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Thomas W. Gavett
June 15, 1966

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PART I

EDUCATION AS A MEASURE OF QUALITY

THE PROBLEM

In areas of the country which have been losing population, such as the state of West Virginia, complaints are frequently heard that the "cream-of-the-crop" is leaving the state. Implicitly, the average quality of the labor force is being depleted by this out-migration. Even in areas of the country not suffering a substantial reduction in population, such as the Midwest, there are complaints of a "brain-drain," that is, complaints that the better educated persons, especially those with Ph.D.'s, are leaving the area to take jobs elsewhere. On the other hand, there are also complaints in some areas about the quality of the migrants into areas which are gaining new citizens, particularly the cities. For example, the Council of Economic Advisors in their 1966 *Annual Report* said as follows:[1]

> When nearly 6.5 million people move across State lines every year and far larger numbers move within States, it is obvious that no community is immune to the effects of substandard education in other localities. Studies have shown that areas that are losing population—particularly their young people—spend less per student on education than those which are growing. The communities gaining population—typically our larger cities—are crowded with migrants who are often inadequately prepared to assume their social responsibilities or to qualify for urban jobs.

Since it cannot both be true that those areas which are gaining population are suffering a deterioration in the quality of the labor force and that at the same time those areas which are losing population are suffering a similar deterioration, this paper proposes to investigate the relationship between migration and changes in the quality of the labor force.

FORMULATION OF THE HYPOTHESIS

On the basis of complaints previously cited, it could be argued that the direction in which population moves is also the direction in which the better qualified members of the labor force are moving; or one could argue exactly the opposite. On *a priori* grounds, the proposition could similarly be argued either way. It might be true that the better qualified are more mobile and more likely to move to other areas of the country. Or it might be true that those who are less well qualified find it impossible to find jobs in areas of declining opportunities and are compelled, of necessity, to move to other areas of the country. Since, on the basis of arguments that have been raised and on *a priori* grounds one could assume that the direction of quality change and that of migration are either directly or inversely related, the hypothesis of this paper is that there is no relationship between migration rates and the net change in the average quality of the labor force attributable to migration.

The word "average" must be stressed, since one would expect that there is a relationship between migration and gross qualitative loss. Every time an area loses a person with some claims to "quality," the area is losing in a gross sense. However, the hypothesis that is investigated here is not whether the area is losing quality in some gross sense, but rather whether or not the average quality of those who remain is augmented or diminished as a result of the migration of people.

In this part of the study, education (the number of years of school completed) is used as a proxy measure of quality. Though there are deficiencies to this measure of quality, one outstanding virtue is that we do have comprehensive information on educational attainment from decennial census data. It should be kept in mind, however, that in addition to other defects noted below, education does not perfectly measure quality of the labor force. There is no evidence that there is a direct and perfect relationship between education and initiative, adaptability, and other characteristics that one might expect of or ascribe to a highly qualified worker.

It is assumed in this study that "a year of education is a year of education." Whether a year of schooling was received in a state with excellent schools or in a state with a very poor school system is not, in this study, a consideration. Nor can we account for any differences which might be attributed to the fact that the year of schooling was gained in an urban rather than a rural school. Of necessity, it must also be assumed that the marginal value of education is constant. Regardless of whether or not the year of schooling represents a change from seventh to eighth grade or from eleventh to twelfth grade or from the third to the fourth year of college, it is assumed that an additional year of schooling has equal value at

[1] *Economic Report of the President, 1966* (GPO, 1966), p. 95.

all levels. Whether or not the marginal value of education is constant, increasing, or decreasing, cannot be established.

METHOD

In analyzing the effects of migration on the quality (education) of the labor force, states were used as the unit of analysis. States are, of course, not perfect units for analysis since states are creatures of political history and not integrated economic entities. States were, nonetheless, used because published data of the detail needed for this analysis is available for states but not for counties or comparable standard statistical areas for both 1950 and 1960. In short, availability of data dictated the choice of states as the unit.

In analyzing the change in the number of school years completed in each state, adjustments must be made for age and sex. Mobility decreases as age increases, and also the number of school years completed is lower among older members of the labor force than among younger persons. Hence, any comparison of changes in average education level made without accounting for differences among age groups would misrepresent the actual effects. For example, a state which is losing population is likely to lose a larger proportion of its younger workers. Since the younger persons have a higher educational attainment on the average than older persons, this would, almost automatically, mean the data for average educational attainment for the state would indicate a deterioration. If, however, the data were standardized for age, it would not necessarily be true that the average educational attainment of those of comparable age who remain behind is lowered. Similarly, there are differences in mobility rates between males and females and differences in educational attainment of males and females. Any analysis of the data should also standardize for sex.

The Census Data

From the published reports of the decennial census, data can be obtained on the number of years of school completed by age and sex.[2] More specifically, the published reports give data on the number of years of school completed for various age groups by sex. For 1960 the data is broken down into twelve age categories, as indicated in Table 1. The data is also further broken down by number of school years completed into fifteen categories, also indicated in Table 1. Similar data is also available for the 1950 census,[3] but the age breakdown is not quite as detailed. Rather than twelve age categories as in the 1960 data, there are only nine age categories in the 1950 data (see Table 1). The number of school years completed has an identical breakdown in both the 1950 and the 1960 data except that no distinction was made in the 1950 census between persons who had completed four years of college and those who had completed five or more years of college.

TABLE 1

AGE CATEGORIES AND SCHOOL-YEARS-COMPLETED CATEGORIES IN 1950 AND 1960 CENSUS

Age		School Years Completed	
1950	1960	1950	1960
14-24	14-24	none	none
25-29	25-29	1 and 2	1 and 2
30-34	30-34	3 and 4	3 and 4
35-39	35-39	5 and 6	5 and 6
40-44	40-44	7	7
45-54	45-49	8	8
	50-54	1 high school	1 high school
55-64	55-59	2 high school	2 high school
	60-64	3 high school	3 high school
65-74	65-69	4 high school	4 high school
	70-74	1 college	1 college
75 and over		2 college	2 college
	75 and over	3 college	3 college
		4 or more	4 college
			5 or more

In making comparisons of what has happened to the average educational attainment of a particular age-sex group from 1950 to 1960, we must have legitimately comparable age groups and number-of-years-of-school-completed categories. The data were, therefore, combined. For example, those persons who were 55 to 64 years of age in 1950 were 65 to 74 years of age in 1960; hence, the age categories 65 to 69 and 70 to 74 for 1960 were combined. The combined and comparable age categories for 1950 and 1960 are given in Table 2. Further, since the number of school years completed as reported in the two censuses was not identical, the number of persons who had completed four years of college in 1960 was combined with those who had completed five or more years of college in 1960.

Since data from the decennial census on number of school years completed is being used, it should

[2] This data can be found in Table 103 in the *Final Report* Series PC(1), the D volumes (GPO, 1962) for the various states and the District of Columbia.

[3] Published in same reports cited in footnote 4, Table 103.

also be noted that education acquired in adult education classes, the military, or industrial education is not taken into account. The census simply counts the number of years of academic education actually completed.

TABLE 2

COMBINED AND COMPARABLE AGE CATEGORIES USED FOR 1950 AND 1960

1950	1960
14-24	25-34
25-29	35-39
30-34	40-44
35-39	45-49
40-44	50-54
45-54	55-64
55-64	65-74
65 and over	75 and over

In using data from the 1950 and 1960 censuses for analysis of changes in the average quality (education) of the labor force, there are the usual problems of errors or misstatements by persons interviewed or the census taker, and sampling procedures used in the census.[4] In addition to these problems, however, there are others that should be pointed out particularly. The first is that comparisons made are comparisons between two points in time, April 1950 and April 1960. It is not necessarily true that those two points in time indicate an accurate measure of average educational gain or loss in the intervening time period. A second, and more serious problem, is that in the 1950 census, persons who did not answer the question on number of years of school completed were reported as a separate group of non-respondents. In the 1960 census, however, the non-respondents were allocated by statistical procedures to various categories of number of years of school completed.[5]

Three measures of the qualitative change attributable to migration were developed: (1) For that part of a state's labor force aged 25 years or over in 1960, the gross change in quality (educational attainment) attributable to migration during the 1950's (hereafter referred to as GQC). (2) For that part of a state's labor force aged 25 years or over in 1960, the net change in quality (educational attainment) attributable to migration during the 1950's (hereafter referred to as NQC25). (3) For that part of a state's labor force aged 35 years or over in 1960, the net change in quality (educational attainment) attributable to migration during the 1950's (hereafter referred to as NQC35).

Gross Quality Change (GQC)

To explain the techniques used to develop estimates of GQC, the following simplified example will be used. First, assume that there are only two school groups rather than the fourteen actually used in this study. Second, assume that there are only two age groups rather than the eight actually used. Suppose that in hypothetical State X there were 132 people, distributed by age and school group as indicated in Table 3. Next, assume that in the nation as a whole

TABLE 3

HYPOTHETICAL POPULATION DISTRIBUTION IN STATE X IN 1950

Age	School Group		Total
	1	2	
1	30	60	90
2	12	30	42
Total	42	90	132

there was a 50 per cent decrease in each age-school group in the following ten years. If there were no migration among the states nor into the United States, and if the death rate in each age-school group was uniform among the states, then the number of persons in each age-school group in State X should have been cut in half. The thirty persons who were in age group 1 and in the first school group in 1950 should, if the above assumptions are true, have been reduced to fifteen in 1960. Of course, this would be fifteen persons in school group 1 in the second age category since they had advanced ten years in age. Since the number in each age-school group which one would predict is 50 per cent of the 1950 figures, the predicted number in each age-school group would be the figures given in Table 4. The 50 per cent figure is the "census survival ratio."[6] In the actual computations there were, of course, different census survival ratios for each age-sex-school group in the nation. Further assume that the actual number of persons in each age-school group in State X were the figures given

[4] See U.S. Bureau of the Census, *U.S. Census of Population: 1960, Detailed Characteristics, United States Summary*. Final Report PC(1)-1D. (GPO, 1963), pp. xviii-xix, xliii-xvii.

[5] The allocative procedures resulted in an increase primarily in the number of persons in the 0-years-completed group or in the lower school-years-completed groups (first through fourth). If the allocative procedures had uniform effects among the states in 1960, any distortion introduced by using these allocative procedures in 1960 and not in 1950 is accounted for by the census-survival-ratios discussed below.

[6] See Everett S. Lee and others, *Population Redistribution and Economic Growth, United States, 1870-1950*, Vol. 1 (Philadelphia, The American Philosophical Society, 1957), pp. 15-27.

in Table 4. For example, there were actually twenty persons in the second age category and first school group, forty in the second age category and second school group, and so forth. The difference between the number predicted for 1960 and the actual number is a difference attributable to migration among the states or to migration into the United States. The latter explanation would mean that migrants into the United States did not settle in each state in proportion to that state's population as a per cent of the national population.

TABLE 4

POPULATION DISTRIBUTION IN STATE X IN 1960

	School Group					
	1			2		
Age	Actual	Predicted	Difference	Actual	Predicted	Difference
2	20	15	+ 5	40	30	+10
3	10	6	+ 4	20	15	+ 5
Totals	30	21		60	45	

If the differences between the actual and predicted figures for each school group were added, then State X gained nine persons in the first school group and fifteen in the second school group. Since we are interested in the qualitative change in the labor force rather than the general population, variations in labor force participation rates of the various age groups must be introduced. Otherwise, those groups who have relatively lower labor force participation rates, such as older workers and females generally, would exert a disproportionate influence in the weighted average difference.

Suppose that the labor force participation rate of persons in the second age group is equal to .90 and that the labor force participation rate of persons in the third age group is .50. The difference in each school group, weighted by labor force participation rates, would be 6.5, i.e., $(5\times.9)+(4\times.5)$, in the first school group and 11.5, i.e., $(10\times.9)+(5\times.5)$, in the second school group.

While the total gain attributable to migration was 18, i.e., (6.5+11.5), we want to determine not simply the gain in population attributable to migration, but rather the gross *qualitative* gain. To do this, the gain in each school group was weighted by the number of school years completed. In the case of State X, the 6.5 persons gained in the first school group are equal to (1×6.5) 6.5, and the 11.5 persons gained in the second school group are equal to (2×11.5) 23. The gross change, weighted by number of school years completed, was 29.5 (23+6.5). If that figure is divided by the number of persons actually in State X in 1960, weighted by labor force participation rates, we have the gross change as a per cent of weighted 1960 population:

$$\left[\frac{29.5}{(60\times.9)+(30\times.5)}=42.8\%\right].$$

It is important to note that this procedure could also give the rate of net migration for the group if we had not weighted the figures by number of school years completed. For example, in State X, 18 people (6.5+11.5) migrated into the state. This gives an estimated rate of net migration, as a per cent of weighted 1960 population (69) equal to 26.1 per cent. A more detailed mathematical statement of the procedure used to obtain the estimates of GQC and the net migration rates for the decade can be found in the Mathematical Appendix (Notes 1, 5, and 6).

In practice, similar calculations were made for males and females and the results added together and divided by the weighted total male plus female population to get the GQC. The estimated rate of net migration as a per cent of 1960 population takes no account of the number of school years completed or age or sex. The GQC figures do take into account the number of school years completed, but does not adjust for age or sex. In other words, the gross change figures are "school weighted" but not "de-aged" or "de-sexed." Nor are the gross change figures adjusted for in-migration or out-migration from the state.

Net Quality Change (NQC25 and NQC35)

The GQC figure computed in the previous section for hypothetical State X, is, as the name states, a gross change. State X did gain population. But this does not really answer the question as to whether or not State X was, on the *average,* better off or worse off as a consequence of this gain in population; that is, did those persons entering the state raise or lower the average educational level of the population. To answer this question, the effects of net in-migration to State X must be eliminated.

This can be done by computing the predicted and the actual population figures in each age-school group as a per cent of the total in the age group. For example, as indicated in Table 5, the fifteen persons *predicted* in the second age category, school group 1, are 33.3 per cent of the total number

of persons predicted in the second age category [15/(15+30)]. Similarly, the twenty persons who were *actually* in the second age category, school group 1, were 33.3 per cent of the total actually in the second age category [20/(20+40)].

TABLE 5

PERCENTAGE POPULATION DISTRIBUTION IN STATE X IN 1960

	School Group					
	1			2		
Age	Actual	Predicted	Difference	Actual	Predicted	Difference
2	33.3	33.3	0.0	66.7	66.7	0.0
3	33.3	28.6	+4.7	66.7	71.4	−4.7

Note that the sum of the predicted percentages and the sum of the actual percentages both equal 100 per cent. Hence, any difference in the actual and predicted percentages, as given in Table 5, cannot be attributed to in-migration or out-migration from the state. The sum of the differences must equal 0. In the third age group, for example, the 4.7 gain in the first school group is precisely offset by the 4.7 loss in the second school group. Hence, the differences reported in Table 5 are the result of net shifts among school groups attributable to migration and not to additions to or subtraction from the population of the state caused by migration.

Having eliminated the effects of migration, the effects of age must next be eliminated. If the differences for each school group were simply added, for example, 0.0 + 4.7, each age group would be counted as being equally important; however, this is not true. Not every age group has the same number of persons in the labor force. If the age groups were of equal size, it would be permissible to simply add up the differences. Therefore, the average difference in each school group is computed by weighting the figures by population and labor force participation rate in each age group. In the case of State X, the weighted average is

$$.09\left[\frac{(.09\times 60\times 0.0)+(.50\times 30\times 4.7)}{(.90\times 60)+(.50\times 30)}\right].$$

This weighted average difference for each school group is now free of the effects of age as well as the effects of population change attributable to in-migration or out-migration.

It should be again emphasized that the sum of the weighted average differences for the two school groups (0.9 and −0.9) is zero. The effects of net shifts in educational attainment—that is, movements from one school group to another—is obtained by further weighting the average differences by number of school years completed. In the case of State X, this figure would be −0.9, i.e., $(0.9\times 1)+(-0.9\times 2)$. If similar calculations are made for both males and females, the results cannot simply be added together, and divided by two, since this would, again, give equal weight to each sex, even though the labor force has a larger proportion of males than females. Hence, instead, the figures for males and females were weighted by the population and labor force participation rates of each sex. This last figure is the net qualitative change in the labor force attributable to migration. In practice, the calculations made were identical to the procedure outlined above, but somewhat more complicated. A mathematical statement of these calculations is included in the Mathematical Appendix, Note 2.

The calculations actually made were for two groups, the first for those persons who were 25 years of age or older in 1960. The reason for excluding those under 25 years of age in 1960 included a number of factors. First, those who were less than 25 in 1960, and therefore under 15 in 1950, were persons who, during the decade of the fifties, were still, by and large, in school. Hence, including this group (those under 25 in 1960) might *heavily* reflect the "educational effort" of the state or local area. It might well be questioned whether the change for this group really reflects the effect of migration into or out of the state or whether it reflects changes in this local educational effort. The second reason for excluding those under age 25 in 1960 is that most have not yet begun their cycle of geographic movement. Census surveys indicate that the rate of migration reaches its peak among those 22-24 years of age and then begin to decline.[7]

Though eliminating those persons under age 25 in 1960 ended certain problems, there are still limitations in the measure that was used. First, the age breakdown is not as fine as might be desired. As previously noted, there were eight age groups used in the actual calculations. Undoubtedly, it would be desirable if we had five-year age groups or, better still, single-year age groups. Second, it had to be assumed that the labor force participation rate was the same in each school-group for a particular age category. For example, it was assumed that the

[7] See Seymour L. Wolfbein, *Employment and Unemployment in the United States* (Chicago, Science Research Associates, Inc., 1964), pp. 220-221.

labor force participation rate for females, age 25 to 34, was the same regardless of whether they had finished three years of grade school, or were high school graduates, or had gone to college. It is known that this is not perfectly true.[8] However, there is no way to eliminate this difficulty except by making very arbitrary assumptions.

Third, the data as published in the census reports, does not give us a breakdown by single years of school completed in all cases. Those completing one and two years of school are grouped together, as are those who complete three and four years and those who complete five and six years. Also, at the other end of the scale, no distinction is made among those who completed four, five, or six years of college (see Table 1). Hence, NQC25 does not perfectly account for shifts among individuals in the lower educational levels, such as one versus two years of school, or at the very highest educational level.

Even though we restricted, in our first calculation, our computations to those who were 25 years of age or older in 1960, there are certain additional problems for which adjustments could be made, in particular, the problems associated with the group who were 25 to 34 years of age in 1960. In comparing the educational gain of those who were 25 to 34 in 1960, data for those who were 14 to 24 in 1950 were used as a basis for comparison. This meant that an age category of eleven years (14 to 24) was being compared with a ten year age group (25 to 34 in 1960). Second, using this younger group (those 24 to 35 in 1960) meant that persons who had a substantial degree of what might well be aimless geographic mobility were being used.[9] Finally, using this younger age group might still include some of the effects of educational effort in the local area. Obviously, among those persons who were 14 to 24 in 1950 there was included a large number who were still in high school and college during the decade of the 1950's.

While it is true that some persons in every age group are still in school, if all those who were under 35 years of age in 1960 were eliminated, this would substantially, though not completely, eliminate the effects of educational effort by the state or local area during the decade of the fifties. Therefore, the NQC35 was calculated, as well as the NQC25 (see the Mathematical Appendix, Note 3, for calculations).

[8] See Wolfbein, *op. cit.*, p. 241.
[9] *Ibid.*, pp. 220-221.

TEST OF HYPOTHESIS

The results of the calculations of NQC25, NQC35, and GQC are given in Table 6 for the fifty states plus the District of Columbia. To test the hypothesis that there was no relationship between net qualitative change and the migration rate, a measure of net migration among the states is also needed.

The most authoritative measure of migration rates among the states is that published by the Bureau of the Census and reproduced in Table 6.[10] However, this authoritative measure may not be appropriate for our purposes for two reasons. First, the Bureau of the Census computation of net migration rates uses birth and death rate statistics obtained from the National Vital Statistics Division of the Public Health Service as a method of estimating what the population of each state would have been had there been no migration. The measure developed for estimating the net qualitative change in the labor force in each state uses census survival ratios rather than vital statistics on birth and death rates. Second, the census measure is for estimating the migration of the entire population and not simply those over 25 or over 35 years of age in 1960. Third, the census measure takes no account of the number of persons in each age group who are actually in the labor force. Since the estimate of net qualitative change used in this paper is an estimate only for those persons over age 25 (or over age 35) and does make adjustments for labor force participation rates, the census estimates of net migration among the states are not perfectly compatible with the net qualitative change measures.

Separate calculations were made of the estimated rate of net migration among the states for persons over 24 (and those over 34). The procedure used in calculating these figures, as described above and in more detail in the Mathematical Appendix, Notes 5 and 6, provides a more legitimate basis for comparison with the estimates of net qualitative change. The reasons for this greater comparability are: (1) both the estimates of net migration and the estimates of the net qualitative change use census survival ratio methods rather than vital statistics, (2) both measures use the same age group and the same age intervals, (3) both measures use labor force participation rate weights. In addition to the Bureau of the Census estimates of the rate of net migration, Table 6 also gives our estimates of the rate of net migration of those 25 and older in 1960 and those

[10] *Current Population Reports*, Series P-25, No. 247.

35 and older in 1960, for the fifty states and the District of Columbia. The estimates of the rate of net migration developed in this paper are not superior to those of the Bureau of the Census; however, they do present a better basis for comparison with the estimates of net qualitative change in the labor force.

The original hypothesis had been that there was

TABLE 6

MEASURES OF QUALITATIVE CHANGE IN THE LABOR FORCE AND NET MIGRATION

State	Net Qualitative Change			Net Migration Rates		
	25 and over 1960	35 and over 1960	Gross Qualitative Change	Bureau of the Census	Estimate for those 25 and over 1960	Estimate for those 35 and over 1960
Alabama	.3590	.3058	— 32.4	— 12.0	— 9.7	— 9.2
Alaska	.3268	.1544	138.2	32.0	11.9	4.5
Arizona	.2996	.2473	286.1	44.0	31.4	29.4
Arkansas	.3022	.2696	—121.4	— 22.7	— 20.6	— 15.2
California	—.0675	—.1243	168.7	29.7	18.9	15.4
Colorado	.1148	.0626	76.0	12.3	7.2	7.4
Connecticut	—.0620	—.0408	67.7	11.7	8.3	7.7
Delaware	.0747	.0791	150.3	20.1	16.1	11.5
District of Columbia	—.4862	—.4116	—345.5	— 19.7	— 31.7	— 33.9
Florida	.2418	.3357	305.1	58.3	35.1	33.9
Georgia	.3421	.3562	15.6	— 6.2	— 3.1	— 4.9
Hawaii	.4485	.3347	7.6	0.6	— 5.6	— 7.9
Idaho	.1654	.0514	— 54.6	— 6.8	— 8.0	— 6.2
Illinois	—.2215	—.1948	— 42.3	1.4	— 2.5	— 2.6
Indiana	—.1709	—.1388	— 28.0	1.6	— 1.2	— 0.8
Iowa	—.0757	—.1017	—129.0	— 8.9	— 13.1	— 7.8
Kansas	.0260	—.0267	— 31.1	— 2.3	— 3.4	— 0.7
Kentucky	.0183	—.0022	— 83.4	— 13.2	— 11.6	— 9.8
Louisiana	.1766	.1992	21.7	— 1.9	0.1	— 1.8
Maine	.1154	.0910	— 44.0	— 7.2	— 6.6	— 6.2
Maryland	.0440	.0916	90.3	13.7	9.8	6.5
Massachusetts	—.1259	—.1232	— 84.1	— 2.0	— 7.7	— 4.8
Michigan	—.1475	—.1438	— 1.0	2.5	1.3	0.0
Minnesota	—.0047	—.0528	— 54.4	— 3.2	— 5.9	— 3.8
Mississippi	.4039	.3585	—102.4	— 19.9	— 20.4	— 15.5
Missouri	—.1406	—.1025	— 64.5	— 3.3	— 5.7	— 3.5
Montana	.1185	.0316	— 34.7	— 4.3	— 5.4	— 6.1
Nebraska	.0120	—.0087	—113.8	— 8.8	— 12.3	— 7.0
Nevada	.1221	.0343	331.9	53.8	35.3	30.9
New Hampshire	—.0724	—.0423	— 9.2	2.4	0.0	2.3
New Jersey	—.0688	—.0919	66.0	11.9	8.1	6.3
New Mexico	.3845	.3040	130.5	7.7	11.1	7.4
New York	—.1782	—.1141	— 36.4	1.4	— 2.2	— 2.0
North Carolina	.1383	.1541	— 35.8	— 8.1	— 7.0	— 7.2
North Dakota	.0891	.0454	—152.3	— 17.0	— 19.6	— 15.4
Ohio	—.1953	—.1810	3.8	5.1	2.4	0.6
Oklahoma	.0305	—.0667	—105.8	— 9.8	— 12.6	— 8.0
Oregon	—.0047	—.0820	— 15.4	1.0	— 1.5	— 0.5
Pennsylvania	—.0766	—.0726	— 70.0	— 4.5	— 7.3	— 5.4
Rhode Island	—.2233	—.1776	—108.0	— 3.3	— 9.7	— 5.8
South Carolina	.2596	.2889	— 21.4	— 10.5	— 7.2	— 7.2
South Dakota	.0273	—.0041	—143.2	— 14.4	— 16.6	— 11.1
Tennessee	.0386	.0284	— 49.9	— 8.3	— 7.2	— 6.6
Texas	.0251	.0727	4.9	1.5	0.2	— 0.5
Utah	.1160	—.0570	— 24.6	1.5	— 3.6	— 1.0
Vermont	.0194	.0167	— 98.8	— 10.0	— 11.6	— 7.3
Virginia	.1377	.1436	1.0	0.4	— 2.0	— 3.4
Washington	.0876	—.0325	1.0	3.7	— 0.7	— 0.2
West Virginia	.0286	.0054	—186.0	— 22.3	— 24.6	— 20.4
Wisconsin	—.0589	—.1020	— 43.2	— 1.6	— 4.0	— 2.6
Wyoming	.1238	.0173	— 83.5	— 6.8	— 10.6	— 8.7
State Mean	.0556	.0311	— 13.4	1.2	— 2.5	— 1.9

Sources: Bureau of the Census estimate of net migration from *Current Population Reports*, Series P-25, No. 247. For other series, see text and mathematical appendix.

no relationship between the net qualitative change in the labor force attributable to migration and the rate of net migration among the states. This initial hypothesis is tested by making simple correlations between the three measures of qualitative change and the three measures of net migration given in Table 6. As one would expect, there is a very high correlation between the GQC and all three measures

TABLE 7

SIMPLE CORRELATIONS BETWEEN MEASURES OF QUALITATIVE CHANGE AND MIGRATION RATES

Qualitative Change	Migration Rates: Bureau of the Census	Migration Rates: Estimate for those 25 or over 1960	Migration Rates: Estimate for those 35 or over 1960
GQC	.93*	.98*	.96*
NQC25	.14	.20	.20
NQC35	.14	.22	.21

*Significant at the 1 per cent level.

of migration rates (see Table 7). The most appropriate comparison in this case, namely the correlation between the GQC and the estimated rate of net migration of those 25 and over is .98. Even using the less appropriate comparison between the gross qualitative change and the Census Bureau's estimate of net migration, the correlation is still very high (.93) and significant well beyond the 1 per cent level.

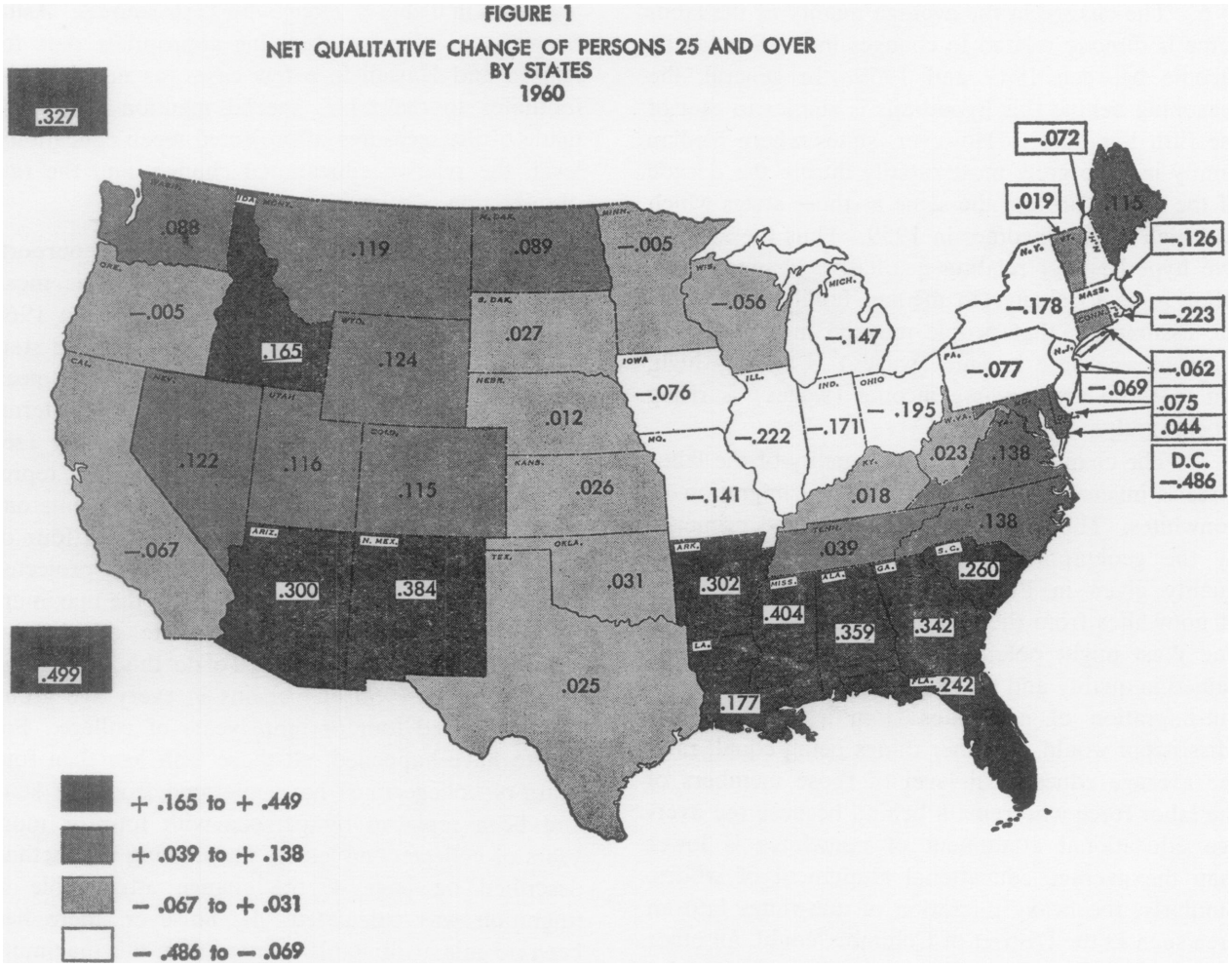
In comparing the net qualitative change and the migration rate, however, we find that the correlation is extremely low and not significant statistically. The simple correlation between the NQC25 and the comparable migration rate for that group is only .20. In other words the proportion of total variance, or variation, in NQC25 explained by net migration rates is only .04, and again, not statistically significant. Similarly, the correlation between the NQC35 and the appropriate migration rate for that group is but .21, again explaining about 4 per cent of total variation. Hence, the initial hypothesis that there is no relationship between the change in the average educational attainment (quality) of the labor force attributable to migration—after adjusting for age, sex, and gross population change attributable to migration—and the migration rate is verified. This verification of the hypothesis does not, however, enable us to state what does account for the changes that have been found in average quality of the labor force attributable to migration.

THE DEVELOPMENT OF NEW HYPOTHESES

New hypotheses to explain the net change in the quality of the labor force were developed on the basis of *a priori* reasoning and on the basis of the pattern of observed changes. The geographic pattern of observed changes is given in Figure 1 for persons 25 and over in 1960. The pattern for those 35 and over does not differ markedly. The geographic pattern of change in net quality presents some interesting and surprising results. It is noteworthy that the greatest change in average quality attributed to migration occurred in the South, particularly Mississippi, and in the southwestern states of Arizona and New Mexico. In general the areas which gained quality are the southern states and the mountain-prairie states. The substantial gain in average quality in Alaska and Hawaii should also be pointed out. Although there was a very sharp drop in average quality in the District of Columbia, most of the states which lost quality—as measured by educational change—were in the old industrial heartland of the nation, stretching from Massachusetts to the Mississippi River. Rather surprisingly, on the other hand, a drop in average quality also occurred in California and Oregon. On the basis of these observed patterns, and hunches, a number of hypotheses attempting to explain the changes in average quality were developed.

1. The net change in quality of the labor force is directly related to the change in total employment. This hypothesis was based on the assumption that those areas of the country which have had substantial gains in employment would be more likely to attract the "bright" members of the labor force. Similarly, it was assumed that those states which had decreasing employment or where employment was growing less rapidly than the national average would be more likely to lose the well-educated members of the labor force.

2. The change in the average quality of the labor force is directly related to the change in nonagricultural employment. The reasoning behind this hypothesis is essentially the same as that of the first hypothesis. Conceptually, these two hypotheses would be almost identical except for the fact that the states which gained substantially in total employment are not necessarily the same as those which gained in nonagricultural employment. For example, some of the southern states had significant increases in nonagricultural employment even though total employment in those states declined or lagged behind the national average as a consequence of their heavy



Source: Table 6.

dependence on agriculture in the past and the rapid decline of that particular sector. Mississippi might be cited as one example. There are, of course, also differences in the method of collecting the data and the concepts behind the two measures of employment. The total employment data come from the decennial census while the nonagricultural employment data come from employer establishment reports collected by the Bureau of Labor Statistics. Further, the nonagricultural employment data do not include the self-employed, domestic servants, and certain other categories, but double count those individuals who had more than one wage or salary job.

3. The change in the average quality of the labor force is inversely related to the rate of unemployment in 1960. The logic behind this hypothesis is that those states which had high unemployment rates would be likely to lose their well-educated persons, and *vice versa* in those states with low unemployment rates.

4. The change in the average quality of the labor force is inversely related to the relative change in the rate of unemployment between 1950 and 1960. The simple assumption here is that those states which had rising unemployment rates during the decade of the 1950's would be more likely to lose well-educated members of the labor force, and just the opposite would be true in those states which had declining unemployment rates during the decade.

5. Changes in the average quality of the labor force are directly related to median family income in 1959. In this hypothesis, median family income is used as a proxy measure of economic advantage. It is assumed that well educated persons are more likely to migrate to those areas where wages and salaries are high. Since there is no comprehensive measure of average wages and salaries for all occupational groups by states, median family income was used as a substitute measure of the economic advantage that higher wages present.

6. The change in the average quality of the labor force is directly related to changes in median family income between 1949 and 1959. In general, the reasoning behind this hypothesis is similar to that of the fifth hypothesis. However, states where median family income grew most rapidly during the decade of the 1950's are not the same as those states which had high family incomes in 1959. Thus the alternative hypothesis of relating qualitative change in the labor force to change in median family income on the assumption that people may be moving not to those areas where income (wages) is already high, but to those areas where income (wages) is rising most rapidly.

7. The change in the average quality of the labor force is inversely related to the rate of migration of nonwhites. This hypothesis was suggested primarily by the geographic pattern of changes in average quality given in Figure 1. The well-known flow of nonwhites from the South into the North and the Far West might potentially explain why the South gained in quality and the other areas lost. The heavy out-migration of nonwhites from a state such as Mississippi would, all other things being equal, raise the average educational level of those members of the labor force who remain behind because the average educational attainment of nonwhites is lower than the average educational attainment of whites. Similarly, the heavy migration of nonwhites into an area such as the District of Columbia could, all other things remaining the same, reduce the average educational attainment of the labor force for the same reasons.

8. The change in the average quality of the labor force is inversely related to the mean education level of the state. This hypothesis, like the last, was suggested by the geographic pattern of change. The assumption here is that those states where average educational attainment is high, such as the Midwest and California, are, in part, supplying the skilled manpower for those states which have a deficiency in well-educated manpower. An example is the common observation that the executives of many Southern plants are the products of schools in other parts of the country. In short, the assumption is that the states which are doing a good job in educating their own citizens are also those supplying the skilled manpower needs of the other states.

9. The change in the average quality of the labor force is unrelated to the rate of net migration. This is merely a restatement of the original hypothesis of the paper.

The data necessary to analyze these hypotheses are given in Table 8, along with their sources. Aside from the problem of obtaining appropriate data for Alaska and Hawaii in a few cases, as noted in the footnotes to the table, special mention should be made of the measures of projected mean educational level, the relative educational change, and the rate of migration of nonwhites.

The "projected mean educational level" purports to represent what the average or arithmetic mean education level of a state would have been in 1960 if there had been no migration to or from the state during the decade of the fifties. The projected mean years of school completed is stated, however, in terms of the 14-fold classification used in the study (see Table 1, the classification for 1950), where 1 represents no years of school completed, 2 represents one or two years completed, and 14 represents four or more years of college completed. The "projected mean" was obtained by first calculating the maximum possible gain that a particular state could have achieved during the 1950's. To do this, it was assumed that in 1960 all persons in every age group had completed four or more years of college. For this to have happened, all those with less than four years of college must have migrated from the state and been replaced by persons with four or more years of college completed. Then, using the method described on page 4, the change attributable to migration was calculated. If, however, there had been no gain attributable to migration, this maximum possible gain would had to have been subtracted from the maximum possible number of years of school completed (14 in the classification scheme). This mean or average from the state does *not* represent the mean education level in the state in either 1950 or 1960, but rather what the education level would have been, in terms of the classification of number of school years completed used in this study, if there had been no migration during that decade (see Note 4 in the Mathematical Appendix).

The relative quality gain given in the last column of Table 8 is equal to the NQC25 divided by the projected mean education level in 1960. The net qualitative change figures are given in the first column of Table 6. Since, once again, this peculiar classification of number of school years completed was used (with a minimum value of 1 and maximum of 14), the relative quality gain figure should not be taken to represent a precise estimate of the relative gain attributable to migration. Rather, the relative differences among the states are more important than the absolute figures themselves.

TABLE 8

MEASURES OF EMPLOYMENT, INCOME, NONWHITE MIGRATION, AND EDUCATION

	Percentage Change in Total Employment 1950-60*	Percentage Change in Nonagricultural Employment 1950-60†	Percentage Change In Rate of Unemployment 1950-60‡	Rate of Unemployment 1960§	Percentage Change in Median Family Income 1949-59‖	Median Family Income 1959#	Net Migration of Nonwhites 1950-60**	Projected Mean Education Level 1960††	Relative Quality Gain‡‡
Alabama	3.4	25.3	35.7	5.7	116.3	3,937	— 7.32	6.86	5.23
Alaska	37.4	40.6	30.6	12.8	83.5	7,305	— 0.78	8.52	3.84
Arizona	80.1	106.6	—30.3	5.3	94.6	5,568	— 1.33	8.08	3.71
Arkansas	— 8.2	23.1	27.7	6.0	105.8	3,184	— 7.86	6.89	4.38
California	47.6	52.5	—22.8	6.1	86.7	6,726	3.34	9.06	— 0.74
Colorado	31.5	43.9	— 4.8	4.0	87.7	5,780	1.13	8.91	1.29
Connecticut	22.1	19.7	—14.8	4.6	90.8	6,887	1.94	8.55	— 0.73
Delaware	28.7	27.6	48.4	4.6	94.1	6,197	1.89	8.41	0.89
District of Columbia	— 8.5	7.6	5.1	4.1	56.4	5,993	6.73	9.24	— 5.26
Florida	70.3	87.5	11.1	5.0	94.4	4,722	3.64	8.01	3.02
Georgia	10.4	30.3	32.4	4.5	121.2	4,208	— 5.92	6.88	4.98
Hawaii	24.9	27.8	—55.8	4.2	78.4	6,366	—10.40	7.66	5.86
Idaho	13.0	17.9	3.6	5.7	72.2	5,259	0.17	8.63	1.92
Illinois	10.0	11.3	12.5	4.5	79.1	6,566	2.17	8.53	— 2.60
Indiana	13.1	12.5	35.5	4.2	79.9	5,798	1.14	8.50	— 2.01
Iowa	1.7	11.4	77.8	3.2	64.6	5,069	0.11	8.58	— 0.88
Kansas	10.8	20.5	48.0	3.7	86.8	5,295	0.26	8.72	0.30
Kentucky	— 2.0	17.4	66.7	6.0	98.9	4,051	— 0.51	7.05	0.26
Louisiana	15.1	24.1	32.6	6.1	99.6	4,272	— 3.43	6.96	2.54
Maine	5.8	9.3	—26.1	6.5	86.3	4,873	0.22	8.17	1.41
Maryland	26.7	25.2	4.3	4.8	90.8	6,309	1.54	8.08	0.54
Massachusetts	9.5	8.8	—27.6	4.2	84.5	6,272	0.53	8.79	— 1.43
Michigan	13.9	9.1	27.8	6.9	74.4	6,256	1.99	8.48	— 1.74
Minnesota	7.8	19.5	42.9	5.0	75.0	5,573	0.13	8.46	— 0.06
Mississippi	— 4.8	29.7	54.3	5.4	134.9	2,884	—14.82	6.67	6.06
Missouri	3.3	13.8	24.2	4.1	93.7	5,127	0.71	8.11	— 1.73
Montana	5.9	11.9	33.3	6.8	64.1	5,403	— 0.34	8.53	1.39
Nebraska	2.8	19.4	40.9	3.1	71.9	4,862	0.30	8.62	0.14
Nevada	76.7	92.2	— 7.5	6.2	85.9	5,736	3.75	8.91	1.37
New Hampshire	15.7	17.4	—34.8	4.3	96.0	5,636	0.19	8.45	— 0.86
New Jersey	19.5	21.5	— 9.8	4.6	82.4	6,786	2.32	8.41	— 0.82
New Mexico	39.4	55.9	9.3	5.9	99.3	5,371	— 0.15	7.94	4.84
New York	11.0	10.7	—13.3	5.2	79.0	6,371	1.90	8.55	— 2.08
North Carolina	9.7	28.9	36.4	4.5	84.8	3,956	— 5.10	7.02	1.97
North Dakota	— 4.4	16.2	47.4	5.6	54.1	4,530	— 0.32	7.83	1.14
Ohio	14.6	14.0	25.0	5.5	80.9	6,171	1.67	8.58	— 2.28
Oklahoma	4.3	22.0	15.8	4.4	90.2	4,620	— 1.16	8.21	0.37
Oregon	10.8	16.4	— 7.7	6.0	73.1	5,892	0.39	8.84	— 0.05
Pennsylvania	5.0	2.0	14.8	6.2	77.9	5,710	0.73	8.17	— 0.94
Rhode Island	4.2	— 2.3	—26.4	5.3	78.2	5,580	0.25	8.19	— 2.73
South Carolina	6.4	26.2	20.6	4.1	98.6	3,821	—10.30	6.71	3.87
South Dakota	— 1.7	19.4	46.4	4.1	52.5	4,251	— 0.77	8.18	0.33
Tennessee	7.6	21.8	33.3	5.2	99.0	3,949	— 1.73	7.16	0.54
Texas	20.3	32.2	15.4	4.5	79.8	4,884	— 0.35	7.87	0.32
Utah	32.0	39.2	—21.2	4.1	78.9	5,899	0.15	9.32	1.25
Vermont	3.1	10.4	—18.2	4.5	88.4	4,890	0.03	8.30	0.23
Virginia	16.6	26.3	7.7	4.2	87.7	4,964	— 2.11	7.51	1.83
Washington	19.3	18.9	— 1.5	6.6	76.7	6,225	0.76	8.96	0.98
West Virginia	—14.3	—12.3	72.9	8.3	76.0	4,572	— 1.99	7.32	0.39
Wisconsin	8.4	16.6	34.5	3.9	80.5	5,926	0.84	8.34	— 0.71
Wyoming	12.0	20.9	18.6	5.1	66.8	5,877	— 0.34	8.79	1.41
State Mean	15.5	22.4	15.1	5.2	85.0	5,360	— 0.77	8.15	0.80

* U.S. Bureau of the Census, *U.S. Census of Population, 1950.* Vol. II, *Characteristics of the Population,* Part I, U.S. Summary, Chapter B (GPO, 1952), p. 124. U.S. Bureau of Census, *County and City Data Book, 1962* (A Statistical Abstract Supplement, GPO, 1962), p. 4.

† *Employment and Earnings Statistics for States and Areas, 1939-62* (BLS Bulletin No. 1370), pp. xii-xiii. Data are not available for nonagricultural employment in Alaska or Hawaii for 1950. See the Mathematical Appendix, Note 7, for the method used to gain estimates of nonagricultural employment in those two states for 1950.

‡ *U.S. Census of Population, 1950, op. cit.*, p. 124. *County and City Data Book, op. cit.*, p. 4.

§ *Ibid.*

‖ U.S. Bureau of the Census, *Statistical Abstract of the United States: 1965* (GPO, 1965), p. 343. Data for Alaska are not available. It was assumed that the per cent increase in Alaska was equal to the average for the conterminous U.S. (=83.5 per cent).

Ibid.

** *Current Population Reports,* Series P-25, No. 247, pp. 4, 6. See text for discussion.

†† See text and Mathematical Appendix, Note 4.

‡‡ See text.

The estimates of net migration of nonwhites between 1950 and 1960 are taken from data prepared by the Bureau of the Census. However, the migration rates used in this study are not the same as those computed by the Bureau. The Bureau of the Census made an estimate of the absolute net migration of nonwhites and computed the rate by dividing through by the 1950 population of nonwhites. This method gives some peculiar and misleading results. For example, using the Bureau's method, the state with the highest in-migration of nonwhites during the decade of the fifties was New Hampshire (137 per cent). This substantial rate of in-migration is, however, a phenomenon of small numbers. The Bureau's estimate of net migration of nonwhites to New Hampshire, in absolute numbers, was 1,000. Since the population of nonwhites in New Hampshire in 1950 was only 967, the rate of net migration is, therefore, 137 per cent. To avoid this distortion of small numbers, and to better reflect the true effect of nonwhite migration upon the state's population, the net migration rates for nonwhites were recomputed by dividing the Bureau's estimate of net migration in absolute numbers by the total population (white and nonwhite) in the state in 1950. This provided the set of figures reported in column seven of Table 8.

TESTS OF HYPOTHESES

Simple Correlations

The simple correlations among all the variables, given in Tables 6 and 8, are presented in Table 9. This correlation matrix makes it possible to make a simple analysis of the nine hypotheses given in the preceding section. This is done using the *three* measures of net qualitative change—NQC25, NQC-35, and the relative qualitative change.

The results of this analysis may be summarized briefly as follows:

1. The correlation between qualitative change and relative change in total employment is positive but extremely low. Moreover, the correlation is statistically significant at the 5 per cent level only in the case of the relationship between NQC25 and the relative change in total employment.

2. The correlation between change in the quality of the labor force attributable to migration and the relative change in nonagricultural employment is also very low and statistically significant only in the case where NQC35 was used.

3. The correlation between change in the quality of the labor force and the rate of unemployment in 1960 is very low and is not statistically significant at the 5 per cent level in any case.

4. The relationship between the change in the quality of the labor force and the relative change in the rate of unemployment between 1950 and 1960 is almost nonexistent and statistically insignificant.

5. The correlation between median family income in 1959 and change in the quality of the labor force is appreciably higher (ranging from $-.40$ to $-.51$) and significant at the 1 per cent level. Contrary to the initial hypothesis, however, the relationship is inverse rather than direct.

6. The correlation between the change in median family income between 1949 and 1959 is fairly high (.52 to .62) and significant at the 1 per cent level. As had been hypothesized, this relationship is direct rather than inverse.

7. The highest simple correlation between the measures of net qualitative change attributable to migration and other variables is found in the case of the net migration rate of nonwhites. This correlation, ranging from .70 to .75, is, as hypothesized, inverse.

8. The net change in the quality of the labor force is, as hypothesized, inversely related to the projected mean education level of the labor force in the states. The simple correlation between these variables ranges from $-.54$ to $-.69$.

9. Using any of the three measures of net qualitative change and any of the three measures of migration rates, the correlation between these variables is extremely low and not statistically significant at the 5 per cent level.

The simple correlation analysis of the hypothesis does not fully answer all the questions which might be raised. It could be true that some of the variables which appear to be statistically insignificant are, in fact, related to the net qualitative change in the labor force, but their importance is clouded by the mutual dependency of the many variables that have been introduced. Similarly, some of the variables which do appear to be statistically significant may, in fact, be unimportant if the effects of certain other variables were removed. Further, none of the variables explain a very high proportion of total variation in net qualitative change. The highest simple correlation between net qualitative change and the variables is the $-.75$ correlation between the net migration rate of nonwhites and the net quality change. This relationship does, therefore, explain only 56 per cent of total variation in net quality change.

TABLE 9

SIMPLE CORRELATION MATRIX OF VARIABLES

	Net Quality Change 25 and Over	Net Quality Change 35 and Over	Relative Quality Change	Projected Mean Education Level	Bureau of Census Migration Estimate	Net Migration Rate 25 and Over	Net Migration Rate 35 and Over
Net Quality Change, 35 and Over	.95*	—	—	—	—	—	—
Relative Quality Change	.99*	.96*	—	—	—	—	—
Projected Mean Educational Level	−.54*	−.69*	−.59*	—	—	—	—
Bureau of Census Migration Estimate	.14	.14	.09	.35†	—	—	—
Net Migration Rate, 25 and Over	.20	.22	.16	.25	.96*	—	—
Net Migration Rate, 35 and Over	.20	.21	.14	.26	.95*	.98*	—
Per Cent Change in Total Employment	.29†	.27	.24	.28†	.95*	.94*	.93*
Per Cent Change in Nonagricultural Employment	.26	.32†	.26	−.03	.48*	.54*	.59*
Per Cent Change in Rate of Unemployment	.04	.06	.06	−.37*	−.37*	−.36*	−.35†
Rate of Unemployment, 1960	.25	.15	.23	−.06	.20	.15	.07
Per Cent Change in Median Family Income	.52*	.62*	.56*	−.62*	.09	.20	.20
Median Family Income, 1959	−.40*	−.51*	−.45*	.78*	.54*	.48*	.42*
Net Migration Rate of Nonwhites	−.70*	−.72*	−.75*	.78*	.40*	.33†	.33†
Gross Quality Change	.39*	.39*	.34†	.10	.93*	.98*	.96*

	Per Cent Change in Total Employment	Per Cent Change in Non-agricultural Employment	Per Cent Change in Rate of Unemployment	Rate of Unemployment 1960	Per Cent Change in Median Family Income	Median Family Income 1959	Net Migration Rate of Nonwhites
Net Quality Change, 35 and Over	—	—	—	—	—	—	—
Relative Quality Change	—	—	—	—	—	—	—
Projected Mean Educational Level	—	—	—	—	—	—	—
Bureau of Census Migration Estimate	—	—	—	—	—	—	—
Net Migration Rate, 25 and Over	—	—	—	—	—	—	—
Net Migration Rate, 35 and Over	—	—	—	—	—	—	—
Per Cent Change in Total Employment	—	—	—	—	—	—	—
Per Cent Change in Nonagricultural Employment	.62*	—	—	—	—	—	—
Per Cent Change in Rate of Unemployment	−.44*	−.25	—	—	—	—	—
Rate of Unemployment, 1960	.13	−.44*	.09	—	—	—	—
Per Cent Change in Median Family Income	.14	.25	.02	.02	—	—	—
Median Family Income, 1959	.44*	−.12	−.49*	.17	−.42*	—	—
Net Migration Rate of Nonwhites	.27†	.02	−.17	−.01	−.56*	.65*	—
Gross Quality Change	.93*	.55*	−.32†	.20	.32†	.36*	.16

*Significant at 1 per cent level
†Significant at 5 per cent level

Some of these questions can better be answered by placing all of the variables into a multiple regression equation. Not all of the nine variables can, however, be placed in the same regression equation, since the simple correlation between two of the independent variables—the relative change in total employment between 1950 and 1960, and the net migration rate in the fifties—is extremely high (ranging from .93 to .95). Therefore, separate regressions were run, using in the first case, the appropriate migration rate, and in the second case, the relative change in total employment.

Multiple Regression Analysis[11]

Analysis of NQC35. The relationship between NQC35 and the nine dependent variables used in this study is given in Table 10. As previously noted, since there is a high correlation between the relative change in total employment and the net migration rate, separate regressions were computed. The coefficient of multiple determination (R^2) is in each regression quite high (.8077 and .8350) and significant beyond the 0.1 per cent level. The statistical significance of the dependent variables is best indicated by the probability values for the various T-scores, and the relative importance of the dependent variables is indicated by the standard partial regression coefficients.

Certain of the dependent variables were not significant in either regression equation and were discarded for further analytic purposes. The relative change in nonagricultural employment between 1950 and 1960 was not significant, even though the simple correlation between it and the dependent variable (.32) was significant at the 5 per cent level. Similarly, the relative change in the rate of unemployment between 1950 and 1960 was not significant in either regression. This is not too surprising since there is no reason to suspect that the direction of change in unemployment rates between 1950 and 1960 within a state was linear or, for that matter, followed any consistent path. The relative change in median family income also proved insignificant in both regressions.

The net migration rate of nonwhites during the fifties was in both regression equations—and in all subsequent analysis—highly significant. While the measure of net qualitive change had adjusted the census data for differences in age and sex and gross migration, it was not adjusted for color. This has not been possible because the census data, as published, do not give detailed breakdown of the data by color, age, sex, and number of school years completed; and no data are published on differences in number of school years completed by color for states with very small nonwhite populations. The net migration rate of nonwhites was retained for further analysis.

Both the net migration rate and the relative change in total employment are significantly related to the dependent variable in the regression analysis. Though the simple correlation between migration rates and NQC35 was low (.21) and statistically insignificant, the partial correlation between the two variables, adjusting for the other seven, was higher (.47) and significant at the 1 per cent level. Similarly, the simple correlation between relative change in total employment and NQC35 (.27) was low and insignificant; however, the partial correlation between the two variables (.58) was significant at the 1 per cent level. Because of the high correlation between migration rates and relative changes in total employment, the two variables are, to a degree, substitutes for one another. However, for purposes of further analysis, the decision was made to use the relative change in total employment rather than the rate of net migration, both because the coefficient of multiple determination was significantly higher in the regression using relative change in total employment and because the partial correlation between the relative change in total employment and net qualitative change was higher than that when using the net migration rate.

Because of the decision to use the relative change in total employment rather than the net migration rate in further analysis, the rate of unemployment in 1960 was not retained as an independent variable.[12] The two remaining independent variables—median family income in 1959 and the projected mean education level—hovered about the conventional 5 per cent confidence level and were, therefore, retained for further analysis.[13]

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[11] Some of the data in Table 8 were entered into the multiple regression equations in slightly different forms as follows:
Relative quality change (R) = R/100
Relative chg. in total employ. (T) = T/100 + 1
Relative chg. in nonag. employ. (N) = N/100 + 1
Relative chg. in rate of unemploy. (U) = U/100 + 1
Net migration rate of nonwhites (C) = C/100
Since all relationships in the equations are linear, none of these transformations affects the results except to change the position of the decimal point in the partial regression coefficient and in the standard error. The transformations would change the values of the intercepts of the regression equations, but the intercepts are not reported in this paper.

[12] Regression analysis was run retaining the rate of unemployment in 1960 along with the relative change in total employment, but it proved to be insignificant.

[13] The deletion of certain independent variables *may* mean that observations of other independent variables are not unbiased. However, one is confronted with the alternatives of either retaining meaningless independent variables or running the hazard of violating certain of the strictest assumptions of statistical analysis.

TABLE 10

CORRELATION-REGRESSION ANALYSIS OF NET QUALITATIVE CHANGE OF PERSONS 35 AND OVER IN 1960*

	Per Cent Change in Total Employment	Per Cent Change in Nonagricultural Employment	Rate of Unemployment 1960	Per Cent Change in Rate of Unemployment	Median Family Income 1959	Per Cent Change in Median Family Income	Migration Rate of Nonwhites	Projected Mean Educational Level	Net Migration Rate‡
Excluding Change in Total Employment									
Regression Coefficient	.....	.06517	.01999	— .02713	— .00003	— .00067	—2.69720	— .04999	.00682
Standard Error	.....	.08192	.00994	.50251	.00003	.00112	.51890	.03605	.00196
T-Score	.....	0.795	2.011	0.540	1.386	0.599	5.198	1.387	3.479
Probability†	.....	.437	.048	.593	.170	.558	.000	.170	.002
Standard Partial Regression Coefficient	.....	.103	.179	— .048	— .209	— .062	— .616	— .209	.474
R^2	.8077								
F-Ratio	22.054								
Probability†	.000								
Excluding Migration Rate									
Regression Coefficient	.59583	— .08654	.00301	— .00093	— .00005	— .00018	—2.27132	— .05996	.....
Standard Error	.12990	.09421	.01083	.04616	.00002	.00098	.46880	.03335	.....
T-Score	4.587	0.919	0.278	0.020	2.142	0.182	4.845	1.798	.....
Probability†	.000	.367	.688	§	.036	.656	.000	.076	.....
Standard Partial Regression Coefficient	.698	— .137	.027	— .002	— .310	— .017	— .519	— .251	.....
R^2	.8350								
F-Ratio	26.564								
Probability†	.000								

* Apparent errors due to rounding of numbers
† Probability that the T or F value could be attributable to chance. Probability value .000 means less than .001.
‡ Estimated Net Migration Rate of *Those 35 or Over in 1960*
§ The probability values were obtained with an estimating equation which gives inaccurate values for extremely small (less than 0.1), and very insignificant, T-scores.

In summary, only four of the nine variables were retained for further analysis: the net migration rate of nonwhites, the relative change in total employment, the projected mean education level, and median family income in 1959. Table 11 gives the regression analysis of these four independent variables and the net qualitative change of workers 35 and over. Two of the independent variables, the net migration rate of nonwhites and the relative change in total employment, were significant beyond the 0.1 per cent level. The projected mean education level was significant at the 2 per cent level. Median family income in 1959 was not significant at the 5 per cent level.

A further regression was run, deleting median family income in 1959. This analysis, also given in Table 11, indicates that all three remaining independent variables were significant beyond the 0.1 per cent level. It is noteworthy that the elimination of five of the eight original independent variables in the regression reduces the coefficient of multiple determination by a relatively modest amount—from .835 to .8118. The relative importance of the three significant independent variables is indicated by both the standard partial regression coefficients and partial correlation coefficients. Clearly, the net migration rate of nonwhites and the relative change in total employment are more important than the projected mean education level, though it may be debatable as to which of the former two are the more important.

On the basis of the analysis so far presented, we conclude that the NQC35 is inversely related to the net migration rate of nonwhites, directly related to the relative change in total employment (and also directly related to the net migration rate), and inversely related to the projected mean education level of a state. Since the direction of change is in each of the three cases the same as that which was hypothesized, it is assumed that the rationale given in that section for the three independent variables is correct. The original assumption, however, that there is no relationship between the net migration rates and net qualitative change must, on the basis of the evidence presented, be laid aside. Rather, it would appear that while there is no simple relationship between net qualitative change as measured in this paper and net migration rates, there is a significant relationship if that data is adjusted for other variables—the most important being the net

TABLE 11

ANALYSIS OF RELATIONSHIP BETWEEN NET QUALITY CHANGE OF PERSONS 35 AND OVER IN 1960 AND SIGNIFICANT VARIABLES*

	Migration Rate of Nonwhites	Change in Total Employment	Projected Mean Education Level	Median Family Income 1959
Regression Coefficient	−2.28923	.49085	— .06967	— .00003
Standard Error	.43214	.05928	.02919	.00002
T-Score	5.297	8.280	2.387	1.796
Probability†	.000	.000	.020	.076
Standard Partial Regression Coefficient	— .5228	.5750	— .2914	— .1930
R^2	.8241			
F-Ratio	53.887			
Probability†	.000			
Omitting Median Family Income in 1959				
Regression Coefficient	−2.342	.452	.101	.....
Standard Error	.441	.057	.024	.....
T-Score	5.308	7.999	4.168	.....
Probability†	.000	.000	.000	.....
Standard Partial Regression Coefficient	— .535	.530	— .421	.....
R^2	.8118			
F-Ratio	67.575			
Probability†	.000			
Partial Correlations				
Net qualitative change of those 35 or over	— .61‡	.76‡	— .52‡	.....
Migration rate of nonwhites	.....	.51‡	.19	.....
Change in total employment	.....	.....	.46‡	.....

* Apparent errors due to rounding of numbers
† Probability that the T or F value could be attributable to chance. Probability value .000 means less than .001.
‡ Significant at 1 per cent level

migration rate of nonwhites. This does not necessarily mean that the measure of net qualitative change is *seriously* defective due to the failure to adjust for color. The simple correlation between net migration rates of nonwhites and the overall net migration rate is, while statistically significant, relatively low (.33).

Analysis of NQC25. The analysis of the relationship between NQC25 and the nine independent variables, given in Table 12, presents results which are similar but not identical to those which have just been cited. These differences are largely attributable to the fact that the coefficient of multiple determination is somewhat lower in the regressions used in this section (.7879 and .8028) than in the regression used in the preceding section.

As in the last section, certain of the independent variables may be eliminated since they do not, in either regression, remotely approach the 5 per cent significance level. These discarded variables are: the relative change in nonagricultural employment, the relative change in the rate of unemployment, and the relative change in median family income between 1949 and 1959. Also as in the last section, the net migration rate of nonwhites is highly significant in both regression equations. Further, as was previously true, both the net migration rate in the one regression equation, and the relative change in total employment in the other, are significant above the 1 per cent level. For reasons identical with those mentioned in the last section, it was decided to use the relative change in total employment rather than the net migration rate for further analysis.

Unlike the last case, the projected mean education level did not approach the 5 per cent confidence level; therefore, it was not used for further analysis. The remaining two independent variables—median family income in 1959 and the rate of unemployment in 1960—did hover about the 5 per cent level and were retained for further analysis.

The relationship between the remaining four independent variables and NQC25 is given in Table 13. All of the four independent variables except median family income in 1959 were significant above the 1 per cent level, and median family income in 1959 was significant at the 1.7 per cent level. The net migration rate of nonwhites and the relative change in total employment during the decade of the fifties were, as indicated by the standard partial regression coefficients and the partial correlation coefficients in Table 13, the most significant of the four independent variables. While the direction of the relationship with the dependent variable was in these two cases as originally hypothesized, this was not true of the other two independent variables.

The hypothesis had been that those areas with high unemployment rates would be more likely to lose quality and that there would, therefore, be an inverse relationship between the two variables. The regression coefficient in Table 13 indicated, however, that the relationship is direct rather than inverse. Similarly, the hypothesis had been that those areas with high median family incomes would be more likely to gain quality, but the regression analysis indicated that the relationship is inverse rather than direct. Further, it is noteworthy that while the projected mean education level was a significant independent variable for the analysis of NQC35, it was not in the case of NQC25. Similarly, the unemployment rate in 1960 and the median family income in 1959, which were significant independent variables in explaining net qualitative change of those over 24, were not important in explaining net qualitative change of those over 34.

It could be that the reason for the significance of certain of these variables is because of their intercorrelation with other independent variables which had already been dropped from the analysis. For example, there is a significant and inverse simple correlation between median family income in 1959 and the change in family income during the fifties and a direct simple correlation with projected mean education level in 1960. When the equations were rerun, however, substituting first the relative change in median family income and second the projected mean education level for the median family income in 1959, there was a material reduction in the coefficient of multiple determination and—most significantly—the T-scores for the substitute variables were statistically insignificant (probabilities were .688 and .561). There is no significant simple correlation between unemployment rates in 1960 and any of the other independent variables other than the relative change in nonagricultural employment. Again, when substituting the relative change in nonagricultural employment for the rate of unemployment in 1960, the regression coefficient was not statistically significant. Hence, any explanation of the direct relationship between net quality change and the rate of unemployment and the inverse relationship between net quality change and median family income must be sought elsewhere.

TABLE 12

CORRELATION-REGRESSION ANALYSIS OF NET QUALITATIVE CHANGE OF PERSONS 25 AND OVER IN 1960*

	Per Cent Change in Total Employment	Per Cent Change in Nonagricultural Employment	Rate of Unemployment 1960	Per Cent Change in Rate of Unemployment	Median Family Income 1959	Per Cent Change in Median Family Income	Migration Rate of Nonwhites	Projected Mean Educational Level	Net Migration Rate‡
Excluding Change in Total Employment									
Regression Coefficient	.....	.08645	.03733	— .00044	— .00007	— .00140	—4.42396	.07045	.00731
Standard Error	.....	.10070	.01218	.05908	.00003	.00134	.61498	.04315	.00223
T-Score	.....	.859	3.063	.007	2.022	1.047	7.194	1.633	3.279
Probability†	.....	.400	.004	§	.047	.301	.000	.106	.002
Standard Partial Regression Coefficient	.....	.123	.299	— .001	— .361	— .116	— .905	.264	.526
R^2	.7879								
F-Ratio	19.497								
Probability†	.000								
Excluding Migration Rate									
Regression Coefficient	.60859	— .03056	.02494	.03260	— .00006	— .00062	—3.86342	.03764	———
Standard Error	.15842	.11490	.01321	.05630	.00003	.00120	.57276	.04067	———
T-Score	3.842	.266	1.887	.579	2.019	.515	6.757	.926	———
Probability†	.001	.687	.063	.570	.047	.608	.000	.363	———
Standard Partial Regression Coefficient	.639	— .043	.200	.052	— .320	— .051	— .791	.141	———
R^2	.8028								
F-Ratio	21.375								
Probability†	.000								

* Apparent errors due to rounding of numbers
† Probability that the T or F value could be attributable to chance. Probability value .000 means less than .001.
‡ Estimated Net Migration Rate of *Those 25 or Over in 1960*
§ The probability values were obtained with an estimating equation which gives inaccurate values for extremely small (less than 0.1), and very insignificant, T-scores.

TABLE 13

ANALYSIS OF RELATIONSHIP BETWEEN NET QUALITY CHANGE OF PERSONS 25 OR OVER IN 1960 AND SIGNIFICANT VARIABLES*

	Migration Rate of Nonwhites	Change in Total Employment	Unemployment Rate 1960	Median Family Income 1959
Regression Coefficient	−3.38961	.53043	.02642	− .00004
Standard Error	.43508	.07127	.00861	.00002
T-Score	7.791	7.442	3.068	2.464
Probability†	.000	.000	.004	.017
Standard Partial Regression Coefficient	− .6937	.5569	.2118	− .2364
R^2	.7931			
F-Ratio	44.079			
Probability†	.000			
Partial Correlations				
Net qualitative change of those 25 or over	− .75‡	.74‡	.41‡	− .34§
Migration rate of nonwhites	———	.56‡	.22	.13
Change in total employment	———	———	− .27	.47‡
Unemployment rate in 1960	———	———	———	.31

* Apparent errors due to rounding of numbers
† Probability that the T or F value could be attributable to chance. Probability value .000 means less than .001.
‡ Significant at 1 per cent level
§ Significant at 5 per cent level

It could be true, of course, that the unemployment rate and median family income are related to some other unidentified variables. But if that is not true, it could be that the direct relationship between NQC25 and the unemployment rate in 1960 might, in essence, represent a lag effect. That is, those persons between ages 25 and 34 in 1960 had not, as yet, completed their movements. Some of this younger group who were in areas of high unemployment would in the near future move to other areas. In the meantime, however, areas with high unemployment rates benefited from the fact that these young and well-qualified persons had not yet moved out of the area.

The inverse relationship between median family income in 1959 and net qualitiative change of those over 24 might represent a movement of poorly educated young workers to the area, attracted by high income *possibilities* in such states—possibilities which are not necessarily realized in terms of a high wage job.

In an attempt to re-analyze the results, the relative qualitative change measure was substituted for the net qualitative change data. However, the new regression analysis yielded exactly the same results. The only notable difference was to raise the coefficient of multiple determination from .7931, when NQC25 was used, to .8259, when relative qualitative change was used. Also, the median family income in 1959, which was significant at the 1.7 per cent level in the earlier regression analysis, was significant at the 0.9 per cent level when relative qualitative change was used.

Conclusions

The conclusions of the preceding analysis of NQC25 and NQC35 are as follows:

1. The most important variable in explaining the net qualitative change is the net migration rate of nonwhites. There is a substantial difference in the median education level of whites and nonwhites. In 1960 the median number of school years completed for whites over age 24 was 10.9, and the median for nonwhites was 8.2.[14] This difference means that the movement of nonwhites into an area will, all other things remaining the same, reduce the average education level of the area. Precisely the opposite will happen if nonwhites move out of an area.

2. An almost equally important variable in explaining net qualitative change is the relative change in total employment. Evidently those areas which have experienced substantial increases in employment are gaining persons not only in sheer quantity, but also in terms of quality.

3. The relationship between net migration rates and net qualitative change is almost as great as that between the latter and relative change in total employment. Contrary to the original hypothesis of this paper, there is a significant and direct relationship between the two variables after adjusting for other significant variables. The relationship might

[14] Bureau of the Census, *Statistical Abstract of the United States: 1965* (GPO, 1965), p. 112.

be identical with that in the case of relative change in total employment except for the existence of unstructured labor markets. In moving about from one area to another, people move to areas where employment opportunities are growing more rapidly, but this movement is not perfect because workers do not know precisely what job opportunities exist in various areas.

4. There appears to be a tendency for the areas which do a good job of educating their own citizens to supply the skilled manpower needs of the other areas. This is indicated by the inverse relationship between projected mean education level and NQC35. However, this effect is obscured when the uncompleted and somewhat aimless movement of younger workers (those 25 to 34 in 1960) is included.[15]

5. The direct relationship between unemployment rates in 1960 and NQC25 suggests a lag effect. Younger and better educated workers have not yet left the areas of high unemployment.

6. Those areas with high family income have had a relative loss in quality because poorly educated younger workers are attracted to the areas by higher income possibilities.

All of these conclusions can be "proved" statistically, but the last two would seem to be more tenuous than the others. The results supporting the last two conclusions may really reflect the existence of other unidentified variables which are correlated with unemployment rates and/or median family income.

THE MIGRATION OF NONWHITES

While not a central consideration of this paper, the fact that the net migration rates of nonwhites are so important as an explanatory variable merits their further consideration. Can the pattern of migration rates of nonwhites be explained in terms of the variables used in this study? A regression analysis was run relating the migration rate of nonwhites to the: (1) relative change in median family income between 1949 and 1959, (2) median family income in 1959, (3) the relative change in total employment during the 1950's, (4) the relative change in the rate of unemployment between 1950 and 1960, and (5) the rate of unemployment in 1960.

The coefficient of multiple determination among the variables was .5647 and the F-ratio (11.677) was significant beyond the 0.1 per cent level. However, only two of the independent variables were statistically significant: the percentage change in median family income, and the median family income in 1959. There was an inverse relationship between the change in median family income and the net migration rates of nonwhites and a direct relationship between the net migration rates of nonwhites and median family income in 1959. This would suggest that nonwhites have been attracted to states where income is high rather than to the areas where income is rising more rapidly. More important, however, is the conclusion that the independent variables are, in part, the results of the migration pattern of nonwhites rather than the causes of the pattern. Hence, on the basis of the analysis presented here, we cannot pretend to have explained what causes the pattern of movement of nonwhites.

VARIATION IN MEASURES OF QUALITATIVE CHANGE

Variation in GQC

In the beginning of this section it had been noted that, in a gross sense, qualitative changes in the labor force would run in the same direction as migration. It was assumed that anytime an area gained a "body" it gained quality in a gross sense. But a question remains: To what degree is the variation in gross qualitative change associated with migration rates and to what degree is it associated with the factors which determine net qualitative change? To answer this question a multiple regression equation was fitted to the data for gross qualitative change as the dependent variable and the net migration rate of those over 24 in 1960 and NQC25 as the independent variables. Not surprisingly, the coefficient of multiple determination was extremely high (.9945) since virtually by definition, the migration rate and the net qualitative change factors should explain all variation in gross qualitative change.

Since all partial correlation coefficients among the variables were extremely high (.9234 to .9968), they are not helpful in answering the question about the relative importance of the dependent variables. Rather the standard partial regression coefficients are more important. The standard partial regression coefficient for net migration rate was .939, and the

[15] The projected mean education figures are projected means for those over 24 in 1960. Any comparison between the projected mean and net qualitative change of those over age 34 is, therefore, not entirely appropriate. Separate projected means for those over 34 had not been included in the computer programs, but it is not unreasonable to assume that the relative differences in the projected means among the states would be quite similar.

standard partial regression coefficient for net qualitative change was .195.

The net migration rate is, therefore, not only a good predictor of gross qualitative change, with a simple correlation between the two variables of .9788, but also by far the more important in predicting the variation in gross qualitative change after adjusting for net qualitative change factors. While the net qualitative change is, by itself, a poor predictor of variation in gross qualitative change, with a simple correlation between the two variables of .387, the standard partial regression coefficient would indicate that the variables determining net qualitative change—freed of the effects of migration rates—are not unimportant.

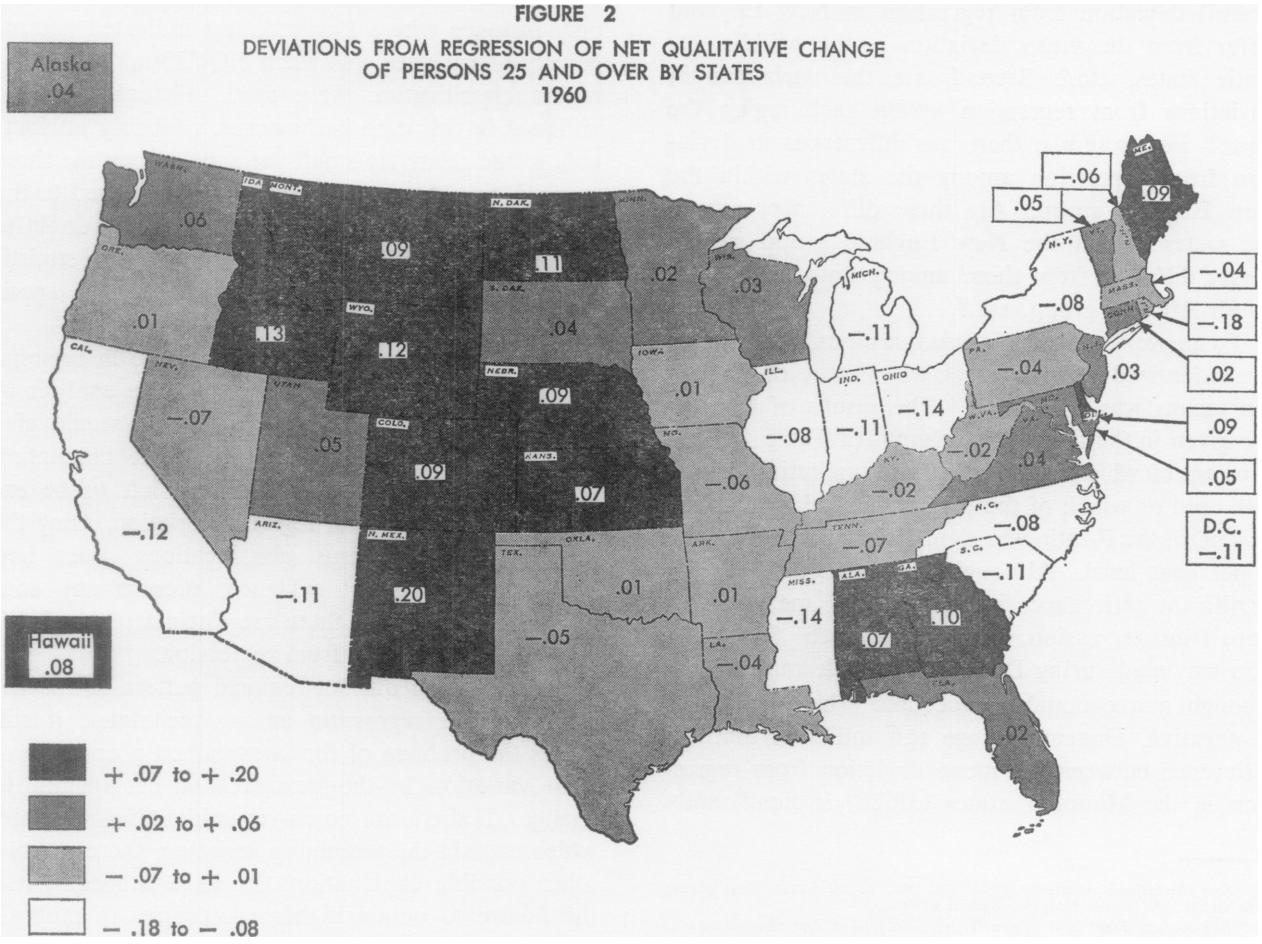
Unexplained Variation in Net Qualitative Change

The coefficients of multiple determination between the various measures of net qualitative change and the significant independent variables were high enough to warrant speculation about causal relationships among the variables. These coefficients of multiple determination were .7931, using NQC25, .8118 when using NQC35, and .8259 when using relative qualitative change. The three coefficients also mean, however, that at least part of the variation in net qualitative change is not explained in terms of our independent variables—20.69 per cent, 18.82 per cent, and 17.41 per cent of total variation remains unexplained in the three measures.

To attempt to determine whether there was any explainable pattern in the unexplained proportion of total variation, deviations from the multiple regression equations were computed for all the states and the District of Columbia. Figure 2 gives the measure of the deviations from regression in the estimating equation for NQC25. The figures are, of course, different in the case of the other three measures of net qualitative change, but the geographic pattern of deviations from regression is extremely similar. The pattern of deviations from regression does not instantly suggest any unidentified variable which might be included in a new regression equation. The only further test which was suggested

FIGURE 2

DEVIATIONS FROM REGRESSION OF NET QUALITATIVE CHANGE OF PERSONS 25 AND OVER BY STATES 1960



Source: Computed from Regression Given in Table 13.

and which was made was whether there was any regional pattern to the deviations from regression.

Both of the regional classifications of the Bureau of the Census were used for the tests. The four-region classification scheme of the Bureau of the Census included the Northeast (Pennsylvania, New Jersey and states to the northeast of them), the South (the southern states and the border states other than Missouri), the North Central (Ohio, Michigan and states to the west of them through the Dakotas, Nebraska, and Kansas), and the West (Montana, Wyoming, Colorado, and New Mexico and states to the west, including Alaska and Hawaii).

The nine-region classification of the Bureau of the Census includes: New England, Middle Atlantic, South Atlantic, East South Central, West South Central, East North Central, West North Central, Mountain, and Pacific.[16]

Two questions are raised concerning the variations in deviations from regressions. First, are there significant differences in the regional mean deviations from regression? For example, does the average (mean) deviation from regression in New England differ from the mean deviation in the Middle Atlantic states, etc.? Second, are the variations in deviations from regression *within* each region the same? For example, there are differences in deviation from regression among the states within the New England group. Are these differences among the states within the New England group significantly different from those among states within the South Atlantic group, etc.?

To answer the first of these questions, a completely randomized design analysis of variance of the region means was computed.[17] The results of this test are given in the first three columns of Table 14. Regardless of which measure of net qualitative change was used or which of the two regional classifications was used, the F-ratio was significant in no case at the 5 per cent level. Although the F-test indicates no significant differences in the regional mean deviations from regression, another test of the first question was made using Duncan's multiple range test.[18] Though a questionable procedure when the F-test is negative, Duncan's range test indicates that the difference between the mean deviation from regression in the Mountain states (.0628) is significantly greater than the mean deviation in the East North Central states (−.0791) at the 5 per cent confidence level. Also, the mean deviation from regression in the West North Central states (.0387) is also greater than the mean deviation in the East North Central states at the 5 per cent level. These significant differences in the regional mean deviations were found when using NQC25 and the nine-region classification. The only other difference in regional mean deviation which was significant at the 5 per cent level was, again, the difference between the Mountain states (.0067) and the East North Central states (−.009) when relative qualitative change and the nine-region classification were used. If Duncan's multiple range test is meaningful in the face of a negative F-test, it would mean that there is some factor or factors not readily identifiable which would explain the drain from the states of Ohio, Indiana, Illinois, Wisconsin, and Michigan towards the West.

To answer the second question concerning the homogeneity of variance within regions, Bartlett's test was used.[19] The results of Bartlett's test are given in the last three columns of Table 14. The only instance where Bartlett's test indicated heterogeneity of variance was when NQC35 and the nine-region classification were used. Heterogeneity of variance in this case is, however, probably attributable to the relatively small variance among the three states in the Middle Atlantic group compared to the variance in any of the other regions. It is doubtful whether this heterogeneity of variance, while statistically provable, has any significant practical application.

In summary, the analysis of variance in regional mean deviations from regression and the analysis of homogeneity of variance within regions would give some, but very scanty, support to the contention that there is some regional pattern left to be explained. The pattern of regional variation, using the Bureau of the Census classifications, does not, despite the statistical evidence, present any convincing evidence that there are distinct regional differences in deviations from regression.

If there is no distinct regional pattern to the deviations from regression among the states, it still leaves the problem of the unexplained proportion of total variation in the measures of net qualitative change. If there are no as-yet-unidentified variables which explain the remaining variation, there are two other possible explanations for its existence. First, the failure to obtain higher coefficients of multiple

[16] See *Statistical Abstract: 1965, op. cit.*, p. xii for a map giving both the 4-region and 9-region classification.

[17] See Robert Steel and James Torrie, *Principles and Procedures of Statistics* (McGraw-Hill, 1960), pp. 112-113 for a description of the technique.

[18] See *Ibid.*, pp. 107-109, 114 for a description of the test.

[19] See *Ibid.*, pp. 347-349 for a description of the test.

determination may be attributable to the incompatibility of the measures of the variables. The measure of net qualitative change, for example, was restricted to the group of persons who were 25 or 35 years of age and over in 1960; the relative change in total employment during the decade of the 1950's is, however, a measure of the change in employment opportunities for all workers, and not simply those above a certain age limit. As another example, the net migration rates of nonwhites is an estimate for all nonwhites—not those above age 24 or 34 —and not just those in the labor force. Moreover, the migration rate for nonwhites was computed using vital statistics data and not census survival ratios as an estimating procedure. It might be true that if perfectly comparable measures of the various independent variables were obtainable, the coefficients of multiple determination might be substantially higher.

Finally, the unexplained variation in net qualitative change may possibly represent a truly random movement of persons among areas which is not "rationally" explainable in terms of any particular variable.

TABLE 14

ANALYSIS OF VARIANCE OF DEVIATIONS FROM REGRESSION

	Test of Variance of Region Means			Bartlett's Test of Homogeneity of Variance		
	F-Ratio	Degrees of Freedom	Probability	Chi Square	Degrees of Freedom	Probability
Net Qualitative Change, 25 and Over						
4 regions	1.649	3,47	.190	1.146	3	.689
9 regions	1.645	8,42	.141	6.023	8	.683
Net Qualitative Change, 35 and Over						
4 regions	0.619	3,47	.603	2.595	3	.461
9 regions	1.122	8,42	.368	18.847	8	.016
Relative Qualitative Change						
4 regions	1.383	3,47	.259	0.643	3	.864
9 regions	1.346	8,42	.248	5.742	8	.655

PART II

THE RESPONSE OF EMPLOYERS

In Part One of this study, by using census data on education as the measure of quality, the author attempted to determine whether or not there are any changes in the net quality of the labor force attributable to migration. Education is, as already noted, not a perfect measure of the quality of individuals. In addition to the deficiency of depending upon education as a measure of quality, there were also certain deficiencies in the data and the method employed in Part One, as already pointed out. Since education is, however, the only measure of quality available from census data, if other approaches are to be used, census data cannot be relied upon.

Another possible approach to the question of qualitative changes brought about by migration of people is to make a field study of the migrants themselves. The approach in such a case would be to analyze the characteristics both of those persons moving out of an area and of those persons moving into the area in an attempt to determine whether, on balance, the area is better or worse off as a consequence of the migration.

Two studies can be cited as examples of such an attempt. The first is a study by Hobbs conducted in the 1930's in Luzerne County in the anthracite region of Pennsylvania.[1] During the summer of 1939 information on 2,667 migrants was gathered through interviews. The purpose of the information was to determine what differences, among others, existed among non-migrants, in-migrants, return-migrants, and out-migrants from a depressed area on educational attainment and educational ability. On the basis of his study, Hobbs concluded that "migration from a region of low socio-economic status [the depressed anthracite region] to one of higher status is selective of those of greater ability. . . ."[2]

The other study which should be cited was conducted by the Survey Research Center of the University of Michigan.[3] One of the purposes of this study was to determine what kind of people moved out of and into depressed areas. The study consisted of interviews with 1,400 families between August 1962 and November 1963. The major qualitative measure used in the study was the education of the family head. The study concluded that there is a "striking similarity of people who move into and out of depressed areas. . . . People who move into depressed areas are on the average somewhat older than those who move out; on educational and occupational levels, there are almost no differences. This is true despite the fact that migrants into and out of depressed areas fall well below the average for all other migrants in educational and occupational attainment."[4]

It is noteworthy that these two studies which are attempting to determine the net effect of migration from depressed areas on the quality of the residual population come to differing conclusions—Hobbs concluding that the quality of the residual population is reduced and the Survey Research Center concluding that quality is unaffected. The differences in the conclusions of these two studies is, of course, attributable in part to the time when the studies were conducted (1939 versus 1962-63), the area in which the study was conducted (one county in Pennsylvania versus 81 primary sampling points), and the techniques of the interviewers. Nevertheless, these studies do point up some of the limitations of this approach. First, these two studies used education as a primary measure of quality, as we have done in Part One of this paper. Even though the migrants themselves are interviewed, it would be difficult for an interviewer to get any sort of measure or appraisal of the migrants' quality other than to use some objective standard such as education. Second, neither of the two studies were able to cover a significant number of areas which were both losing population *and* gaining population through migration. A study consisting of interviews of migrants in a representative sample of areas both gaining and losing population through migration would require a substantial expenditure of both time and money. It was largely for this last reason that no attempt was made in this study to interview the migrants themselves to determine the effects of migration on the average quality of the population.

Another approach to the determination of the effects of migration on quality is to contact employers. This approach poses certain obvious disadvantages. First, no employer is exposed to all of the

[1] Albert H. Hobbs, *Differentials in Internal Migration* (Philadelphia, University of Pennsylvania, 1942).
[2] *Ibid.*, p. 110.
[3] Area Redevelopment Administration, *Migration Into and Out of Depressed Areas* (Washington, GPO, 1964).
[4] *Ibid.*, p. 24. Chart 12 on page 26 of the cited report would seem to indicate that the education of the family head of families who moved *into* depressed areas is slightly greater than that of those moving *out* of depressed areas. However, the study indicates no statistical test of the significance of this difference.

labor force available in a particular area. Hence, he would always have a myoptic view of the quality of the labor force in an area because his judgment would really be based upon his exposure to a part of the labor force. Second, the employer would also not have any perfect measure of the quality of even that part of the labor force with which he does have contact. Not every employer keeps records on persons who have applied for employment or have been employed. Moreover, such records would not necessarily enable the employer to tell what has happened to the quality of the labor force except on the basis of some objective measure such as educational attainment. Further, few employers tabulate the results of such objective measures that they do possess in their records.

Also, not every employer gives psychological tests to job applicants or recently employed individuals. Such psychological tests, of course, plus interviews, plus personal data on educational attainment do not measure "quality." In short, employers, like other persons, do not have perfect measures of quality. Third, answers that employers might give to questions on qualitative changes in the labor force in their area might reflect biases. These biases might be induced by good or bad fortunes in business which are not a consequence of changes in the quality of the labor force. Or the biases might simply reflect the predispositions of the particular individual answering the questions on the particular day he was contacted. Nevertheless, employers do have better contact with a broad cross section of the labor force and certainly a more continuous contact than any other small group of individuals. Further, to the knowledge of the writer, studies have not been made which attempt to contact employers as a method of attempting to determine qualitative change in a number of areas experiencing different patterns of migration. For these reasons, as well as matters of economy, this approach is adopted in Part Two of this study.

PROCEDURE

A mail questionnaire was used to gather information from employers. This procedure has, of course, the deficiency of non-response error plus the risk of misunderstanding of set questions on a printed questionnaire. It is also limited by its inability to gather additional information as through a depth interview. Since the hypothesis of this paper would require contacting employers both in those areas experiencing net in-migration and net out-migration, the cost and time necessary to interview a representative sample of employers in both types of areas would be beyond the resources of this study.

Selection of Areas

Although states do not represent the most appropriate unit for study, as noted in Part One, states were nevertheless used. In large part, this decision was dictated by the availability of information about employers' names and addresses. Most available directories, as noted below, give such information by states. Nine states were selected for this study. They were: Illinois, Indiana, Kentucky, Maryland, New Jersey, Ohio, Pennsylvania, Virginia, and West Virginia. These states were selected because, in addition to ready availability of employers' names and addresses from these states, they are contiguous. A goodly proportion of the migrants into and out of any state come from the immediately surrounding areas. If states were selected on a hit and miss fashion, the results might be quite different than when using a contiguous group of states. Another reason for the selection of these nine states is that they are all from the same general area of the country—a band stretching from New Jersey to Illinois. It was thought that it would be desirable to avoid selecting states from significantly differing regions of the country—such as the South plus far West—since any differences among such regionally disparate states might reflect regional differences which are not necessarily related to migration rates. Another factor in selecting these nine states was that they represented a respectable range of migration rates. During the decade of the 1950's, migration rates among these states varied from —22.3 per cent in West Virginia to +13.7 per cent in Maryland. Using a more recent time period, the estimated migration rate from 1960 to 1963 ranged from —6.08 per cent in West Virginia to +4.14 per cent in New Jersey. It should be noted that these states were selected prior to the completion of the analysis of qualitative (educational) change in Part One. Had that analysis been completed prior to the selection of the states, it might have dictated another choice of states.

Because of the limitations on the use of states as an area for study, an attempt was made to analyze the relationship between employers' estimates of qualitative change in the labor force and county migration rates. This will be discussed in more detail later.

Selection Criteria for Employers

Prior to the actual selection of particular establishments, three criteria were set up which had to be met by firms selected for the sample. First, only employers in manufacturing were used in the sample. The reason for this criterion was both theoretical and practical. If employers from a number of quite

different industries were selected, this might nominally introduce variables in the type of labor force to which the employers are exposed. These differences in the types of labor forces might affect the employers' evaluation of the quality of the workers and thus complicate any analysis of changes in the area itself. By restricting the sample to employers in manufacturing only, this possibility is reduced. The practical reason for selecting manufacturing was that most of the directories of employers which are readily available give information on employers in manufacturing industries only.

The second selection criterion was that each firm had to be in business at least five years. It was decided to ask of employers their evaluation of qualitative changes in the labor force over the period of the last five years. While even this time period might be too short to judge adequately any trend in qualitative change, certainly any employer's evaluation over a shorter time period might represent momentary fluctuations in the type of workers applying for work in his establishment rather than any long-term trend in the area. A longer time period might well have been desirable, but a longer time period might have stretched the accuracy of an employer's memory.

The third selection criterion was that only those firms which hired at least one hundred employees would be included. Smaller employers would be exposed to such a relatively small proportion of the labor force in the area in which they operated that they would have a less adequate basis for making any judgment on the qualitative change in the labor force in the area. Further, small companies seldom have personnel departments and hence are less likely to have persons who would give serious attention to changes in the quality of applicants for employment over time. Finally it was expected that small companies, because of the paucity of staff personnel, would be less likely to answer any mail questionnaire, thus increasing nonresponse error.

Testing of Preliminary Questionnaire

A preliminary version of the questionnaire actually used in this study was mimeographed and tested in two ways. First, about a dozen employers—not selected by any systematic method other than convenience to the interviewer—were interviewed and asked to fill out the preliminary questionnaire. At this stage, there was less interest in their specific answer to the various questions than there was in their reaction to the questionnaire itself. On the basis of comments made, certain changes were made in the preliminary version of the questionnaire. These changes were largely matters of spelling out somewhat more specifically what was meant by certain terms used in the questionnaire.

The second stage in the preliminary testing was to send out copies of the mimeographed questionnaire to fifty employers. Again, the employers were not selected on a scientific basis. The fifty questionnaires were sent to ten employers in each of five different states. The employers in any one state were selected from one of the three size categories used in the study. From the response, a few ideas were gathered which resulted in changes in the final questionnaire. More important, the fifty sample questionnaires sent out did enable us to get some estimate of the proportion who would respond and the sample size which would be needed.

The Sample

The interviews with the dozen employers indicated that probably the most significant response would be their evaluation of changes in the overall quality of job applicants (the last item on the questionnaire used). In estimating the sample size needed, therefore, particular attention was given to the response from the mail questionnaire on the last question.

Fifteen of the fifty questionnaires originally sent out (30 per cent) were returned. Ignoring differences among states and among firms of various size classes, the overall variance on the response of employers returning the sample questionnaire to the last question on overall quality was 1.095 for nonsupervisory employees and 1.286 for managerial employees. This measure of variance was based upon a five-fold classification where the employer would rate overall quality as being substantially higher (a rating of one) to substantially lower (a rating of five). If we were to take a 5 per cent chance that the error in the sample mean would be more than .5 (on a 5.0 scale), the number of questionnaires needed from each state would be 17.5 for nonsupervisory employees and 25.6 for managerial employees.[5] If we want to detect a .25 unit difference with a 5 per cent chance of error, 70 questionnaires would be needed from each state for the response to overall quality of nonsupervisory employees and 82.3 for the response to the overall quality of managerial employees.

The number of returned questionnaires indicated

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[5] William G. Cochran, "Design and Analysis of Sampling," in George W. Snedecor, *Statistical Methods* (Ames, Iowa State U. P., 1957), p. 501. The required sample size is equal to $4\sigma^2/L^2$ where σ^2 is the population variance (standard deviation squared) and L is the allowable error in the sample mean.

in the preceding paragraph would theoretically enable us to determine the true mean of a state within .5 or .25 units at the 95 per cent confidence limit; this would not necessarily be a sufficient number of questionnaires to determine the existence of differences between states. If the accepted probability of committing a Type I error (rejecting the null hypothesis when in fact it is true) is .05, and if the desired probability of successfully determining a difference among states which really exists is .80, then to determine a 10 per cent difference between states (for example, 3.5 versus 3.15 or a .35 unit difference) would require 290 questionnaires returned from each state. To detect a 25 per cent difference (for example, 3.5 versus 2.625) with the same probabilities would require 57 questionnaires from each state.[6]

Certain other considerations were important in establishing the desired number of questionnaires returned from each state. First, as previously noted, the return on the sample mail questionnaire was 30 per cent. It was assumed that the return on the final questionnaire would be approximately the same. Second, the maximum number of questionnaires which could be distributed within a state was limited by the number of names and addresses available. In West Virginia for example, the maximum number of employers' names and addresses available from a directory was 220. A third and very important consideration was the cost of sending out questionnaires.

Balancing these various factors, an objective of seventy returned questionnaires from each state was set. Assuming a 30 per cent return, this meant sending 210 questionnaires to each state, or 1,890 questionnaires altogether. Unscientifically rounding off the figure, 2,000 copies of the questionnaire were printed.

Selection of Companies

Various manufacturing directories were used as a source of names and addresses of employers.[7] The use of these sources instantly introduces some error, since the directories differ as to date of publication and completeness of coverage of employers in the state. Since the sample size needed from a state is independent of the number of employers in the state, it was decided to send an approximately equal number of questionnaires to each of the nine states. The names and addresses of employers were selected by using a systematic random sample with proportionate subsamples. This means that the procedure used was as follows. First, a disproportionate number of the larger employers was selected. The reason for this was the assumption that larger employers are exposed to a broader cross section of the labor market in the state in which they are located.

Table 15 gives the number of employers in each of three size classes as reported by *County Business Patterns.*[8] The table also gives the percentage of total employment among firms hiring one hundred or more employees in each of the three size classes within a state. The questionnaires were then allocated to firms in the three size classes in proportion to their share of total employment in the state. Second, the theoretical distribution of the questionnaires—given in column three of Table 15—could not in fact be followed. In some cases this was because the theoretical distribution would require sampling a larger number of employers than the number which actually existed within that size class within a state. For example, in Kentucky, Maryland, and West Virginia, the number of employers hiring five hundred or more employees which should theoretically have been included in the sample was greater than the actual number of employers in that size class. Another factor was that the number of employers in the various size categories by state as recorded in *County Business Patterns* did not necessarily correspond to the number of employers included in the directories actually used. For example, according to *County Business Patterns,* there were only 177 employers in manufacturing in West Virginia hiring 100 or more employees, but the directory used listed 220 who could be included in the sample. Hence, the actual distribution of questionnaires differed somewhat from the theoretical number to be sent in the case of some states.[9]

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[6] See W. G. Cochran and Gertrude Cox, *Experimental Design* (New York, Wiley, 1957), p. 25.

[7] *Illinois Manufacturers Directory, 1963* (Chicago, Manufacturers' News, Inc., 1963). *The Indiana Industrial Directory* (Indianapolis, The Indiana State Chamber of Commerce, 1964).
1966 Kentucky Directory of Manufacturers (Frankfort, Kentucky Department of Commerce, 1965).
1965-1966 Directory of Maryland Manufacturers (Annapolis, Department of Economic Development, 1965).
1965 New Jersey State Industrial Directory (New York, New Jersey State Industrial Directory, Inc., 1965).
Directory of Ohio Manufacturers: 1965 (Columbus, Department of Industrial Relations, 1965).
1965 Industrial Directory of the Commonwealth of Pennsylvania (Harrisburg, Department of Internal Affairs, 1965).
Industrial Directory of Virginia Manufacturing and Mining (Richmond, Virginia State Chamber of Commerce, 1965).
West Virginia Manufacturing Directory: 1964-65 (Charleston, West Virginia Department of Commerce, 1964).

[8] Bureau of the Census, *County Business Patterns, First Quarter, 1962.* Part I, United States Summary (Washington, GPO, 1963). This was the most recent edition available at the time the sample was drawn.

[9] Care was taken to select only those firms from the directories which met the qualifications—employing 100 or more in manufacturing, in business at least 5 years. Information in the directories was not always complete enough to tell whether or not a firm did in fact meet the qualifications. However, questions on the questionnaire verified these qualifications.

TABLE 15

DESIGN OF SAMPLE

Employment Size Class	Total Number of Employers	Per Cent of Total Employment Among Firms Within States*	Theoretical Number to Send with Proportionate Subsampling	Actual Number Sent
Illinois				
100-249	1,283	22	49	49
250-499	468	18	40	40
500 or more	422	60	133	133
Indiana				
100-249	475	15	33	33
250-499	234	17	38	38
500 or more	192	68	151	151
Kentucky				
100-249	176	21	47	74
250-499	95	26	58	91
500 or more	57	53	118	57
Maryland				
100-249	263	20	44	88
250-499	83	14	31	60
500 or more	78	66	147	74
New Jersey				
100-249	900	25	56	56
250-499	323	20	44	44
500 or more	225	55	122	122
Ohio				
100-249	1,094	18	40	40
250-499	453	16	36	36
500 or more	423	66	147	147
Pennsylvania				
100-249	1,575	22	49	49
250-499	599	19	42	42
500 or more	441	59	131	131
Virginia				
100-249	283	20	44	65
250-499	127	20	44	64
500 or more	93	60	133	93
West Virginia				
100-249	91	16	36	131
250-499	41	15	33	45
500 or more	45	49	153	44
Totals	10,539	----	1,999	1,997

* Figures in this column are from *County Business Patterns, 1962, op. cit.*

TABLE 16

ACTUAL AND EXPECTED RETURNS FROM THE QUESTIONNAIRE SURVEY BY SIZE OF FIRM

	Employer Size Classes							
	100-249 Employees		250-499 Employees		500 or more Employees		Total	
	Actual	Expected	Actual	Expected	Actual	Expected	Actual	Expected
Illinois	10	12.2	5	9.9	32	33.0	47	55.1
Indiana	6	8.2	10	9.4	43	37.5	59	55.1
Kentucky	9	18.4	15	22.6	16	14.2	40	55.1
Maryland	19	21.9	14	14.9	21	18.4	54	55.1
New Jersey	5	13.9	12	10.9	24	30.3	41	55.1
Ohio	9	9.9	9	8.9	38	36.5	56	55.4
Pennsylvania	7	12.2	12	10.4	48	32.5	67	55.1
Virginia	10	16.1	14	15.9	24	23.1	48	55.1
West Virginia	42	32.5	19	11.2	23	10.9	84	54.6
Total	117	145.3	110	114.1	269	236.7	496	------

THE QUESTIONNAIRE

The questionnaire finally sent out (reproduced on pages 49 to 52 in the appendix) had questions designed to ascertain a number of relevant factors. Items 1 to 5[10] were to determine the location of the firm. Items 6 to 8 were included to determine whether the firm met our selection criteria. The type of work force employed by the firm was determined by items 9 to 26. This includes the sex composition of the labor force, the occupational composition of the labor force in the firm, and whether or not the firm was unionized and its degree of unionization. It should be noted that no questions were asked concerning wage rates or levels in the firms. The reason for this is that there is no simple way of getting information about wage levels and changes in wage levels over time in a meaningful fashion without asking a long series of questions. It was feared that asking for such detailed information might further reduce the number of returned questionnaires.

Items 27 to 94 raise a number of questions about company recruitment and selection procedures and experience. Also, beginning with these questions, a distinction was made between nonsupervisory personnel and managerial (including foremen and higher levels) personnel. It was assumed that there would be a distinct difference between the recruitment and selection procedures used for the two types of workers and also differences in the employers' judgment of their quality. It might have been desirable to have had an even more detailed breakdown, perhaps distinguishing among five different levels of employees, but to keep the questionnaire as brief as possible the distinction was made only between managerial and nonsupervisory personnel.

Items 27 to 44 ask about recruitment methods currently used by the firms. The same question was repeated in items 45 to 62 to determine whether recruitment procedures were substantially different five years ago. Following this, there were questions on the intensity of the firms' recruitment activities (items 63-64), the change in the number of job applicants over the past five years (items 65-66), and changes in the quit rate in the firm over the last five years (items 67-68).

Selection devices used by the firms presently and five years ago were covered in items 69 to 88. Questions were also raised about changes in the firms' selection standards (items 88-90), the firms' selection ratio (items 91-92), and changes in the selection ration over the last five years (items 93-94). The basic purpose of items 9 through 94 was to determine whether or not the employer's evaluation of changes in the quality of the job applicants was attributable to the type of workers he employed and/or his recruitment and selection methods, or, on the other hand, changes in the labor force within the area.

The remaining questions relate to the employer's judgment of qualitative change. Items 95-96 relate to the measure of quality used in Part One of this study—education. The question on age (items 97-98) is not necessarily a qualitative measure in and of itself, but the question was included to determine whether or not the employer's judgments on qualitative changes in the other measures may have been related to changes in the age of applicants for employment over the last five years. The final five questions asked of the employer involve a judgment on five rather nebulous aspects of quality—initiative, intelligence, adaptability, ambition, and overall quality. None of these, other than possibly intelligence, are susceptible of objective measurement and it is doubtful whether many employers actually administer acceptable intelligence tests to job applicants. Nevertheless, employers' judgments of changes in these "qualities" of workers are crucial to this part of the study since the purpose is to determine what the employer believes has happened to the quality of the labor force over time. Further, it was the intention to get the employers' judgments on aspects of quality which, unlike educational attainment, could not be objectively measured.

Response to the Questionnaire

On February 9-10, 1966, a total of 1,997 questionnaires were mailed out. On the basis of the pattern of returns, March 25, 1966, was arbitrarily used as the cutoff date. By that date, 542 questionnaires had been returned; an additional 20 questionnaires, not used in this study, were returned after the cutoff date. Of the 542 questionnaires returned prior to the cutoff date, 46 could not be used because they did not meet the selection criteria for firms (100 or more employees in manufacturing and in business for at least five years) or because the person completing the questionnaire had not answered a large number of critical questions or had forwarded the questionnaire to the parent office of a branch plant, the parent office being outside the nine states included in this study.

[10] The numbers on the questionnaire do not represent the number of the question, but rather were numbers used to facilitate coding of the questionnaire. In referring to the various questions, however, these coding numbers are used.

The number of returned questionnaires used in this study was, therefore, 496—a 24.8 per cent return. The percentage response to the final questionnaire mailed out was less than that on the sample mail questionnaire (30 per cent) and certainly less than had been desired.[11] Table 16 gives the actual number of questionnaires returned by state and employer size class and the number that one would have expected to have been returned in each category had 496 questionnaires been distributed precisely in proportion to the number of questionnaires originally sent out. A chi-square test of the differences between the number returned by state and the expected frequencies indicates that the differences are significant at the 5 per cent level ($\chi^2=19.619$, df=8). The major differences contributing to the large chi-square value were the disproportionately large number of returns from Pennsylvania and, especially, West Virginia, and the relatively small number of returns from Kentucky and New Jersey.

A chi-square test of the differences between the actual and expected returns by firm size also indicates that there are significant differences at the 1 per cent level ($\chi^2=10.14$, df=2). Rather obviously, the significant chi-square value is attributable to the disproportionately large number of returns from firms employing 500 or more workers and the small number of returns from those firms employing 100 to 249 employees. Quite probably this reflects the availability of staff personnel to complete such mail questionnaires. A final test was made of the differences between the number of questionnaires actually returned and the expected number by state and employer size class. These differences were also significant beyond the 0.1 per cent level ($\chi^2=54.0115$, df=16). This large chi-square value is attributable to the disproportionately large number of returns from firms in each size class in West Virginia and from the large (500 or more) firms in Pennsylvania, and, on the other hand, the disproportionately small number of returns from small firms in Kentucky, New Jersey, Pennsylvania, and Virginia, from medium size firms in Illinois and Kentucky, and large firms in New Jersey. These significant differences do represent biases in the sample of questionnaires returned and must be kept in mind in evaluating the results of the analysis of the returned questionnaires.

[11] One important factor may have been the failure to include a stamped, self-addressed return envelope. Also important, however—as a few noted on their questionnaires or in letters sent without the questionnaire—was the reluctance of some employers to answer the detailed questions on the first three pages of the questionnaire or their reluctance to make subjective judgments about qualitative changes.

Answers to the Questionnaire

The tabular results of the answers to the questionnaire are given in the questionnnaire which is reproduced in the appendix at the end of this study. The distribution of replies by states has already been discussed and analyzed. All of the firms were, of course, in manufacturing, and slightly more than three-fourths of them (375 of 496) were in durable goods manufacturing. The great bulk of the firms, 91.7 per cent, had been in business more than ten years, the rest having been in business five to ten years. More than half of the responding firms employed 500 or more employees, the remaining firms being approximately equally divided among those hiring 100 to 249 employees and those hiring 250 to 499.

For the typical firm in the sample, 72 per cent of the labor force consisted of males and about 28 per cent females. The typical (mean) firm also employed 11 per cent professional-managerial workers, 13 per cent clerical and sales workers, 22 per cent skilled workers, 33 per cent semiskilled, and 25 per cent unskilled workers.[12] About 77 per cent of the firms responding to the questionnaire indicated that some of their nonsupervisory employees were unionized, and the mean percentage unionized in those firms was 82 per cent.

The most commonly mentioned method of recruiting nonsupervisory employees, also the most important method for those indicating the relative importance of methods, was to rely upon applications at the company employment office. The second most commonly mentioned method of recruiting nonsupervisory employees was through referral from current employees. Almost an equal number of firms mentioned relying upon public employment agencies and advertisements as methods of recruiting nonsupervisory workers. These four methods of recruiting nonsupervisory employees were also the most commonly mentioned methods—and in the same order—five years ago.

The recruitment methods for managerial employees differed, however. Advertisements were the most commonly mentioned methods for both the current period and the period five years ago. This method was closely followed by reliance upon private employment agencies. The other frequently mentioned methods of managerial recruitment were:

[12] The figures do not add up to 100 per cent because the canned program used to tabulate these results did not distinguish between nonresponding firms on these questions and those firms who answered zero per cent. Hence, the mean percentage for firms as calculated includes only those firms which indicated they did hire some workers in the specific category.

college recruitment, applications at the company employment office, and referrals from current employees.

The majority of firms indicated they were more actively recruiting both nonsupervisory employees (339 out of 493 firms) and managerial employees (330 out of 468 firms) at present than they had been five years ago. Firms were almost equally divided among those reporting an increase and a decrease among the number of job applicants over the period of the last five years, but the number of firms reporting an increase in the quit rate was greater than the number reporting a decrease. Undoubtedly, the necessity for a more active recruitment program and the increase in the quit rate in the firms is in large part attributable to the upswing in economic activity in the economy over the course of the last five years.

In selecting new employees, the largest number of firms indicated they relied upon the record of work experience of job applicants and their performance in the interview. Education and personnel test scores were less important, but it should be noted that in selecting managerial employees firms tended to rely upon education to a greater extent than they did in selecting nonsupervisory employees. Most firms indicated they had raised their selection standards over the course of the last five years. It might be questioned, however, whether they had raised their selection standards relative to improvements in the quality of the labor force that was occurring, or whether they simply believed they had raised their standards. The majority of firms hired less than one out of four applicants for employment, but a surprisingly large number had higher selection ratios. Firms were almost equally divided among those which believed their selection ratio had increased and those which believed it had decreased over the last five years.

The overwhelming majority of the responding firms reported that the average education of persons applying for employment had increased over the course of five years. On this, as on most of the following measures, the firms indicated that the improvement among applicants for managerial positions had been greater than that of applicants for nonsupervisory positions. This may reflect the bias of the person completing the questionnaire. Of those firms indicating a change in the average age of job applicants, a majority indicated that the average age of job applicants had decreased, but about one-third indicated no change in the average age of job applicants.

Of those employers indicating any change at all, a majority believed that the average intelligence and adaptability of applicants for nonsupervisory positions had increased over that of job applicants of five years ago. A greater number, however, believed that the initiative and ambition of job applicants for nonsupervisory employees was lower today than it was in the past. The firms were exactly divided among those indicating that the overall quality of applicants for nonsupervisory positions had increased and those who believed it had decreased. The number of firms indicating the overall quality was "substantially lower" was greater, however, than the number indicating it was "substantially higher."

Though again perhaps reflecting the biases of the persons filling out the questionnaires, the number of respondents who believed the initiative of managerial employees had increased outweighed the number who believed it had decreased. Further, an absolute majority of respondents believed that managerial applicants of today were more intelligent, adaptable, ambitious, and exhibited higher overall quality than was true of applicants for managerial positions five years ago.

While this cursory review of the results of the questionnaire presents some interesting but not very surprising results, it does not answer the hypothesis of this paper. To determine whether or not there is any relationship between migration rates and qualitative changes in the labor force requires a more careful analysis of the data.

ANALYSIS OF DATA

County Migration Rates

Because of the objection that states are inappropriate units for study, being too broad and diversified, an attempt was made to determine the relationship between employers' evaluations of quality change and county migration rates. Since on the basis of interviews conducted during the preliminary testing of the questionnaire it seemed as though the employers' response to the question on overall quality of applicants for employment would be the most significant, the test was made using the employers' response on this question and relating it to county migration rates.

Data on county migration rates were obtained from the Bowles and Tarver study.[13] These migration

[13] Gladys K. Bowles and James D. Tarver, *Net Migration of the Population, 1950-60, By Age, Sex, and Color,* Vol. I, Parts 2, 3, and 4 (Washington, GPO, 1965).

rates relate to the period 1950 to 1960; none are available for a more recent time period. Given the location of responding employers from item two on the questionnaire and the Bowles-Tarver county migration rates, a completely randomized design analysis of variance[14] was computed to determine whether or not there were any significant differences in county migration rates by response to the question on overall change of applicants for nonsupervisory and managerial positions. Table 17 below gives the mean county migration rate for nonsupervisory and managerial employees by response to the question on overall quality.

TABLE 17

COUNTY MIGRATION RATES BY EMPLOYER RESPONSE GROUP

	Nonsupervisory		Managerial	
Employer Response on Overall Quality	Obser-vations	Mean Rate	Obser-vations	Mean Rate
Substantially Higher	16	5.294	62	.773
Moderately Higher	186	— .937	261	— .099
No Change	87	—2.215	94	—2.205
Moderately Lower	133	— .026	37	— .597
Substantially Lower	69	—1.322	5	.780

The F-test of the variance in mean migration rates for nonsupervisory employees indicates no significant differences by employer response to the question on overall quality (F=1.129; df=4, 486; p=.342). An F-test of the mean migration rate by employer response on the overall quality question for managerial employees also indicates no significant differences in the mean migration rates (F=.534 df=4, 454; p=.676). Bartlett's test of homogeneity of variance within employer response groups does indicate heterogeneity of variance in the case of nonsupervisory employees (corrected χ^2= 15.731, df=4, p=.004). Bartlett's test does not indicate heterogeneity of variance for the managerial group. The heterogeneity of variance in the nonsupervisory employee group is largely attributable to the large variance in county migration rates among the small number of firms who ranked nonsupervisory employees as substantially better.

Since in Part One of this study the migration rate of nonwhites appeared to be a crucial variable in explaining the qualitative (educational) change in the labor force attributable to migration, a further test of the county migration rates was made in a completely randomized design analysis of covariance with the nonwhite migration rate introduced as an independent variable.[15] Since the migration rate for nonwhites given in the Bowles-Tarver study used the 1950 population of nonwhites as a denominator, the nonwhite migration rate was recalculated using the Bowles-Tarver estimate of net migration of nonwhites by county in absolute numbers, but using 1950 population of the entire county as a numerator.[16]

The Bowles-Tarver study calculated the migration of nonwhites only for those counties with a nonwhite population of 5,000 or more. Hence, some of the firms responding to the questionnaire could not be included in this analysis, since the firms were located in counties with a nonwhite population of less than 5,000. Of the 491 employers answering the question on overall quality of nonsupervisory applicants, 225 were located in counties which could be included in this analysis. A simple analysis of variance of county migration rates for the entire population and also for the nonwhite population indicates that the differences in mean migration rate by employer response group was not significant for either the county migration rate for the entire population (F=1.298; df=4, 220; p=.271) or for the nonwhite population (F=.634; df=4, 220; p=.630).

The analysis of covariance given in Table 18 below indicates that the mean county migration rate, adjusted for the nonwhite county migration rate, does not differ significantly among the employer response groups. Including the nonwhite migration rate in the covariance analysis seems to have made little difference. Unfortunately, the validity of the F-test in the covariance analysis must be questioned, since Bartlett's test indicates heterogeneity of variance among the treatments (corrected χ^2=16.9, df=4, .005>p>.001). The data would not seem, however, to warrant transformation to eliminate the heterogeneity of variance. It seems quite likely that even after such transformation there would be no significant differences among the adjusted treatment means by employer response groups.[17]

The conclusion would then seem to be that there are no significant differences in mean county migration rates classified by employer response to the question on overall quality. In other words, there is no relationship between county migration rates and employers' evaluation of changes in the overall

[14] Steel and Torrie, *op. cit.*, pp. 112-113.

[15] See Snedecor, *op. cit.*, pp. 400-401.

[16] 1950 population data from *County and City Data Book, op. cit.*

[17] Duncan's multiple range test was also run on the adjusted treatment means, but there were no significant differences. The entire procedure of using variance-covariance analysis in connection with the type of data obtained from the questionnaire might be questioned. Perhaps it would be better to stick to the nonparametric measures used in the analysis below.

quality of applicants for employment. The failure to find any relationship between county migration rates and employers' evaluation of overall quality changes may not, however, be meaningful. It should be kept in mind that: (1) the sample size may be too small to detect differences that do exist, (2) the sample had been designed to represent nine states and not the counties within the states, (3) the above analysis is comparing the migration rates of the 1950's with employers' evaluations of overall quality changes in the early 1960's, and (4) counties are perhaps not the appropriate labor market unit for analysis of changes—particularly not for managerial employees and perhaps not even for nonsupervisory employees.

Analysis of State Differences

Nonsupervisory Employees. In analyzing the results of the questionnaire, it might be ideal to compare firms which have idential labor forces and idential recruitment and selection procedures and experience, but located in different states, to determine what differences there are in the employers' response to questions on quality changes. However, the sample size is not great enough to permit use of the technique of matched pairs. As an alternative approach, the questionnaires were sorted by state and by employer response to the question on overall quality. The analysis of these sorts is given in Tables 19 and 20.

Since not every employer answered every question, the number for most of the cross sorts is less than 496. To obtain valid chi-square tests (no expected frequency less than one, and less than 20 per cent of the expected frequencies less than five), the data had to be combined in a number of cases. For example, recruitment and selection procedures could be analyzed only by distinguishing between those employers who used a particular method and those who did not. Another important example is the measures of qualitative change. In the case of all these measures, other than overall quality change, the five-fold classification (from substantially higher to substantially lower) did not make possible valid chi-square tests. Hence, a three-fold classification (higher, no change, lower) was used. There are reported in Tables 19 and 20 some invalid chi-square tests. Some of these, such as the number of years in business, represent cases where the data could not be combined any further to make possible a valid test. In other cases, such as the instance of employers who used some method of recruiting nonsupervisory employees other than those mentioned on the printed questionnaire (the "other" category), the probability of the originally computed chi-square values was so low and/or the number who mentioned some other method of recruiting workers was so small that it did not seem worthwhile recategorizing and recomputing the chi-square value.

Tables 19 and 20 also give a coefficient of contingency. This is a measure of the degree of association between the two items being cross tabulated. This coefficient should be interpreted with extreme care. This is not the commonly used coefficient of contingency,[16] but rather a measure of the actual chi-square value as a proportion of the maximum possible chi-square value. This coefficient of contingency is not comparable to any other commonly used statistical measure, such as a correlation coefficient, and can only be compared with other coefficients of contingency similarly measured. Even when comparing the coefficient with other coefficients, care must be used. Coefficients computed from different sized frequency tables (for example a 5 by 2 table versus a 3 by 3 table) are not directly comparable. The significance of any particular cross classification does not depend upon the coefficient of contingency, but rather upon the chi-square value and the number of degrees of freedom. The coefficient of contingency is useful in measuring the degree of association of contingency tables of the same size even though the number in the sample may vary. For example, the degree of association between employer evaluation of overall quality of nonsupervisory employees and employer evaluation of certain other quality measures, such as education, initiative, and intelligence, is indicated by the coefficient of contingency (see Table 20, page 36, items 95-105).

In Tables 19 and 20, cross classifications which are significant at 1, 5, and 10 per cent levels have been indicated. Since the sample size was fairly small, it might be injudicious to insist upon too high a significance level and thus run the risk of rejecting real differences which exist.

As Table 19 indicates, there are real differences in the proportion of firms which are in durable versus nondurable goods manufacturing. If firms

[16] The more commonly used formula for the coefficient of contingency is $[\chi^2/(N+\chi^2)]^{1/2}$. See Sidney Siegel, *Nonparametric Statistics* (New York, McGraw-Hill, 1956), pp. 196-202. The coefficient used is this study is from Steel and Torrie, *op. cit.*, p. 369, and is equal to $\chi^2/[N(T-1)]$ where N is the number in the sample and T is the smaller of the number of rows and columns. The denominator — N (T-1) — is the maximum possible value of χ^2 for any given frequency table. The advantage of the Steel-Torrie measure over that in Siegel is that the maximum values are ± 1.0 while the Siegel measure has variable maximum values. Neither measure of contingency is, however, without fault.

are classified by industry and employer response to the question of overall quality (Table 20), the differences between durable and nondurable goods firms is not significant. Hence, we conclude that while there are significant differences among the states as to the proportion of firms in durable and nondurable goods manufacturing, this industry classification is not important in explaining differences in employer evaluation of overall quality of job applicants.

There are significant differences in employer evaluation of overall quality between firms in business five to ten years and those in business more than ten years. Measuring overall quality on a three-fold scale—where 1 represents an increase in quality, 2 represents no change, and 3 represents a decrease in quality—the weighted average evaluation of quality in those firms in business five to ten years was 1.70, and among those firms in business more than ten years, it was 2.03. The better rating given on overall quality by the relatively newer firms may reflect the optimism of youth. It is questionable whether this difference in assessment between the old and new firms is a critical factor in explaining differences in evaluation by state. As item 7 in Table 19 indicates, the differences among states by number of years in business is significant only at the 10 per cent level and that chi-square test is invalid.

There are significant differences among the states by number of persons employed in the firm—as one would expect from the design of the sample—but the number of employees is not a significant variable in explaining differences in employer evaluation of overall quality. The percent of males employed in the firm does differ significantly among the states at the 10 per cent level, and the differences in the proportion of males employed classified by employer response on overall quality is also significant at the 10 per cent level. This factor would not, however, seem to be important in explaining differences in employer evaluation of overall quality for two reasons. First, the weighted average employer evaluation of overall quality by proportion of males employed does not progress smoothly from one end of the spectrum to the other. Among those firms employing 1 to 25 per cent males, the weighted average was 1.80; among those employing 26 to 50 per cent, it was 2.21; among those employing 51 to 75 per cent, it was 2.02; and among those employing 76 to 100 per cent males, it was 2.00. Facetiously, this could indicate that employers who hire almost all males or almost all females are relatively more content than those who have a mixed labor force. The second reason for concluding that the sex ratio is not important is that when employer response on overall quality is cross sorted with the proportion of females employed (item 11-12 in Table 20), the differences are not significant.[19]

While there are significant differences among the states as to the occupational composition of the work force in the firm and whether or not the firm is unionized and the degree of unionization (items 13 to 26, Table 19), these differences are not significant in explaining employer evaluation of overall qualitative change.

There are significant differences among the states as to the proportion of employers who currently use one or another of the nine recruitment methods (items 27-35). Only in the case of advertising, however, would these differences among the states seem to be important. Among those employers who did use advertising as a method of recruiting nonsupervisory employees, the weighted average rating on overall quality was 2.16, while those employers who did not use advertising gave nonsupervisory applicants a weighted average rating of 1.87. If the weighted average rating on overall quality by state is related to the proportion of employers in a state who used advertising as a recruitment method, Spearman's rank correlation is $-.80$, which is significant at the 1 per cent level. Perhaps it does not really pay to advertise; or it might indicate that those employers who are forced to advertise as a method of recruiting employees do, as a consequence, receive a less selected group of job applicants than if they were able to use alternative recruitment methods. In any case, using advertising as a method of employee recruitment must be kept in mind as a factor explaining differences in employer evaluation of overall quality.

There is no convincing evidence that recruitment methods for nonsupervisory employees have changed over the course of the last five years. Cross classifying employers' response to questions on current recruitment methods with their response on recruitment methods of five years ago yields coefficients of contingency—which measure the degree of association—ranging from a low of .344 to a high of .899.

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[19] The proportion of females hired is not simply equal to one minus the proportion of males hired, because of the method used to classify employer response on the per cent of persons employed by sex. See footnote 12 above.

TABLE 18

COVARIANCE ANALYSIS OF COUNTY MIGRATION RATES

Source	DF	Deviations from Regression: Sum of Squares	Mean Square	F	P
Substantially Higher	5	3518.6	703.7		
Moderately Higher	72	17226.4	239.3		
No Change	37	10334.6	279.3		
Moderately Lower	59	6651.9	112.7		
Substantially Lower	42	9302.1	221.5		
Within	215	47033.5	218.8		
Regression Coefficient	4	796.5	199.1	.910	.461
Common	219	47830.0	218.4		
Adjusted Means	4	1143.8	286.0	1.309	.266
Total	223	48973.9			

TABLE 19

STATISTICAL ANALYSIS OF RESULTS FOR NONSUPERVISORY EMPLOYEES, STATE SORT

	Question	Number	Chi-Square	Degrees of Freedom	Coefficient of Contingency
6	Industry	496	25.098	8	.0506*
7	Years in Business	496	14.220	8	.0287‡§
8	Number of Employees	496	79.560	16	.0802*
9-10	Per Cent Males	481	35.604	24	.0247‡
11-12	Per Cent Females	473	30.174	24	.0213§
13-14	Per Cent Professional	435	20.117	16	.0231§
15-16	Per Cent Clerical & Sales	435	28.975	16	.0333†
17-18	Per Cent Skilled	435	23.745	16	.0273‡
19-20	Per Cent Semiskilled	425	27.614	16	.0325†
21-22	Per Cent Unskilled	415	9.644	16	.0116
23	Unionized?	494	20.051	8	.0406†
24-26	Per Cent Unionized	375	18.530	8	.05 †
	Recruitment				
27	Applications	491	21.934	8	.045 *§
28	Referrals	490	12.850	8	.117 †
29	Ads	490	50.469	8	.103 *
30	Private Agencies	490	37.397	8	.076 *
31	Public Agencies	490	30.085	8	.061 *
32	Union	490	36.251	32	.0185§
33	College	490	29.456	32	.0150§
34	High School	490	19.247	8	.039 *
35	Other	490	14.570	16	.0149
63	More actively recruit?	493	28.020	16	.0284†§
65	Change in number of job applicants?	491	29.284	16	.0298†
67	Voluntary quits up?	494	37.564	16	.0380*
	Selection Standards				
69	Interview	491	6.074	8	.012
70	Personnel Test	491	7.212	8	.015
71	Work Experience	491	14.132	8	.029 †
72	Education	491	7.716	8	.016
73	Other	491	2.631	8	.005 §
89	Selection Standards Up	493	31.574	16	.0302†
91	Per Cent Applicants Employed	488	30.875	24	.0211§
93	Above per cent up?	480	21.175	16	.0221
95	Education	489	23.369	16	.0239
97	Age	489	16.542	16	.0169
99	Initiative	492	21.839	16	.9222
101	Intelligence	489	32.095	16	.0328*
103	Adaptable	489	18.083	16	.0185
105	Ambitious	491	12.655	16	.0129
107	Overall—3 fold	491	24.146	16	.0246‡
107	Overall—5 fold	491	47.379	32	.0241†

* Significant at 1 per cent level
† Significant at 5 per cent level
‡ Significant at 10 per cent level
§ Invalid chi-square test

TABLE 20

STATISTICAL ANALYSIS OF RESULTS FOR NONSUPERVISORY EMPLOYEES, OVERALL SORT AND 3-FOLD CLASSIFICATION

	Question	Number	Chi-Square	Degrees of Freedom	Coefficient of Contingency
6	Industry	491	0.933	2	.0019
7	Years in Business	491	7.21	2	.0147†
8	Number of Employees	491	3.535	4	.0036
9-10	Per Cent Males	476	11.066	6	.0116‡
11-12	Per Cent Females	464	9.489	6	.0101
13-14	Per Cent Professional	431	2.272	4	.0026
15-16	Per Cent Clerical & Sales	431	2.194	4	.0025
17-18	Per Cent Skilled	430	3.654	4	.0042
19-20	Per Cent Semiskilled	421	1.355	4	.0016
21-22	Per Cent Unskilled	410	5.450	4	.0066
23	Unionized?	489	1.890	2	.0039
24-26	Per Cent Unionized	373	3.832	4	.0051
	Recruitment				
27	Applications	487	2.764	2	.006
28	Referrals	486	0.908	2	.002
29	Ads	486	15.472	2	.032 *
30	Private Agencies	486	0.330	2	.001
31	Public Agencies	486	4.071	2	.008
32	Union	486	11.345	16	.0058§
33	College	486	18.664	16	.0096§
34	High School	486	0.379	2	.001
35	Other	486	4.511	8	.0046§
63	More actively recruit?	489	19.409	4	.0198*
65	Change in number of job applicants?	488	38.082	4	.0390*
67	Voluntary quits up?	490	42.783	4	.0437*
	Selection Standards				
69	Interview	488	4.098	2	.008
70	Personnel Test	488	5.819	2	.012 ‡
71	Work Experience	488	4.886	2	.010 ‡
72	Education	488	8.673	2	.018 †
73	Other	488	2.699	2	.006
89	Selection Standards Up	490	95.562	4	.0975*
91	Per Cent Applicants Employed	485	12.936	6	.0133†
93	Above per cent up?	477	28.598	4	.0300*
95	Education	486	125.899	4	.1295*
97	Age	487	29.454	4	.0302*
99	Initiative	488	175.158	4	.1791*
101	Intelligence	486	248.041	4	.2552*
103	Adaptable	487	231.289	4	.2375*
105	Ambitious	488	171.673	4	.1759*

* Significant at 1 per cent level
† Significant at 5 per cent level
‡ Significant at 10 per cent level
§ Invalid chi-square test

These are extremely high values for coefficients of contingency as calculated in this study.[20]

There were significant differences among the states among the proportion of employers reporting that they were more actively recruiting (item 63), that there was a change in the number of job applicants (item 65), and that the quit rate had changed (item 67). There were also significant differences on these three items when employers were classified by their response to the question on overall quality. Among those employers reporting that they were more actively recruiting, the weighted average evaluation of overall quality was 2.06, for those reporting no change in recruitment activities, it was 1.89, and for those reporting a decrease in recruitment activities, it was 1.79. Because of the continuous and inverse relationship between changes in employer recruitment activity and his evaluation of overall quality change, a rank correlation between employer response on recruitment activity by state and evaluation of overall quality by state was computed. The Spearman rank correlation was −.33, which is not significant. Moreover, the differences between employer's reports on recruitment activity among the states, while significant at the 5 per cent level, was based on an invalid chi-square test. Hence, we conclude that the intensity of employer recruitment activity is not important in explaining differences in overall quality among the states.

Employers reporting an increase in the number of job applicants rated the overall quality of applicants for nonsupervisory positions greater than other employers, 1.82 versus 1.99 for those reporting no change and 2.23 for those reporting a decrease in the number of job applicants. Relating employer response to the question on number of job applicants by state to employer evaluation of overall quality by state yielded a Spearman rank correlation of −.80, which is significant at the 1 per cent level. Hence, it may be true that differences in employer evaluation of overall quality among the states is attributable to labor market conditions, as reflected in the number of job applicants.

Employers reporting that quit rates were up evaluated job applicants lower than other employers, 2.24 versus 1.81 for employers reporting no change in quit rates and 1.80 for those reporting a decrease. Again, relating employer response on the quit rate question by state to employer evaluation of overall quality by state gave a Spearman rank correlation of −.58, which is significant at only the 10 per cent level.

In looking at the various selection devices used, there were significant differences in employer evaluation of overall quality of applicants for nonsupervisory positions in the case of those employers using personnel tests, work experience, and education. Higher evaluations on overall quality were given by those employers who did use personnel tests (1.92 versus 2.08), who did *not* rely upon work experience (1.82 versus 2.03), and who did rely upon education (1.93 versus 2.11). Only in the case of work experience were there significant differences among the states, and then only at the 10 per cent level. Relating employer reliance upon work experience by state to employer evaluation of overall quality by state yielded a Spearman rank correlation of −.38, which is not significant. Hence, it would appear that the particular selection device used is not important in explaining differences in employer evaluation of overall quality by state. There would also appear to be no significant change in selection methods over the course of the last five years. The coefficients of contingency between selection methods used today versus five years ago ranged from .452 to .562, all very high coefficients.

In the questions on changes in selection standards (item 89), the selection ratio (item 91), and changes in the selection ratio (item 93), there were significant differences in employer response by overall quality and by state only in the case of the question on changes in selection standards. As one would expect, those who reported that selection standards were up also evaluated overall quality of job applicants as being higher, 1.77 versus 2.22 for those reporting no change and 2.70 for those employers reporting a lowering of standards. Relating employer response on selection standards by state to employer evaluation of overall quality by state gives a Spearman rank correlation of −.73, which is significant at the 5 per cent level.

From the above discussion, it would appear that there are four factors which might be important in explaining differences among the states in employer evaluation of overall quality changes. (1) Employers

[20] These coefficients were calculated by making distinctions between employers who did not use a particular method and among those who rated the method as first or second or third choice or simply indicated they had used it. The chi-square test was in most cases invalid because the sample size was too small. If categories were combined in such a way as to simply distinguish between employers who did and who did not use a particular method, the coefficients of contingency would have been higher. In the case of advertising, which is the most important, the coefficient of contingency was .433. If categories are combined (use advertising or not), the coefficient was raised to .577. Of the 481 employers who responded to both items 29 and 47, only 57 switched. There were 28 who had used advertising five years ago but not currently and 29 who were currently using it but not five years ago.

who relied upon advertising as a recruitment method evaluated applicants lower. (2) Employers reporting an increase in the number of job applicants rated the applicants higher. (3) Employers reporting an increase in the quit rate rated job applicants lower, though the rank correlation was significant only at the 10 per cent level. (4) Employers reporting an increase in selection standards rated job applicants higher. These four factors may reflect changes in labor market conditions. In a tight labor market, employers might be forced to rely upon advertising more heavily, experience a decrease in the number of job applicants, have a higher quit rate, and be forced to lower their selection standards.

It could also be true that some of these four factors are attributable to actual changes in the labor force itself rather than the "tightness" of the labor market. It is notable that there is no significant difference among the states in the proportion of employers reporting a change in selection ratios. If some states were experiencing a substantial tightening of the labor market, one would anticipate employers in those states reporting changes in the selection ratios. As another test of the hypothesis that the importance of the four factors is attributable to a tight labor market, the weighted average employer response on overall quality by state was correlated with the unemployment rate of the state in 1965.[21] While the state unemployment rate is an inadequate measure of the tightness of relevant labor markets for the employer, it is noteworthy that the rank correlation between unemployment rates and employer evaluation of overall quality is .483. Not only is the correlation not significant statistically, but also the correlation is positive; that is, those states with high unemployment rates in 1965 tended to also be the states where employers gave applicants for nonsupervisory positions higher overall quality ratings.

As expected, all the other measures of quality—education, age, initiative, intelligence, adaptability, and ambition—are related to the overall quality rating (Table 20, items 95 to 105). As indicated by the coefficient of contingency, however, age has less relationship to employer evaluation of overall quality than do the other measures of quality. Of the various measures of quality, there is a significant difference among the states in employer evaluation only in the cases of intelligence and overall quality itself. The differences among the states on the intelligence rating are significant at the 1 per cent level, and the differences on the overall quality rating are significant, when a five-fold classification is used, at the 5 per cent level and significant at the 10 per cent level when a three-fold classification is used.

We conclude, therefore, that there are significant differences in employer evaluation of quality of applicants for nonsupervisory positions, using either intelligence or "overall quality" as a measure of quality. The relationship between these differences in employer evaluation of quality and migration rates will be discussed in a following section.

Managerial Employees. The analysis of response to the questions on managerial employees sorted by state and by overall quality of the applicants for managerial positions is given in Tables 21 and 22. (Since no distinction is made between managerial and nonsupervisory personnel in items 6 through 26 of the questionnaire, the relevant information on the state sort would be the same as in Table 19 for those items.) None of the distinguishing characteristics of the firm or the type of work force employed by the firm (items 6 through 26 in Table 22) provide valid distinctions among firms classified by employer response to the question on overall quality of applicants for managerial positions. The same is true for the recruitment and selection methods of the firm (items 36 to 44 and 74 to 78 in Table 22). As in the case of nonsupervisory employees, those employers reporting a decrease in the number of job applicants for managerial positions rated applicants lower than did other employers. Also, those employers reporting that the quit rate for managerial employees was up gave applicants for those positions a lower rating, though in the last case the differences among the states were significant only at the 10 per cent level. While there were significant differences in employer evaluation of overall quality of applicants for managerial positions among those reporting changes in selection standards and in selection ratios, there were no significant differences among the states on these two items.

Of the various measures of quality of applicants for managerial positions, there are significant differences in employer response by state only on the questions concerning education and intelligence. However, these differences are significant at only the 10 per cent level and are based on an invalid chi-square test. In short, there seems to be no persuasive evidence of differences among the states in employer evaluation of the quality of managerial employees. Given the usually broader geographic labor

[21] *Manpower Report of the President* (Washington, GPO, 1966), p. 208.

markets for managerial employees, this is not very surprising. In the case of managerial employees, employers are less likely to restrict their search for applicants to persons in the immediate geographic area. Hence, local or even state labor markets (assuming there are state labor markets) may not be relevant for applicants for managerial positions.

Quality and Migration. The analysis of the results for nonsupervisory employees pointed toward the conclusion that there are significant differences among the states in employer evaluation of changes in the quality of applicants for nonsupervisory positions, at least using intelligence and "overall quality" as measures of qualitative change. The analysis of the results for managerial employees indicated that there are probably no significant differences among the states in employer evaluation of qualitative changes in applicants for managerial positions. In neither case, however, was employer evaluation of qualitative change in the state specifically related to any measure of migration rates.

TABLE 21

STATISTICAL ANALYSIS OF RESULTS FOR MANAGERIAL EMPLOYEES, STATE SORT

	Question	Number	Chi-Square	Degrees of Freedom	Coefficient of Contingency
	Recruitment				
36	Applications	478	4.015	8	.008
37	Referrals	478	11.162	8	.023
38	Ads	478	28.395	8	.059 *
39	Private Agencies	478	39.271	8	.082 *
40	Public Agencies	478	10.383	8	.022
41	Union	478	35.091	24	.0245‡§
42	College	478	15.064	8	.032 ‡
43	High School	478	29.638	32	.0155§
44	Other	478	31.781	8	.066 *
64	More actively recruit?	468	21.536	16	.0230§
66	Change in number of job applicants?	464	41.790	16	.0450*
68	Voluntary quits up?	465	25.393	16	.0273‡
	Selection Standards				
74	Interview	479	11.687	8	.024
75	Personnel Tests	479	5.790	8	.012
76	Work Experience	479	36.352	32	.0190§
77	Education	478	9.982	8	.021
78	Other	479	29.796	32	.0156§
90	Selection Standards Up	476	20.820	16	.0219§
92	Per Cent Applicants Employed	447	15.745	24	.0117§
94	Above per cent up?	440	19.507	16	.0222
96	Education	459	25.102	16	.0273‡§
98	Age	456	18.252	16	.0200
100	Initiative	458	17.017	16	.0186
102	Intelligence	455	24.374	16	.0268‡§
104	Adaptable	460	14.710	16	.0160§
106	Ambitious	459	11.989	16	.0130§
108	Overall—3 fold	459	19.635	16	.0214§
	Overall—5 fold	459	29.972	32	.0163§

* Significant at 1 per cent level
‡ Significant at 10 per cent level
§ Invalid chi-square test

TABLE 22

STATISTICAL ANALYSIS OF RESULTS FOR MANAGERIAL EMPLOYEES, OVERALL SORT AND 3-FOLD CLASSIFICATION

	Question	Number	Chi-Square	Degrees of Freedom	Coefficient of Contingency
6	Industry	459	1.326	2	.0027
7	Years in Business	459	2.892	2	.0063
8	Number of Employees	459	7.711	4	.0084
9-10	Per Cent Males	444	4.146	6	.0047
11-12	Per Cent Females	437	4.777	6	.0055
13-14	Per Cent Professional	408	2.245	4	.0028
15-16	Per Cent Clerical & Sales	408	3.172	4	.0039
17-18	Per Cent Skilled	407	0.728	4	.0009
19-20	Per Cent Semiskilled	401	3.406	4	.0042
21-22	Per Cent Unskilled	388	1.479	4	.0019
23	Unionized?	457	3.245	2	.0071
24-26	Per Cent Unionized	350	7.338	4	.0105
	Recruitment				
36	Applications	454	0.621	2	.001
37	Referrals	454	0.874	2	.002
38	Ads	454	1.613	2	.004
39	Private Agencies	454	1.304	2	.003
40	Public Agencies	454	3.239	2	.007
41	Union	454	12.516	12	.0092§
42	College	454	0.857	2	.002
43	High School	454	20.449	16	.0113§
44	Other	454	1.191	2	.003
64	More actively recruit?	451	15.101	4	.0167*
66	Change in number of job applicants?	452	29.613	4	.0328*
67	Voluntary quits up?	451	25.121	4	.0279*
	Selection Standards				
74	Interview	458	1.552	2	.003
75	Personnel Tests	458	0.678	2	.001
76	Work Experience	458	19.079	16	.0104§
77	Education	458	1.877	2	.004
78	Other	458	10.377	16	.0053§
90	Selection Standards Up	457	80.036	4	.0876*
92	Per Cent Applicants Employed	440	6.214	6	.0071§
94	Above per cent up?	434	15.595	4	.0180*
96	Education	453	100.203	4	.1216*§
98	Age	452	48.262	4	.0534*
100	Initiative	453	181.723	4	.2006*
102	Intelligence	452	256.842	4	.2841*
104	Adaptable	457	275.288	4	.3021*
106	Ambitious	456	240.848	4	.2641*

* Significant at 1 per cent level
§ Invalid chi-square test

TABLE 23

QUALITATIVE MEASURES AND MIGRATION RATES FOR SELECTED STATES

	Illinois	Indiana	Kentucky	Maryland	New Jersey	Ohio	Pennsylvania	Virginia	West Virginia
Nonsupervisory									
Adaptability	2.04	2.10	1.71	2.15	2.07	1.89	1.94	1.79	1.85
Intelligence	1.95	1.84	1.47	1.92	1.90	1.76	1.54	1.60	1.51
Initiative	2.69	2.62	2.35	2.61	2.56	2.42	1.92	2.27	2.35
Ambition	2.41	2.08	2.02	2.22	2.21	2.19	2.10	2.08	2.06
Age	2.26	2.35	2.32	2.30	2.05	2.38	2.13	2.19	2.27
Education	1.61	1.52	1.26	1.28	1.40	1.62	1.28	1.44	1.31
Overall—3 classes	2.21	2.26	1.74	2.00	2.10	2.04	1.88	1.96	1.87
Overall—5 classes	3.38	3.29	2.78	3.11	3.24	3.21	2.96	2.98	2.86
Managerial									
Adaptability	1.48	1.46	1.51	1.65	1.45	1.40	1.50	1.33	1.38
Intelligence	1.43	1.36	1.38	1.47	1.33	1.44	1.38	1.28	1.26
Initiative	1.77	1.73	1.91	1.84	1.47	1.59	1.57	1.62	1.64
Ambition	1.35	1.31	1.60	1.48	1.45	1.36	1.45	1.44	1.32
Age	2.22	2.20	2.11	2.02	2.15	2.06	2.14	1.96	2.05
Education	1.22	1.29	1.11	1.20	1.18	1.09	1.14	1.16	1.17
Overall	1.26	1.53	1.44	1.45	1.42	1.36	1.42	1.35	1.26
Migration Rates									
1950-1960	1.4	1.6	−13.2	13.7	11.9	5.1	− 4.5	1.0	−22.3
1960-1965	− 1.23	− 2.04	− 1.55	2.97	4.14	− 1.34	− 2.29	2.82	− 6.08
Measure from Section 1									
NQC25	− .2215	− .1709	.0183	.0440	− .0688	− .1953	− .0766	.1377	.0286
NQC35	− .1948	− .1366	− .0022	.0916	− .0919	− .1810	− .0726	.1436	.0054

The qualitative measures for nonsupervisory (except overall—5 classes) and for managerial employees are on a 3-fold scale where 1=increase, 2=no change, and 3=decrease. The overall—5 classes scale for nonsupervisory employees is 1=substantial increase, 3= no change, and 5=substantial decrease.

Sources:
Qualitative measures for nonsupervisory and managerial employees: computed from questionaires.
Migration rates: 1950-60, see Table 6; 1960-63, *Statistical Abstract, 1965, op. cit.*, pp. 10, 12.
NQC25 and NQC35: see Table 6.

Table 23 gives the weighted average employer evaluation of qualitative change by state for nonsupervisory and managerial applicants. Since in these weighted averages, an increase in quality measure is equal to one and a decrease is equal to three (excepting the case of overall quality measured on a five point scale), a low score is, except in the case of age, "good" and a high score (such as 2.6) is "bad." Table 23 also gives the estimates of migration rates from the Bureau of the Census for the decade of the 1950's and the estimated rate of net migration for the period 1960 to 1963.[22] The table also gives the measures of net qualitative change, using education as the measure of quality, derived in Part One of this study.

The various relevant measures of qualitative change and migration rates for both nonsupervisory and managerial applicants were correlated with one another using both the Pearsonian product-moment correlation and Spearman's rank correlation coefficients. These correlation coefficients are given in Tables 24 and 25. To make the correlation coefficients meaningful, signs for the Pearsonian product-moment correlations were reversed in the cases of any correlations between migration rates or the NQC25 or the NQC35 figures and the qualitative measures derived from the questionnaire. Doing this means that the correlations between the migration rates or the NQC figures and the measures from the questionnaire run in a proper fashion; that is, a positive correlation between a migration rate and one of the measures of qualitative change would mean that a state which is gaining population through migration is also gaining in the quality of its work force, and a negative sign before the correlation coefficient would mean just the opposite. Similarly, in ranking the migration rates and NQC figures in the Spearman rank correlation, these data were ranked in reverse order from that given in Table 23, so that the signs of the correlation coefficients would be meaningful.

It is notable that the measures of qualitative change derived from the questionnaire are, except in the case of age (which is itself on an inverted scale), all inversely related to the migration rates. Not all of the correlations are statistically significant, nor are all of the differences in employer rating of qualitative change among the states statistically significant, as noted previously. The two measures of qualitative change in applicants for nonsupervisory employees which do differ significantly among the states—intelligence and overall quality—are both inversely related to migration rates. In the case of intelligence, the correlation between employer evaluation and the migration rate of the 1950's is significant at the 1 per cent level; the correlation with the migration rate of 1960-1963 is not significant, except that the Spearman rank correlation is significant at the 10 per cent level. The correlation between overall qualitative change and the migration rate is inverse and significant at the 5 per cent level; the correlation with the net migration rate of 1960-1963 is, though inverse, not significant.

It is also notable that the correlations between the measures of qualitative change derived from the questionnaire and NQC25 and NQC35 figures from Part One are positive. However, in comparing the measures from that part of the study and the questionnaire, the correlations are significant only when using education changes reported by the employer (significant at the 10 per cent level in three cases and at the 5 per cent level in one case) or overall qualitative change (significant at the 10 per cent level in six cases and at the 5 per cent level in the case of two correlation coefficients).

As indicated in the analysis (page 38) and confirmed by Table 25, there is no significant relationship between the measures of qualitative change of applicants for managerial positions derived from the questionnaire and the migration rate of the 1950's or the period 1960-1963. It is at least interesting, however, that the correlations between the measures of qualitative change derived from the questionnaire and the migration rate are inverse, excepting the case of initiative of applicants for managerial positions and the relationship between changes in the age of applicants for managerial positions and the migration rate for 1960-1963.

At first glance, these correlations would point toward the conclusion that if there is any relationship between employers' evaluation of qualitative changes in the labor force and the migration rate of the state, the relationship is inverse.

CONCLUSIONS

1. Any conclusions based on this survey of employer evaluation of qualitative changes in the labor force must take into consideration biases in the sample. There were too many large employers and too many employers from West Virginia and Pennsylvania represented in the questionnaires returned.

[22] Estimates of net migration for the period through 1964 or 1965 were not available at the time these computations were made.

2. The particular group of states used in this part of the study may have represented an adverse selection. If a different group of states had been used, there might have been a positive correlation between migration rates and employer evaluation of qualitative changes.

3. All the employers were drawn from manufacturing, and manufacturing is not necessarily typical of the experience of all employers in the nine states.

4. Despite the fact that there was no significant relationship between unemployment rates and employer evaluation of overall quality changes, the results of this survey might nevertheless reflect local labor market conditions. During the time these questionnaires were sent out and returned, for example, the Great Lakes area was experiencing a very tight labor market as opposed to the relatively milder pick-up in economic activity in Kentucky and West Virginia.

5. Not all of the measures of qualitative change indicated significant differences among the states. A larger sample might have indicated greater, or smaller, differences or differences in another direction.

In view of these considerations, it might be hazardous to conclude that there is an inverse relationship between migration rates and changes in the quality of the labor force as viewed by the employer. A more conservative and defensible conclusion would be that this section of the study does *not* support the common contention that areas which are gaining population through migration are, as a consequence, also gaining a more qualified labor force.

TABLE 24

CORRELATION AMONG QUALITY MEASURES AND MIGRATION RATES NONSUPERVISORY EMPLOYEES

	Adaptable		Intelligent[a]		Initiative		Ambitious		Age		Education	
	r	r_s	r	r_s	r	r_s	r	r_s	r	r_s	r	r_s
Intelligent[a]	.86*	.80*	----	----	----	----	----	----	----	----	----	----
Initiative	.57	.69†	.79†	.81*	----	----	----	----	----	----	----	----
Ambitious	.58	.69†	.57	.90*	.57	.58	----	----	----	----	----	----
Age	−.11	−.03	.00	−.10	.33	.30	−.08	−.24	----	----	----	----
Education	.22	.17	.54	.50	.47	.47	.55	.39	.30	.24	----	----
Migration, 1950-60	−.69†	−.77†	−.81*	−.80*	−.44	−.59	−.55	−.73†	.18	−.08	−.34	−.33
Migration, 1960-63	−.33	−.35	−.50	−.65	−.27	−.35	−.29	−.61	.43	.28	−.02	−.15
NQC25	.42	.25	.51	.35	.34	.48	.54	.39	.25	.23	.70†	.59
NQC35	.30	.28	.39	.42	.27	.56	.47	.42	.16	.22	.65	.63
Overall—3 classes[c]	.75	.72†	.85*	.83*	.68†	.80*	.61	.63	.06	.08	.75†	.74†
Overall—5 classes[b]	.75	.68†	.91*	.88*	.67†	.81*	.77†	.72†	.03	.02	.78†	.75†

	Migration 1950-60		Migration 1960-63		NQC25		NQC35		Overall—3 classes[c]	
	r	r_s	r	r_s	r	r_s	r	r_s	r	r_s
Intelligent[a]	----	----	----	----	----	----	----	----	----	----
Initiative	----	----	----	----	----	----	----	----	----	----
Ambitious	----	----	----	----	----	----	----	----	----	----
Age	----	----	----	----	----	----	----	----	----	----
Education	----	----	----	----	----	----	----	----	----	----
Migration, 1950-60	----	----	----	----	----	----	----	----	----	----
Migration, 1960-63	.83*	.75*	----	----	----	----	----	----	----	----
NQC25	−.22	−.15	.26	.18	----	----	----	----	----	----
NQC35	−.11	−.23	.32	.07	.98*	.98	----	----	----	----
Overall—3 classes[c]	−.59	−.68†	−.22	−.38	.65	.58	.55	.65	----	----
Overall—5 classes[b]	−.69†	−.67†	−.30	−.43	.73†	.62	.64	.68†	.96*	.98*

r = Pearsonian correlation coefficient

r_s = Spearman's rank correlation coefficient

* Significant at 1 per cent level

† Significant at 5 per cent level

Chi-square test of quality measures indicates real difference among states at:

[a] 1 per cent level

[b] 5 per cent level

[c] 10 per cent level

TABLE 25

CORRELATION AMONG QUALITY MEASURES AND MIGRATION RATES MANAGERIAL EMPLOYEES

	Adaptable		Intelligent[d]		Initiative		Ambitious		Age	
	r	r_s	r	r_s	r	r_s	r	r_s	r	r_s
Intelligent[d]	.72†	.68†	----	----	----	----	----	----	----	----
Initiative	.56	.53	.42	.35	----	----	----	----	----	----
Ambitious	.43	.58	.17	.35	.36	.15	----	----	----	----
Age	.21	.27	.25	.11	.05	—.05	—.24	—.29	----	----
Education[d]	.19	.15	—.04	—.05	.15	.25	—.49	—.42	.46	.43
Migration, 1950-60	—.36	—.20	—.54	—.52	.18	.13	—.04	—.12	—.04	—.08
Migration, 1960-63	—.23	—.07	—.20	—.26	.14	.07	—.42	—.40	.24	.10
NQC25	.05	.12	.49	.39	—.11	—.13	—.51	—.40	.78†	.82*
NQC35	—.05	.07	.36	.35	—.19	—.15	—.47	—.40	.80*	.83*
Overall—3 classes	.45	.60	.24	.32	.17	.25	.33	—.36	.17	.12

	Education[d]		Migration 1950-60		Migration 1960-63		NQC25		NQC35	
	r	r_s	r	r_s	r	r_s	r	r_s	r	r_s
Intelligent[d]	----	----	----	----	----	----	----	----	----	----
Initiative	----	----	----	----	----	----	----	----	----	----
Ambitious	----	----	----	----	----	----	----	----	----	----
Age	----	----	----	----	----	----	----	----	----	----
Education[d]	----	----	----	----	----	----	----	----	----	----
Migration, 1950-60	—.24	—.35	----	----	----	----	----	----	----	----
Migration, 1960-63	—.05	—.20	.83*	.75†	----	----	----	----	----	----
NQC25	.23	.12	—.22	—.15	.26	.18	----	----	----	----
NQC35	.13	.17	—.11	—.23	.32	.07	.98*	.98*	----	----
Overall—3 classes	.27	.19	—.38	—.40	—.32	—.09	.01	—.07	—.06	—.07

r = Pearsonian correlation coefficient

r_s = Spearman's rank correlation coefficient

* Significant at 1 per cent level

† Significant at 5 per cent level

Chi-square test of quality measures indicates real difference among states at:

[d] 10 per cent level, but chi-square test invalid

PART III

SUMMARY AND CONCLUSIONS

1. The purpose of this study was to determine whether or not there is any relationship between migration rates and changes in the average quality of the labor force in an area. It could, of course, be assumed that an area which lost population suffered a loss in quality in a gross sense. Losing persons through migration means that whatever attributes, however meager, which those individuals possessed were lost to the area. Whether or not even a gross loss means a reduction in the collective welfare of those remaining in an area is debatable.[1] A gross loss, however, does not mean that the average quality of the labor force is adversely affected by out-migration. Previous studies of the effect of migration upon the average quality of the labor force have come to differing conclusions. Part of the difficulty in conclusively answering the question concerning the effect of migration on the average quality of the labor force is inherent in the nebulous nature of quality itself. Previous studies have used educational attainment as a relatively objective measure of quality, but alternatively one might associate with quality such ill-definable words as initative and adaptability.

2. This study utilized two approaches to attempt to evaluate the effect of migration on the average quality of the labor force. The first approach (in Part One) was to analyze census data on educational attainment. The data were adjusted for age, sex, and the gross population change attributable to migration to determine whether, after these adjustments, there were any shifts in the average educational attainment attributable to migration. The second approach (in Part Two) was a survey of employers in nine states to gain their evaluation of changes in the quality of job applicants over the course of the past five years.

3. The analysis of the census data indicated that there is no significant simple relationship between changes in the average quality of the labor force and migration rates. After adjusting the data through multiple correlation analysis for other variables it was found that there was a significant and positive relationship between migration rates and the average quality of the labor force. After adjustments for other relevant variables, however, migration rates explained only 45 per cent of the total variation in changes in the average quality of the labor force among the states.[2]

Relating employer evaluations of changes in the quality of the labor force to the migration rates of the counties in which the employers were located indicated no significant differences in county migration rates categorized by employer evaluation of changes in overall quality. The sample had not been appropriately designed, however, to adequately test this relationship.

Relating employer evaluation of several aspects of quality to migration rates of the nine states indicated that there were significant differences among the states in their evaluation of the intelligence and overall quality of applicants for nonsupervisory positions, and these differences among the states were inversely related to the migration rates of the states. There is the possibility that the inverse relationship between employer evaluation of quality change and migration rates might represent labor market conditions in the nine states—rather than changes in the labor force—or an adverse selection of states.[3] The analysis of the employers' evaluation of the quality of applicants

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[1] See the interesting analysis of Herbert B. Grubel and Anthony D. Scott, "The International Flow of Human Capital," *American Economic Review* (May, 1966), pp. 268-274. See also the discussion of the Grubel-Scott paper by Burton A. Weisbrod, *ibid.*, pp. 277-280, and the remarks by Harry G. Johnson, *ibid.*, pp. 282-283.

[2] After Part One of the manuscript had been completed, the analysis of migration rates and NQC35, given in the top half of Table 10, was rerun, retaining only those variables significant in the original analysis—net migration rate of nonwhites, the rate of unemployment in 1960, and the computed migration rate for 1950-60. This later analysis indicated that, for NQC35, the rate of unemployment in 1960 was not significant. An additional analysis, retaining only the migration rate of nonwhites and the computed migration rate, proved both of these two independent variables significant beyond the 0.1 per cent level. The coefficient of multiple determination in this last analysis was .7324, and the partial correlation between migration rates and NQC35, adjusted for the migration of nonwhites, was .6719.

A similar reanalysis of NQC25—the original analysis is given in the top half of Table 12—indicates that the same four variables significant in Table 12 (the migration of nonwhites, unemployment rate in 1960, median family income in 1959, and the migration rate for those over 24) remained significant in the reanalysis. The R^2 was .7505, and the partial correlation between migration rates and NQC25 in the reanalysis was .6729.

[3] After the manuscript of Part Two had been completed, the relationship between migration rates and employer evaluation of quality change was reanalyzed by bringing in the migration rates of nonwhites. Specifically, employer evaluation of the changes in intelligence and overall quality of applicants for nonsupervisory employees (the only two measures where the test indicated significant differences among the states) were fitted to a multiple regression equation with both the migration rate of all persons and the migration rate of nonwhites as independent variables. The simple correlation between the migration rate of nonwhites and changes in intelligence, as evaluated by the employer, was slightly lower than when the overall migration rate was used. It was slightly higher in the case of overall quality.

What is important is that the R^2 was slightly less significant than the simple correlation between overall migration rates and quality in each case. (The R^2 was, of course, higher than the simple correlation squared, but this means little since adding almost any variable to a multiple regression equation is apt to increase R^2.) Also important is the fact that the partial correlations between quality change and overall migration rates were lower than the simple correlations. Further, the T-test of the regression coefficients indicated that in no case was the migration rate of nonwhites a significant independent variable. In summary, explicitly taking the migration rate of nonwhites into consideration adds nothing towards an explanation of the inverse relationship between overall migration rates and quality in the nine states. The use of parametric tests with the qualitative measures developed in Part Two may, of course, be questioned.

for managerial positions, on the other hand, indicated that there were no significant differences among the states, nor were the differences which did exist significantly relate to migration rates.

4. This study, as a consequence, has a mixed grab bag of results. The analysis of the census data indicates no simple relationship but a more complex and direct (as opposed to inverse) relationship between migration rates and quality change. The analysis of county migration rates provided no discernible relationship between employer evaluation of quality change and migration rates. The analysis of state migration rates indicated an inverse relationship between migration rates and employer evaluation of changes in certain aspects of quality of applicants for nonsupervisory positions, but no relationship between migration rates and employer evaluation of changes in the quality of applicants for managerial positions.

Certainly it would be safe to conclude, however, that it is *not* true that those areas which gain population through migration are necessarily gaining a better qualified labor force as a consequence. It would appear that the migration rate is only one of a host of factors contributing to changes in the quality of the labor force of an area. The author is inclined to conclude that the results of the analysis of the census data in Part One are the more reliable, and if changes in quality could be adjusted for other important variables, there would be a positive correlation between migration and quality change, though variations in migration rates would explain only a small proportion of changes in the average quality of the labor force.

APPENDIX

PART A

QUESTIONNAIRE USED IN SURVEY OF EMPLOYERS, SHOWING BREAKDOWN OF RESPONSES BY CATEGORIES

NR = no response
N = number
T = total
CN = choice level not indicated

I. General Information

			Ill.	Ind.	Ky.	Md.	N.J.	Ohio	Pa.	Va.	W.Va.
	1-2.	State	47	59	40	54	41	56	67	48	84

3-5. County

6. Principal industrial activity:
Durable goods manufacturing (type) 375
Nondurable goods manufacturing (type) 121
Non-manufacturing industry (type)

7. Total number of years your plant has been in existence. (Check one)
___ less than 5 years
41 5-10 years
455 more than 10 years

8. Total number of employees (average for 1965) including both managerial and nonsupervisory employees. (Check one)
117 less than 100
110 100-249
259 250-499
10 500-9,999
___ 10,000 or more

Type of work force

Sex:

N=481 9-10. % male. 72.48% average in firms excluding 0% responses
N=478 11-12. % female. 28.04% average in firms excluding 0% responses

Occupation type:

N=435	13-14.	% professional and managerial	10.76% average in firms excluding 0% response
N=435	15-16.	% clerical and sales	12.95% "
N=435	17-18.	% skilled	21.80% "
N=425	19-20.	% semiskilled	33.20% "
N=415	21-22.	% unskilled	25.31% "

23. Does a union represent any of your nonsupervisory employees?
381 yes
113 no
2 NR

24-26. If yes, what per cent of your nonsupervisory employees are represented?
82.28% average in firms
N=375

II. Information Regarding All Employees

THE REMAINING QUESTIONS ARE RELEVANT TO BOTH NONSUPERVISORY AND MANAGERIAL PERSONNEL. PLEASE NOTE THAT SPACES ARE PROVIDED UNDER THE HEADINGS NONSUPERVISORY AND MANAGERIAL (INCLUDING FOREMAN AND HIGHER LEVELS) FOR EACH OF THE TWO GROUPS.

Which of the following recruitment methods are currently the most commonly used procedures in your firm? Number (1 to 3) the three most important methods for each category of employees.

Nonsupervisory						Managerial					
T	1	2	3	CN			T	1	2	3	CN
456	287	72	41	56	27. applications at company employment office	36.	192	44	49	74	25
359	29	178	107	45	28. referrals from current employees	37.	132	17	47	53	15
218	41	61	80	36	29. advertisement	38.	314	107	99	68	40
64	8	17	20	19	30. private employment agencies	39.	302	111	99	52	40
232	55	64	80	33	31. public employment agencies	40.	94	16	31	29	18
25	5	3	10	7	32. union referrals	41.	5	1	2	0	2
24	1	5	10	8	33. college recruitment	42.	220	76	44	70	30
75	0	14	38	23	34. vocational and high school recruitment	43.	25	1	10	7	7
9	5	0	4	0	35. other (specify)	44.	65	47	6	8	4

Which of the following recruitment methods were the most commonly used procedures 5 years ago? Number (1 to 3) the three most important methods for each category of employees.

Nonsupervisory						Managerial					
T	1	2	3	CN		T	1	2	3	CN	
450	297	72	38	43	45. applications at company employment office	54. 219	65	66	70	18	
362	48	192	82	40	46. referrals from current employees	55. 138	26	45	55	12	
214	34	47	111	22	47. advertisement	56. 294	117	93	62	22	
44	4	16	17	7	48. private employment agencies	57. 259	87	89	63	20	
221	43	67	89	22	49. public employment agencies	58. 91	18	31	34	8	
26	6	5	11	5	50. union referrals	59. 7	1	2	2	2	
14	1	5	6	2	51. college recruitment	60. 178	61	40	57	20	
51	0	10	34	7	52. vocational and high school recruitment	61. 22	2	9	6	5	
11	5	0	5	1	53. other (specify)	62. 65	50	6	6	3	

63-64. Has your firm been more actively or less actively recruiting employees within the last 5 years?

Nonsupervisory		Managerial
339	more actively	330
47	less actively	38
107	no change	100
3NR		28NR

65-66. Has there been an increase or decrease in the number of job applicants over the last 5 years?

Nonsupervisory		Managerial
79	substantial increase	52
149	moderate increase	116
112	moderate decrease	118
84	substantial decrease	70
67	no change	108
5NR		32NR

67-68. Has the number of voluntary quits or cessations of employment in your firm increased or decreased within the last 5 years?

Nonsupervisory		Managerial
58	substantially increased	20
163	moderately increased	112
58	moderately decreased	45
34	substantially decreased	28
181	no change	260
2NR		31NR

Which of the following criteria are most often used by your firm in the selection of managerial and nonsupervisory employees? Number (1 to 3) the three most important criteria for each category of employees.

Nonsupervisory						Managerial					
T	1	2	3	CN		T	1	2	3	CN	
421	158	130	96	37	69. interview performance	74. 413	114	110	155	34	
240	43	74	104	19	70. personnel test scores	75. 145	11	33	82	19	
423	201	121	62	39	71. work experience	76. 424	187	131	73	33	
308	42	103	134	29	72. education	77. 404	122	144	101	37	
38	7	6	21	4	73. other (specify)	78. 21	10	2	6	3	

Which of the following criteria were most often used by your firm 5 years ago? Number (1 to 3) the three most important criteria for each category.

Nonsupervisory						Managerial					
T	1	2	3	CN		T	1	2	3	CN	
437	173	145	84	35	79. interview performance	84. 416	108	124	153	31	
171	36	60	64	11	80. personnel test scores	85. 106	9	28	56	13	
418	204	135	47	32	81. work experience	86. 418	199	126	60	33	
366	26	76	180	24	82. education	87. 391	107	131	122	32	
32	7	5	18	2	83. other (specify)	88. 21	9	2	7	3	

89-90. Have the selection standards used by your firm today been raised or lowered as compared to those used 5 years ago?

Nonsupervisory		Managerial
92	substantially raised	165
224	moderately raised	196
61	moderately lowered	16
13	substantially lowered	1
103	no change	98
3NR		20NR

91-92. Of those persons who apply or are recruited for employment, approximately what percent are employed?

Nonsupervisory		Managerial
298	less than 25%	329
103	25-50%	53
57	50-75%	29
30	More than 75%	36
8NR		49NR

93-94. How does this figure compare with that of 5 years ago.

Nonsupervisory		Managerial
34	substantial increase	16
71	moderate increase	62
77	moderate decrease	47
23	substantial decrease	22
275	no change	293
16NR		56NR

95-96. Is the average EDUCATION of persons applying and/or recruited for employment higher or lower than that of persons applying 5 years ago?

Nonsupervisory		Managerial
56	substantially higher	145
280	moderately higher	242
42	moderately lower	9
29	substantially lower	0
82	no change	63
7NR		37NR

97-98. Has the average AGE of applicants for employment increased or decreased over the last 5 years?

Nonsupervisory		Managerial
6	substantially increased	8
94	moderately increased	102
108	moderately decreased	128
46	substantially decreased	26
164	no change	192
7NR		40NR

99-100. Does the average degree of INITIATIVE of applicants, this is, the willingness to undertake action and responsibility with regard to work duties, appear to have increased or decreased over the last 5 years?

Nonsupervisory		Managerial
8	substantially increased	51
70	moderately increased	173
188	moderately decreased	71
109	substantially decreased	16
117	no change	147
4NR		38NR

101-102. On the average, do applicants today appear to be more INTELLIGENT (brighter) than those of 5 years ago?

Nonsupervisory		Managerial
14	substantially more intelligent	90
227	moderately more intelligent	214
62	moderately less intelligent	14
37	substantially less intelligent	1
149	no change	136
7NR		41NR

103-104. Are applicants for employment today generally more ADAPTABLE, that is, can they more readily adjust to new situations and environments than applicants of 5 years ago?

Nonsupervisory		Managerial
19	substantially more adaptable	60
146	moderately more adaptable	221
106	moderately less adaptable	29
35	substantially less adaptable	5
183	no change	145
7NR		36NR

105-106. Do applicants for employment today appear to be generally more or less AMBITIOUS (exhibits a stronger desire for advancement) than those of 5 years ago?

Nonsupervisory		Managerial
24	substantially more ambitious	111
126	moderately more ambitious	206
154	moderately less ambitious	40
71	substantially less ambitious	5
116	no change	97
5NR		37NR

107-108. In general, do you think that the OVERALL QUALITY of applicants for employment today is higher or lower than that of applicants of 5 years ago?

Nonsupervisory		Managerial
16	substantially higher	62
186	moderately higher	261
133	moderately lower	37
69	substantially lower	5
87	no change	94
5NR		37NR

Comments: (attach additional sheet if necessary)

PART B

MATHEMATICAL APPENDIX

For Notes 1 through 6, the following set of symbols is used:

B_{ijkm} = actual number in the ijkm group

C_{ijkm} = actual number in the ijkm group in the entire United States

L_{ik2} = labor force participation rate in the ik state group in 1960

i = age category (1=14-24, 2=25-24, . . . 9=75 and over). See Table 2 in text for 1960 for the other classifications.

j = school group (1 to 14). See Table 1 in text, school classification for 1950.

k = sex (1=male, 2=female)

m = year (1=1950, 2=1960)

Note 1. Gross Qualitative Change (GQC) for Those 25 and Over in 1960.

The actual number of persons in the ijk2 group in the state is B_{ijk2}. The predicted number (P) equals the actual number in the preceding age group in 1950 times the census survival ratio.

$$(1.1)\quad P_{ijk2} = \frac{B_{(i-1)jk1}\, C_{ijk2}}{C_{(i-1)jk1}}$$

The difference (D) in that group then is:

$$(1.2)\quad D_{ijk2} = B_{ijk2} - P_{ijk2}$$

The difference in a school group (S) after adding the figures for the various age categories weighted by labor force participation rates is:

$$(1.3)\quad S_{jk2} = \sum_{i=2}^{9} L_{ik2}\, D_{ijk2}$$

The weighted difference (W) for a particular sex, after adding the figures for each school category weighted by school category is:

$$(1.4)\quad W_{k2} = \sum_{j=1}^{14} (j)\ (S_{jk2})$$

The gross qualitative change (GQC) for the state as a per cent of actual population in the relevant groups in 1960 weighted by labor force participation rates is:

$$(1.5)\quad GQC = \frac{\sum_{k=1}^{2} W_{k2}}{\sum_{k=1}^{2} \sum_{i=2}^{9} (L_{ik2}) \left(\sum_{j=1}^{14} B_{ijk2} \right)}$$

Note 2. Net Qualitative Change (NQC25) for Those 25 and Over in 1960.

The actual percentage (A) of persons in the ijk2 group in the state is:

$$(2.1)\quad A_{ijk2} = \frac{B_{ijk2}}{\sum_{j=1}^{14} B_{ijk2}}$$

The predicted percentage (P′) is:

$$(2.2)\quad P'_{ijk2} = \frac{\dfrac{B_{(i-1)jk1}\, C_{ijk2}}{C_{(i-1)jk1}}}{\sum_{j=1}^{14} \dfrac{B_{(i-1)jk1}\, C_{ijk2}}{C_{(i-1)jk1}}}$$

The percentage difference (D′) in that group is:

$$(2.3)\quad D'_{ijk2} = A_{ijk2} - P'_{ijk2}$$

The average difference in a school group (S′), eliminating age category, is:

$$(2.4)\quad S'_{jk2} = \frac{\sum_{i=2}^{9} (L_{ik2} \sum_{j=1}^{14} B_{ijk2})\ (D'_{ijk2})}{\sum_{i=2}^{9} (L_{ik2} \sum_{j=1}^{14} B_{ijk2})}$$

The weighted average difference (W′) for a particular sex, eliminating school category, is:

$$(2.5)\quad W'_{k2} = \sum_{j=1}^{14} (j)\ (S'_{jk2})$$

The net qualitative change (NQC) for the state for those 25 or older in 1960, combining the sexes, is:

$$(2.6)\quad NQC = \frac{\sum_{k=1}^{2} \left[\sum_{i=2}^{9} (L_{ik2} \sum_{j=1}^{14} B_{ijk2}) \right] (W'_{k2})}{\sum_{k=1}^{2} \sum_{i=2}^{9} (L_{ik2} \sum_{j=1}^{14} B_{ijk2})}$$

Note 3. Net Qualitative Change (NQC35) for Those 35 and Over in 1960.

The calculations are precisely the same as those given in Note 2, except when the term $\sum_{i=2}^{9}$ appears, substitute the term $\sum_{i=3}^{9}$.

Note 4. Projected Mean Education of Those 25 and Over in 1960.

The calculations are the same as those given in Note 2 with the following exceptions:

A. Assume A_{ijk2} (equation 2.1) is 1.0 when j = 14, and 0.0 when j ranges from 1 through 13.

B. Subtract the resulting NQC (as in equation 2.6) from 14.0.

Note 5. Net Migration Rate of Persons 25 and Over in 1960.

The calculations are the same as in Note 1, except substitute equation 5.4 below for equation 1.4.

$$(5.4)\quad W_{k2} = \sum_{j=1}^{14} S_{jk2}$$

Note 6. Net Migration Rate of Persons 35 and Over in 1960.

The calculations are the same as in Note 1, except (a) substitute equation 5.4 for equation 1.4 and (b) when the term $\sum_{i=2}^{9}$ appears, substitute the term $\sum_{i=3}^{9}$.

Note 7. Method of Computing Nonagricultural Employment for Alaska and Hawaii in 1950.

Let: T_y = total employment in the U. S.

N_y = nonagricultural employment in the U. S.

T'_y = total employment in Alaska

N'_y = nonagricultural employment in Alaska

y = year (1=1950, 2=1960)

Nonagricultural employment in Alaska in 1950 (N'_1) is:

$$(7.1)\quad N'_1 = 2T'_1 T'_2 T_1 N_2 \,/\, N'_2 T_2 N_1.$$

The calculations for Hawaii are the same. The calculations in equation 7.1 make the highly arbitrary assumption that the relative change in nonagricultural employment as a per cent of total employment between 1960 and 1950 (not vice versa) was, in Alaska and Hawaii, half the national average.

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