural increase was greater than net migration (sign excluded) in more than two-thirds of all states between 1870 and 1950 (Eldridge and Thomas, 1964).

There is evidence that natural increase may be losing its dominance over net migration as a component of state population growth. The mean value for natural increase declined from 17.6 percent in the 1950s to 12.4 percent in the 1960s and 7.5 percent in the 1970s. The mean value for net migration (sign excluded) declined from 12.9 percent in the 1950s to 8.7 percent in the 1960s, but rose to 10.3 percent in the 1970s. Natural increase was greater than net migration (sign excluded) in 39 states during the 1950s and 36 states in the 1960s, but only in 24 states in the 1970s. Compared to natural increase, net migration clearly gained in importance as a component of population growth between 1950 and 1980.

Natural increase has rebounded during the 1980s as the large birth cohorts of the 1950s and early 1960s passed through their prime childbearing years, raising the number of births in many states. We believe this resurgence will prove to be temporary. Low fertility rates and an aging population will cause natural increase to decline in future decades, approaching zero or even becoming negative in some states.[4] Consequently, net migration will again grow in importance compared to natural increase and will become the dominant component of population growth in many states. (In the most rapidly growing states, it already is.)

Since net migration varies much more from state to state than does natural increase, the emergence of net migration as the dominant component of population growth may cause larger proportional differences among states in terms of population growth rates. Since net migration varies more from year to year than does natural increase, the emergence of net migration as the dominant component of growth may also lead to greater volatility in annual growth rates for many states. The declining importance of the relatively stable component of population growth (natural increase) and the increasing importance of the relatively volatile component (net migration) may therefore raise the level of uncertainty surrounding many types of population-related planning and analysis, and make the precarious business of modeling and forecasting population growth even more risky than it is now.

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[4]The most recent projections from the U.S. Bureau of the Census (1988) show natural increase for the United States declining from 1,670,000 per year for 1980–1990 to 1,190,000 per year for 1990–2000 and 870,000 per year for 2000–2010. Natural increase is projected to become negative for Florida and Pennsylvania during the 1990s; for several other states, it is projected to remain positive but become very small.

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