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METROPOLITAN MIGRATION EFFICIENCY

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Abstract—The migration efficiency ratio of an area is defined as the net migration of the area (in-migrants minus out-migrants) divided by the total number of moves whose origin or destination is that area (in-migrants plus out-migrants) multiplied by 100. This paper investigates variations in migration efficiency from 1955 to 1960 among Standard Metropolitan Statistical Areas with populations of 250,000 or more. Regional variation in migration efficiency was evident, ranging from an average of −9.7 in the Northeast to 19.6 for SMSA's in the Western region. Nonwhites tended to have higher migration efficiency than whites. Rapidly growing metropolitan areas had higher migration efficiency ratios than areas growing at a lower rate or losing population. The educational level of a metropolitan area, as measured by the percent of the population 25 years old or over with at least a high school education, was positively related to migration efficiency. The composition of the migrant population, both in- and out-migrants for a given area, was related to the value of the migration efficiency ratio. If the migrant population contained a large proportion of persons aged 20–34, migration efficiency was low, regardless of the direction of the major migration stream. Region was found to have a major effect. Variables that had a strong and positive relationship with migration efficiency in one region were usually found to have no relation, or a negative relation, with it in other areas. Obviously, further research is needed for the identification of factors producing these strong regional effects.

One of Ravenstein's "laws" of migration, cited in his original article on the subject, was the "fact that side by side with each main stream or current of migrants there runs a counter-current, which more or less compensates for the losses sustained by emigration" (Ravenstein, 1885, p. 187). This observation, reiterated in subsequent research (e.g., Bogue, Shryock, and Hoermann, 1957), provides the starting point for our research on migration behavior in large metropolitan areas of the United States between 1955 and 1960. Since rates of natural increase are fairly constant over all metropolitan areas, the rate at which a given metropolitan area grows or declines depends primarily on the rates of migration into and out of that area. Given the fact that each stream of migration tends to have a counter-stream, however, it is apparent that a specific net increase in an area due to migration can be achieved in an infinitely varied number of ways. For example, an area which experiences a net increase of 10,000 persons from migration may have acquired this net increase from an influx of 12,000 in-migrants and a decrement of 2,000 persons leaving the area.

The same net result could have come about from 130,000 in-migrants and 120,000 out-migrants. Although the net migration rate would be the same in either case, it seems clear that the first set of in- and out-migrants results in a more "efficient" migration experience for that area. That is, a net migration of 10,000 persons was achieved from a total number of 14,000 moves into and out of the area, as opposed to 250,000 total moves in the second case.

We shall define the migration efficiency ratio of an area to be the net migration of an area (in-migrants minus out-migrants) divided by the total number of moves whose origin or destination is that area (in-migrants plus out-migrants), times 100 (Shryock, 1964). It can be seen from this definition that although an area's migration efficiency ratio is closely related to its net migration rate (they have the same numerator), the interpretation of the two numbers is somewhat different. When appropriate data are available, an area's net migration rate for a specific time interval is computed as the number of in-migrants minus the number of out-migrants, divided by the mid-interval population of the area (Bogue, Shryock, and Hoermann, 1957). Thus, the net migration rate may be viewed as focusing on the effect of migration on the given community (Bogue, Shryock, and Hoermann, 1957). The larger the net migration rate (either positive or negative), the greater the expected impact on the community. Migration efficiency also raises questions as to the impact of migration behavior on a given community, but the emphasis is somewhat different. As can be seen from the illustration given above, two areas with identical net migration rates may have widely varying migration efficiency ratios. Thus, the concept of migration efficiency poses a somewhat more complex question as to the impact of migration on a given community. As Shryock points out, although the measure does not take into account what *ought* to be the direction and volume of migration from a social or economic standpoint, "it could be hypothesized that a great deal of milling about that had but little effect on population redistribution, or represented a great deal of return migration, would involve social and economic costs that were disproportionate to the benefits gained by the national or regional economy, or by the migrants themselves" (Shryock, 1964, p. 285).

This paper will explore variations in migration efficiency ratios of large metropolitan areas in the United States from 1955 to 1960. An attempt will be made to establish empirical relationships between the efficiency ratios and selected migration stimulating variables. Consideration will be given to those measures which have been established in previous research as being related to different aspects of migration behavior. Those differentials selected for analysis will include characteristics of in- and out-migrants, as well as characteristics of the metropolitan areas. Also an attempt will be made to evaluate the validity of the measure by discussing its ambiguities in the light of the empirical findings which evolved during the research procedures.

Sources of Data and Methods of Analysis

The concept of migration efficiency is a relatively new and unused measure of migration behavior. Few references to this measure can be found in the literature (Shryock, 1959, 1964). This paper should thus be considered to be of an exploratory nature—an attempt to investigate whether the concept is a viable one and whether it can be utilized to shed new light on migration activity. There are, for example, a number of unresolved issues about the measure itself, two of which will be briefly noted here. As Shryock has pointed out, there

is a problem with respect to the level of generality. A relatively low migration efficiency ratio for an area as a whole may mask highly efficient migration ratios for specific age or occupational subgroups within the same area (Shryock, 1964). There is also the problem of the sign of the ratios. Is a positive ratio of a given magnitude the same as a negative ratio of the same magnitude? That is, does one discuss efficiency of migration without regard to the direction of the net change? Both of these issues will be looked at briefly with respect to the data at hand.

In this study, migration efficiency ratios are computed for all Standard Metropolitan Statistical Areas (SMSA's) in the continental United States with a population of 250,000 persons or more in 1960. The data source for these ratios is the special report of the 1960 population census on *Mobility for Metropolitan Areas*. Only those persons whose 1955 place of residence was outside their SMSA residence in 1960, but within the United States, were used in the computation of the migration efficiency ratios. That is, persons who were living abroad in 1955 and persons who had moved, but whose 1955 place of residence was not reported, were excluded from the analysis. In an attempt to account for variation in migration efficiency ratios across SMSA's, a number of independent variables were examined for each area. We have looked both at characteristics of the migrant streams and characteristics of the metropolitan areas.

The interval for which migration efficiency ratios are computed is from 1955 to 1960. Since we are relying on census data, and since the beginning of the migration interval is halfway between two censuses, one problem immediately encountered is the question of from which census one should gather social and economic characteristics of the metropolitan areas to compare with the ratios. Neither the 1950 nor the 1960 census is completely satisfactory, but we will use measures from both in an attempt to account for the variation in migration efficiency ratios. The major method of investigation will be correlation and regression analysis.

Results

"Absolute" versus "Real" Values

As we have defined them, migration efficiency ratios may vary from plus 100 to minus 100. But should the sign of the variable be taken into account? It could be argued that a ratio of 50 is just as efficient as one of −50; the ratio of net change to turnover is the same, except that in one case the net change is positive and in the other it is negative. Should negative and positive migration efficiency ratios be treated the same (as absolute values), or are they substantively different? Shryock (1964) is not clear on this issue; he sometimes discusses efficiency without regard to sign, and at other times refers to the "real" values (i.e., he takes into account the direction of the net change). Both interpretations have a meaningful rationale, although the explication of the two measures is rather different. Of the several variables employed in this analysis, only two kinds appeared to be at all related to the absolute values of the migration efficiency ratios. The only variables for which the correlation coefficients for the absolute values of the migration efficiency ratios were higher than the correlation coefficients for the "real" values of the migration efficiency ratios (taking sign into account) were those pertaining to the age distribution and educational levels of the population in the migrant streams. For example, the correlation between the absolute values of the migration efficiency ratios and the percent of all in-migrants who were between 20 and 34 years of age was −.601; the correlation with the "real" values of the ratios was −.373. The correlation coefficients of the absolute and "real"

values of the migration efficiency ratios with the percent of in-migrants who were 65 years of age or older were .498 and .210, respectively. In addition, the educational level of the in-migrants, as measured by the percent over 25 who had completed at least four years of high school, was moderately related to the absolute values of the migration efficiency ratios ($r = -.264$), while showing virtually no relation with the "real" values of the ratios ($r = .014$). For almost all of the other variables examined, the correlations with the absolute values of the migration ratios were substantially less than the correlations with the actual ratios (taking sign into account). Thus, the age distribution of the migrant population and its educational level appear to affect the efficiency of migration to metropolitan areas without regard to whether the SMSA's were gaining or losing population through migration. That is, the more that migrants tend to be in the young adult ages and have higher educational levels, the less efficient their migration behavior will be. This tends to agree with the observation made in numerous studies on the characteristics of migrants as they relate to movement in general (Bogue, 1959).

Since most of the other variables examined appear to have a stronger relationship to the "real" values of the migration efficiency ratios, we will focus on this measure for the remainder of this paper, returning to the problem of different interpretations placed on the two measures of efficiency in the concluding statement.

Level of Generality

The findings just discussed with respect to absolute values of migration efficiency ratios have relevance to the discussion of the level of generality. That is, since the age distribution of the migrant population and its education level are related to total migration efficiency, it seems logical to expect that these population subgroups would have lower efficiency ratios. We would argue, however (as does Shryock), that the general measure of efficiency for an area has a justifiable use and interpretation. We will thus limit our discussion of generality to two other broad variables—region and race.

As a background to examining metropolitan areas, migration efficiency ratios by the two broad color categories were computed for each of the geographic divisions and regions of the United States. These ratios are shown in Table 1. Only the South Atlantic, Mountain, and Pacific divisions have positive total migration efficiency ratios for the 1955 to 1960 period. The net influx of migrants

TABLE 1.—Migration Efficiency Ratios for Geographical Divisions and Regions in the United States by Race, 1955–1960

Division and region	Migration efficiency ratios		
	Total	White	Non-white
New England	-6.7	-8.8	39.2
Middle Atlantic	-23.8	-30.9	33.9
NORTHEAST	-23.4	-30.5	36.3
East North Central	-13.0	-16.2	26.3
West North Central	-21.8	-23.1	7.7
NORTH CENTRAL	-19.8	-23.1	24.6
South Atlantic	16.3	21.2	-33.6
East South Central	-19.5	-13.9	-56.5
West South Central	-8.7	-6.2	-34.8
SOUTH	1.1	7.6	-53.1
Mountain	15.7	15.8	12.3
Pacific	37.8	37.4	56.0
WEST	40.2	40.0	55.1

to the South Atlantic division is sufficiently large to give the Southern region as a whole a positive migration efficiency ratio, but since the other two southern divisions have negative ratios, the total efficiency ratio for the region is very low. The highest migration efficiency ratio is for the West, at 40.2 in-migrants per 100 persons entering or leaving the region. The total efficiency ratios for divisions and regions in the United States reflect in general the behavior of the white population. The magnitude of the migration efficiency ratios for whites for all divisions is very similar to the total ratio, and in every case, the sign is the same. This is not the case, however, for nonwhites. Only in the three southern divisions are the nonwhite migration efficiency ratios negative in sign. Thus, for five of the nine geographical divisions, net migration is in opposite directions for whites and nonwhites. In addition, Shryock's (1964) observation for 1935–40 and 1949–50 that nonwhite migration is in general more efficient than white migration is reiterated for the last half of the 1950 decade. Only in the West North Central and Mountain divisions are the efficiency ratios higher for whites than for nonwhites. In each of these cases, however, the nonwhite population constituted only a very small proportion—4.3 and 3.4, respectively—of the total migration turnover. The percent nonwhite of all migrants entering and leaving a division is higher for all other divisions with the exception of New England, which also had only 4.3 percent of its total migrant turnover classified as nonwhite.

That SMSA's tend to reflect the region in which they are located with respect to the direction of migration can be seen from Table 2, which shows the average migration efficiency ratios by region and race. The exception to this generalization is the Southern region, where metropolitan nonwhites tend to have positive migration efficiency ratios, as opposed to the negative nonwhite efficiency ratio for the region as a whole.

TABLE 2.—Average Migration Efficiency Ratios for SMSA's of 250,000 Population or More by Region and Race, 1955–1960

Region	Total	White	Nonwhite
	(A) Avg. migration efficiency ratios by region computed by taking into account the sign of the ratios		
Northeast	-9.7	-11.6	24.1
North Central	-4.4	-5.8	19.8
South	8.0	8.5	4.8
West	19.6	19.4	22.6
	(B) Avgs. of the absolute values of migration efficiency ratios by region and race		
Northeast	12.4	13.4	26.4
North Central	8.7	9.5	21.1
South	14.7	15.1	17.3
West	19.9	19.6	22.6

The efficiency of migration to and from large metropolitan areas in the United States varies widely. Some SMSA's have three to five times as many in-migrants as out-migrants (or vice-versa), resulting in ratios as high as 70.2 (Fort Lauderdale, Florida) or as low as −45.1 (Wilkes-Barre, Pennsylvania). When migration by race is examined, the variation is somewhat greater (for example, the values of the white ratios in the same two SMSA's were 71.6 and −45.6). The average magnitude of the migration efficiency ratios is substantially less than the equivalent figures for the region as a whole, however. This lower average value is not solely due to the inclusion of both positive and negative ratios in the computation of the averages, as can be seen from

panel B of Table 2. Although the average magnitude of the absolute values of the migration efficiency ratios is slightly higher than the average computed in the traditional way, the differences between these averages and the ratios for the region as a whole are substantial. There are, as has been noted, some individual metropolitan areas whose migration efficiency exceeds the regional figure. These high values, however, are counterbalanced by other SMSA's with fairly low ratios of migration efficiency, thus resulting in the generally lower average for SMSA's.

In the following paragraphs, an attempt is made to account for some of the variation in metropolitan migration efficiency by searching for concomitant differences in a number of social and economic characteristics of the relevant migrant streams and of the SMSA's involved. Because several of the variables used were from the 1950 census, nine metropolitan areas were excluded from this part of the analysis, due to lack of comparability of the metropolitan area at the two time periods, or for other reasons. (Nine SMSA's were omitted from the regression analyses. New York City, Newark, Jersey City, and Paterson were eliminated because they are included in the New York Standard Metropolitan Consolidated Area. Chicago and Gary–Hammond were eliminated, because they are now in the Chicago Standard Consolidated Area. Bakersfield, Fort Lauderdale, and Tucson were eliminated, because data on growth industries for these SMSA's were not available.) A further limitation of the following analysis is suggested by our findings with respect to racial differences in migration efficiency ratios. From Tables 1 and 2 we have seen that the white and nonwhite ratios take on quite different values for each area. This implies that it may be more appropriate to investigate variations in migration efficiency for the two racial categories in separate analyses. This suggestion is further strengthened by the fact that the correlation between white and nonwhite migration efficiency ratios is only .311. Because of limitations of space we shall confine the following analysis to white efficiency ratios.

It is also apparent that efficiency ratios are quite different, on the average, for metropolitan areas in the four geographical regions of the United States. Since the regional ratios are so different, it may be that sources of variation should be examined for each region separately rather than for all SMSA's together. This avenue of analysis will also be explored.

Characteristics of Migrants

It has been noted earlier in this analysis that the age and education characteristics of the migrant population are related to the effectiveness of migration to and from an area regardless of the direction of the net change. Table 3, on the other hand, shows the correlation coefficients of white migration efficiency ratios (the actual values, taking sign into account) with a selected number of characteristics of in- and out-migrants for each of the four regions as well as for all 91 SMSA's together. It is quite evident from this table that migration efficiency is related to these variables in rather different ways in the four geographical regions. Only two of the variables listed show modest correlations across all 91 SMSA's: the percent of in-migrants in the young-adult ages and the percent of in-migrants whose 1955 residence was in a state different from their 1960 state of residence. These modest correlations, however, are the result of somewhat different regional effects. It will be remembered that the correlation between the absolute values of the migration efficiency ratios and this age variable was −.601. The regional correlation coefficients with the actual (or "real") values of the migration efficiency ratios reflect this strong relationship. That is, the correlation is negative in the

TABLE 3.—Zero-Order Correlations of Migration Efficiency Ratios (Whites Only) with Selected Characteristics of In- and Out-Migrants of SMSA's, 1960

Characteristics of migrants	Zero-order correlations by region				
	Total	North-east	North Central	South	West
Pct. in-migrants 25 years old or more with at least a high school education	-.020	.285	.441	-.108	.029
Pct. in-migrants 20 to 34 years of age	-.384	.379	.392	-.549	-.436
Pct. in-migrants 65 years of age or older	.211	-.332	-.354	.558	.148
Pct. out-migrants 65 years of age or older	-.023	.357	-.054	.556	.139
Pct. in-migrants from a different state in 1955	.294	-.028	-.259	.437	.032
Number	91	22	23	31	15

South and West, where the efficiency ratios are generally positive. The correlations are positive in the Northeast and North Central where the ratios are generally negative. The other variable (percent in-migrants from a different state) shows a fairly strong positive correlation in only one region—the South. This relationship is apparently strong enough to offset the weaker negative relationship in the North Central region and lack of relationship in the West and Northeast to maintain a modest positive correlation over all SMSA's.

Characteristics of Metropolitan Areas

Table 4 shows the zero-order correlations of a number of selected characteristics of metropolitan areas with the white migration efficiency ratios for the same areas. In general, there appears to be more consistency across regions with respect to these variables than the variables describing characteristics of the migrants. The level of education of the population in the SMSA appears to be positively related to migration efficiency in all four regions; the same is true of the percent of the employed labor force who have white-collar occupations. The relationship is not quite as clear for the relative prevalence of manufacturing in an SMSA and its relation to migration efficiency, though the two regions at variance with the total correlation coefficient in both sign and magnitude (the West and the Northeast) show very weak relations.

The three metropolitan characteristics discussed above have been used in other studies of migration to explain the amount of in-migration to an area (Tarver, 1965). Our study also suggests that the migration efficiency is positively related to the growth of the area. While this would appear at first glance to be logically tautological, given the definition of migration efficiency, the strength of the relationship can vary a great deal. This can be seen from the fact that the migration efficiency ratio has a correlation coefficient of .948 with the percent population increase in the Western region from 1950 to 1960, whereas the

TABLE 4.—Zero-Order Correlations of Migration Efficiency Ratios (Whites Only) with Selected Characteristics of Metropolitan Areas, by Region

Characteristics of metropolitan areas	Zero-order correlations by region				
	Total	North-east	North Central	South	West
Percent of pop. 25 years old or over with at least a high school educ., 1960	.480	.242	.460	.405	.178
Percent of employed labor force in white-collar occupations, 1960	.447	.352	.378	.248	.132
Percent of employed labor force in manufacturing industries, 1960	-.518	.174	-.379	-.484	.191
Inc. in 7 high-growth industries 1950-60 as a pct. of 1950 employed labor f.	.724	.601	.208	.692	.887
Percent population increase, 1950-60	.829	.772	-.078	.875	.948

same correlation coefficient is −.078 for the North Central region. In general, however, the relationship is strong and positive.

We have attempted to construct a measure which would mirror at least part of the economic climate of an area by looking at the relative growth of a number of selected industries which had rapid rates of growth in the nation as a whole over the 1950 decade. Seven industries were selected, including: electrical machinery, equipment, and supplies; printing, publishing, and allied industries; chemical and allied industries; finance, insurance, and real estate; and both government and private educational services. The rate of increase in employment for the industries over the 1950 decade was 50.9 percent, as compared with a 14.5 percent increase for the labor force as a whole. It may be reasoned, then, that a metropolitan area that combined a substantial portion of its labor force in these industries with a healthy rate of increase in employment in them would tend to have a fairly bright economic picture, which in turn might attract migrants at a relatively more rapid rate than it loses them. It can be seen from Table 4 that this measure of economic attractiveness of an area is positively related to migration efficiency, although its weakest relationship is still in the North Central region.

DISCUSSION

Variations in metropolitan migration efficiency have been related to a number of variables—measures which have been traditionally used in migration research. Some of these variables have been found to have a fairly low level of explanatory power with respect to migration efficiency ratios. Characteristics of migrants, such as age and educational attainment, tend to be related to efficiency regardless of whether absolute values or "real" values of the ratios are used, although the relative number of in-migrants in the young-adult ages has a moderate negative correlation with the

actual values of the ratio. The positive correlation between migration efficiency and percent in-migrants from a different state lends credence to Lee's suggestion of the importance of intervening obstacles: "The efficiency of migration streams will be high if the intervening obstacles are great" (Lee, 1966, p. 55). Distance is, of course, one of the major obstacles to migration, and in general it may be assumed that the more migrants coming from out-of-state, the greater the average distance travelled by in-migrants and consequently the more likely they are to remain.

With respect to characteristics of metropolitan areas, the educational level of the metropolitan area and its economic "attractiveness" as measured by the 1950–60 increase in seven selected growth industries as a percent of the employed labor force of the area in 1950 seem to be the measures showing the most consistent relationships with efficiency. Percent population increase in the metropolitan area from 1950 to 1960 has a higher total correlation, but is less consistent and to a certain extent more tautological.

The major finding of the analysis of white migration efficiency, however, is that regional factors as yet uncontrolled for appear to have as strong or stronger effect than any of the above mentioned variables. What is strongly and positively related to migration efficiency in one region may have no relationship at all with efficiency in another area and may be negatively related to efficiency in yet another area. This type of variation appears to be quite common. Thus, Tarver's finding with respect to metropolitan intercounty migration rates appears to hold true for efficiency as well: census region is an extremely important variable in accounting for variation in migration efficiency ratios (Tarver, 1965, p. 222).

To summarize the relationships between migration efficiency and the variables discussed above, a regression analysis was performed for the white migration efficiency ratio and four independent variables, two relating to characteristics of migrants and two relating to characteristics of the metropolitan areas. These variables were chosen because of their relative stability over the four regions. (Though none of the variables is really stable in its relationship to migration efficiency, these four appear to be more stable than the others.) Table 5 summarizes the results for all 91 SMSA's as well as the regional analyses. As can be seen from this table, the amount of variation the four variables included are able to account for varies widely by region, from 86 percent in the West to 32 percent in the North Central region.

Conclusion

In our analysis of migration efficiency, we have sometimes referred to the absolute values of the migration efficiency ratios and at other times to the "real" or actual values, taking sign into account. When the sign of the ratio is considered in the analysis, migration efficiency appears to be quite closely related to growth. We would suspect that the correlation between the actual values of the migration efficiency ratios and an area's net migration rate would be high. (We found, for example, a correlation of .86 between the "real" values of the migration efficiency ratios and the percent of the population increase from 1950 to 1960 that was due to migration. This correlation would undoubtedly be higher if the net migration figures were for the 1955 to 1960 period.) It would thus seem that net migration rates might just as well be used in the analysis of rates of growth due to migration; the migration efficiency ratios when sign is considered probably add little more useful information about migration behavior. On the other hand, it does appear that the absolute values of the

TABLE 5.—Multiple Regression Analysis of Migration Efficiency Ratios (Whites Only) by Region

Independent variables	Total	Region: Northeast	North Central	South	West
	Standardized beta weights				
Inc. in 7 high-growth industries 1950-60 as a pct. of 1950 employed labor force: (X_1)	.560	.518	-.173	.428	.920
Percent of SMSA pop. 25 years old or over with at least a high school education, 1960: (X_2)	.176	.096	.376	.189	-.037
Percent of in-migrants from a different state in 1955: (X_3)	-.186	-.055	-.196	.249	.258
Percent of in-migrants 20 to 34 years of age, 1960: (X_4)	-.170	.115	.343	-.286	-.119
Standard error of estimate	11.2	11.7	9.7	10.8	6.5
Multiple correlation coefficient	.781	.616	.568	.799	.929

ratios may be used to get at the effectiveness of a given net rate of migration. When used in conjunction with the net migration rate, migration efficiency ratios defined in this way would give an added dimension to the knowledge about the migration experience of any given area. So far, we have found only characteristics of the migrant population involved to be closely related to migration efficiency defined in this manner. It may be, however, that a more systematic search will reveal certain characteristics of a metropolitan area which are also closely related to the effectiveness, or efficiency, of the area's migration experience.

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