

INTRODUCTION

Investigations relating to factors affecting internal migration of people from one area to another can contribute to better understanding of why people move and help to improve judgments about future population adjustments. Existing methods for predicting an area's population are essentially of the nature of extrapolations of past trends, and since they are not based on analysis of changes in factors influencing net migration, they do not permit much insight into causal factors underlying population change.

Why do people move internally from one part of the United States to another? Several widely divergent motives may underlie the migration behavioral pattern of the people of an area. Better wages or more generally, more favorable economic opportunities, present or potential, represent one major group of factors influencing migration decisions. Another major group of causes stems from "non-economic socio-cultural environment" of the areas of origin of migrants and their anticipated evaluation of corresponding elements of "non-economic socio-cultural environment" in the areas of prospective in-migration. Migration decisions are also affected by costs, information, existence of programs of assistance and kindred factors.

A theory of labor migration which regards relative wage ratio (or income differential) as the sole primary determinant of net migration is considered too simple and too inadequate to be useful in theoretical formulation or in empirical investigations. The general remarks in the preceding paragraphs suggest that neither relative wage ratio nor even some of the major relative economic opportunity factors may completely explain internal net migration behavior. For some of the major independent variables, adequately valid data series may not be available; besides, the nature of some particular variable or variables may be such as to preclude its measurability or observability. For example, valid reasons are advanced that the relative wage ratio should relate to marginal workers confronting migration choice and should not be the ratio of average wages.

The principal premise that underlies this study is that there are at least a few major independent variables affecting net migration and that some of these are non-measurable or nonobservable, and that valid data series for such variables do not exist for use in empirical investigations. The method of analyses used is therefore designed to recognize and take into account this problem of nonobservability of some of the major explanatory variables. It is further recognized that net migration behavior patterns vary between the races, between the sexes and between age groups within each race-

sex category. Consequently, there is need for stratification of an area's population into reasonable small homogeneous age, sex and race groups.

It is hypothesized that factors influencing internal net migration decisions of an age-sex-race group are of three categories:

1. Time-related (or sub-area-related) relative opportunity factors. These factors are functions of time in time-series analyses or of a sub-area in cross-section analyses. These factors are the same for all age groups within a race-sex category. These relative opportunity factors are represented by an omnibus variable Z_t which is an index representing all relevant time-related relative opportunity factors. It is assumed that Z_t , which is the independent variable, is nonobservable.

2. Age-related relative opportunity factors. These factors do not vary over time in time series analyses (or over sub-areas in cross-section analyses) but vary between age groups within a race-sex category. Such age-related relative opportunity factors are denoted by a nonobservable index m_i where i refers to age group.

3. Category-related relative opportunity factors. These factors do not vary over time in time series analyses (or over sub-areas in cross-section analyses) and between age groups within a race-sex category. But these factors vary between race-sex categories. These forces are denoted by a_j where j refers to race-sex category.

The results reported in this paper are with reference to the third component of internal net migration which stems from forces which are constant over the time span of a time series study (or over sub-areas of a cross-section study) and over age groups within a race-sex category, but which vary between the four race-sex categories namely white males (WM), white females (WF), nonwhite males (NM), and nonwhite females (NF).

For the purpose of this study, we may define the "race-sex discrimination" index of an area as the race-sex related component of internal net migration of that area (component a_j). It is, however, recognized that the subset S_1 of elements of a socio-cultural environment S giving rise to what is called "race-sex discrimination" may consist of two types of elements--subset S_{11} consisting of elements which are the same for all age groups within a race-sex category (component a_j) and a subset S_{12} consisting of elements which vary between age groups within a race-sex category (component m_{ij}). The latter component may reasonably be thought of, in given situations of being the result of "race-sex discrimination" and should appropriately be attributed to it.**

Model & The Method of Estimation

The model (for each race-sex category) is:

$$Y_{it}/E_{it} = \alpha Z_{it}^{\beta_i} \epsilon_{it} \quad (1)$$

where $Z_{it} = m_1 Z_t$ and β_i is the elasticity of response. Taking logarithms, the linear form becomes:

$$Y'_{it} = \alpha' + \beta_i m_1' + \beta_i Z_t' + \epsilon'_{it} \quad (2)$$

where prime quantities represent natural logarithms of corresponding unprimed quantities. The notation is:

E_{it} - Population of age group i exposed to risk of net migration during time interval t which would be in the area in the absence of any net migration.

M_{it} - Net migration of age group i during time interval t . M_{it} is positive when there is net in-migration and is negative when there is net out-migration.

$Y_{it} = 1 + M_{it}/E_{it}$ = Survival rate against net migration where $(M_{it} + E_{it})$ is the quantity of supply of labor, and E_{it} is the supply shifter.

Z_t - Non-observable independent variable representing the average index of "relative opportunity".

β_i - age group i 's response coefficient (elasticity) to index Z_t .

m_1 - index of age-related opportunity factors

α - represents effect of category-related factors (called "race-sex discrimination effects" in this study)

ϵ_{it} - disturbance terms

The non-linear iterative least squares estimation procedure developed by Johnston and Tolley [1] in their study "Supply of Farm Operators" was used to estimate values of model parameters and the nonobservable variable Z . The basic properties of this model were, however, crucially different in some respects from the properties of Johnston-Tolley model and consequently necessary modifications were introduced in evaluation procedures. It is not proposed to deal with the estimation problems in the report.

In practical language the model separates net migration into three components: category effect 'autonomous' component α which is the same for all age groups within a race-sex category. This component would reflect the amount of net migration that would occur if $Z_t=1$ and $m_1=1$, that is if net migration induced by time-related and age-related factors is zero. It is this component which in this report is said to reflect "race-sex discrimination effect". There are two induced effects, one representing response to time-related omnibus independent

variable Z_t and the other to age-related factors m_1 . The real difficulty comes in the interpretation of the significance of the forces represented by m_1 . Some of the forces underlying m_1 may stem from those elements of the "socio-cultural environmental" complex as may be said to represent "race-sex discrimination", while it may legitimately be argued that some of these age-related factors stem from the fact that the assumption of a common index of relative opportunity facing all age-groups is unrealistic and that the index of relative opportunity is a function of both t and i . In such a situation, Z_t would represent an average index of relative opportunity and a part of m_1 would represent departures of the omnibus variable for the age group from the average Z_t for the category. Under these conditions, it would be necessary to identify the two subsets of the elements underlying m_1 ; those that relate to race-sex discrimination and those that reflect the situation that the index of relative opportunity is both age-related and time-related.

The "race-sex discrimination" index of a socio-cultural environment of an area may be viewed as a measure of the net effect of factors other than age-time related factors. Viewed thus a comparative analyses of α 's may enable us to answer questions such as:

- (1) Are females "potentially" more migratory than males when the influences of age-time related factors are eliminated or equalized out or are Southern non-white males potentially more migratory than the Southern nonwhite females?
- (2) Does the socio-cultural environment of a state discriminate against females or against nonwhites?

The significance of the positive or negative sign of α' may be clearly understood. Since total internal net migration of a color-sex category for the nation as a whole must be zero, it is easy to see that for each race-sex category:

$$\sum_s \alpha'_{js} W_{js} = 0 \quad (j = WM, WF, NM, NF)$$

where α'_{js} equals race-sex discrimination index of category j in state s , and W_{js} equals proportion of category j population in state s (as proportion of the total category population in the nation).

Consequently, index α' is an index of relative "discrimination", in relation to the average for the nation which is zero. A positive α' does not signify that "discrimination" however defined, is absent in that state; it only signifies that "discrimination", if any in this state, is less than the average for the nation as a whole.

Empirical Results

1. For white males, α' was positive for the MSEA's of most States except for Georgia and

Tennessee. This means that the socio-cultural environment of these MSEA's is less favorable to white males than the average for the nation. For white females, α' for MSEA's of Illinois and Washington States were negative. The results for nonwhites of both sexes for New England and Middle Atlantic States is interesting. α' for nonwhite males and nonwhite females are negative for Massachusetts, New York and Pennsylvania. The implication is that the socio-cultural environment of the MSEA's of these States discriminates against nonwhites of both sexes and that the nonwhites would be migrating out of these MSEA's if the relative economic and noneconomic opportunity factors in these States were only as favorable as the average for the nation as a whole. Similarly α' for nonwhite males and nonwhite females for Florida is negative showing that larger numbers of nonwhites of both sexes would indeed be moving into Florida if the discrimination environment against nonwhites improved in the State. Similar remarks apply to nonwhite females for the MSEA's in the States of Louisiana and Texas.

2. Strictly speaking, comparisons of α' between sexes or races for a given state are not always valid. However, the iterations resulted in an underlying pattern of Z's. If the Z's between States are, in fact, similar, or if the Z's between two race or sex categories within a state are about similar, then the comparisons of α' are valid and such comparisons could serve as basis for a reasonably broad and general interpretation.

Some interesting results were:

(a) metropolitan state economic areas (MSEA) are relatively more favorable to males than to females of both races, α' for white males was greater than α' for white females in 10 states out of 15; α' for nonwhite males was greater than α' for nonwhite females in 11 states out of 13.

(b) inter-racial comparisons did not provide definite evidence as to whether MSEA are more favorable to members of one race rather than another. α' for white males was greater than α' for nonwhite males in 5 states out of 8 and was lower in 3 states; α' for white females was higher than α' for nonwhite females in 4 states out of 7 and was lower in 3.

(c) A study of inter-racial comparisons by region, however, reveals some interesting results. In the Southern States, α' for whites was greater than α' for nonwhites in 5 states out of 6. In California, on the other hand α' for nonwhites was higher than α' for whites of both sexes.

PRINCIPAL REFERENCES

1. Johnston, W. E. and Tolley, G. S., 1968. The supply of farm operators. *Econometrica*, Vol. 36, No. 2 (April, 1968), p. 365-382.
2. Lyttkens, Ejnar, 1965. On the fixed-point property of Wold's iterative estimation method for principal components, - a paper presented at the International Symposium on Multivariate Analysis at University of Dayton, Dayton, Ohio June 14-19, 1965.
3. Wold, Herman, 1965. Nonlinear Estimation by Iterative Least Squares; unpublished paper, Institute of Statistics, University of Uppsala, Sweden.
4. U. S. Department of Agriculture, 1965. States, counties, economic areas and metropolitan areas, Volume I. Population-Migration Report; Net Migration of the Population, 1950-60, by Age, Sex, and Color. U. S. Government Printing Office, Washington, D. C.

Footnote

**I am indebted to my colleague Louis Junker for suggesting that the variable m_1 may represent and capture age-related factors of "race-sex discrimination" and that "race-sex discrimination" index need not necessarily be totally described by component α_j .

Acknowledgment

*Main work on this research was done while the author worked at the N.C. State University on a National Science Foundation Project, "Area Population Adjustments in Relation to Economic Activity". The author gratefully acknowledges the help he received from C.E. Bishop, G.S. Tolley, C.H. Hamilton, and F.E. McVay. Results reported in Tables 1 and 2 are contained in author's report to NSF. However, work on the interpretation and significance of α has been done during author's stay at Western Michigan University.

Table 1. Estimates of category effect, MSEA in net in-migration data analyses

Region/state	White		Nonwhite		H ₁ . $\frac{D}{(2)-(3)}$	H ₂ . $\frac{D}{(4)-(5)}$	H ₁ . $\frac{D}{(2)-(4)}$	H ₂ . $\frac{D}{(3)-(5)}$
	Male (2)	Female (3)	Male (4)	Female (5)				
New England					(0, 1)	(0, 1)		
Massachusetts			-.0141	-.0094		0		
Middle Atlantic					(1, 0)	(3, 0)	(1, 0)	(1, 0)
New York			-.0050	-.0139		1		
New Jersey	.1894	.0535	.0562	.0417	1	1	1	1
Pennsylvania			-.0037	-.0060		1		
East North Central					(0, 1)	(4, 0)	(1, 1)	(0, 2)
Ohio	.0336		.0124	.0123		1	1	
Indiana	.0083	.0152	.0170	.0166	0	1	0	0
Illinois		-.0105	.0095	-.0007		1		0
Michigan			.0505	.0194		1		
Wisconsin	.0102							
West North Central					(1, 0)	(1, 0)	(1, 0)	
Minnesota	.0307	.0283	.0157	-.0135	1	1	1	1
South Atlantic and D.C.					(2, 2)	(0, 1)	(1, 0)	(1, 0)
District of Columbia		.0050						
Virginia	.0248	.0196			1			
North Carolina	.0100	.1309			0			
Georgia	-.0382	.0263			0			
Florida	.0325	.0145	-.0072	-.0027	1	0	1	1
East South Central					(1, 0)			
Tennessee	-.0160							
Alabama	.0369	.0191			1			
West South Central					(2, 1)	(2, 0)	(1, 1)	(2, 0)
Louisiana	.0181	.0094	.0296	-.0348	1	1	0	1
Oklahoma	.0337	.0386			0			
Texas	.0422	.0365	.0093	-.0064	1	1	1	1
Mountain					(1, 1)			
Colorado	.0544	.0280			1			
New Mexico	.0095	.0127			0			
Pacific					(2, 0)	(1, 0)	(0, 1)	(0, 1)
Washington	1.7798	-.0151			1			
California	.0163	.0061	.0409	.0207	1	1	0	0