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Interest in internal migration in the United States can be traced to the state-of-birth data first collected in the population census of 1850 (Lee and Lee, 1960). As a sociological phenomenon, however, internal migration in the United States has been seriously studied only since the second quarter of the twentieth century (Thomas, 1938). Previous studies of internal migration may be characterized as follows:

1. In most cases, the relation between selected variables and migration was a segmental one, in the sense that it was impossible to infer the relation between migration and the major factors in a changing economy.

2. The geographic units of analysis varied from study to study, making it difficult to generalize about migration from different areal units.

The primary aim of the present paper is two-fold: First, to develop a theoretical model via the formulation of a systematic conceptual scheme that embraces those variables to which internal migration is most highly related; and second, to apply this theoretical model to areal units in which commuting is reduced to a minimum, economic heterogeneity is increased to a maximum, and labor markets tend to be considerably smaller than their corresponding areas. These areas were delineated in 1969 by the Office of Business Economics and termed OBE Economic Areas (OBEA's) of the United States (Office of Business Economics, 1967).

Construction of the Theoretical Model

According to the present theoretical model, the process of migration is conceptualized to be a result of one or any combination of the following three major factors: First, net migration produced by the continuous development and change in automation and technology in the United States; second, net migration generated by attractive or repellent characteristics; third, net migration produced by compulsory agencies. In other words, the model will use as a basic framework the concepts of mechanization, automation, and technological change; attraction and repellency; and compulsion. For a definition of these concepts, see Jaffe and Froomkin (1968); Bates (1969); Dunlop (1962); Rezler (1969); Lee (1966); Tarver and others (1967); Blanco (1962); Gossman and others (1967); Zipf (1946); Stouffer (1940, 1960); Isard (1960); and Ravenstein (1885, 1889).

Concerning the interrelationship of these concepts, one may assume that migration is stimulated by those occupations and industries most affected by technological developments and changes. This assumption has been substantiated by several studies in which professional, technical, and kindred workers showed the highest geographic mobility, especially for long distance migration, and the farmers for short distance (Lively and Taeuber, 1939; Tarver, 1964b; Beshers and Nishiura, 1961; Miller, 1966, 1967; Ladinsky, 1967 a and b).

In this respect, one can assume that the

higher the technological developments and changes in certain occupations or industries relative to others, the greater is the geographic mobility of persons engaged in them. Consequently, areas with differentiated occupational and industrial structures are expected to yield different selective migration patterns. Phrased in this general statement, migration in the United States is viewed as the result of two polar types of decisions by migrants--voluntary impellent decisions and involuntary impellent decisions.

The voluntary impellent decisions of the workers to migrate stem from their response to the attractive incentives they expect from other labor market areas to maximize their earnings, or the desire to improve their chances of finding a job. For the purpose of this study, then, it seems justifiable to represent the attraction or repellency of an area by those factors which are believed to carry great weight among the other factors that impel the person to migrate. Figure 1 shows four of the relevant factors. These are change in civilian employment, estimated underemployment, change in unemployment, and change in real median income of families and unrelated individuals. The dashed line originating from unemployment implies that the relationship between unemployment and migration is not simultaneous, in the sense that there exists a time lag between the unemployment of a person and his migration. A study of labor mobility in Great Britain based on unemployment data for 1923-36 showed that the time lag between unemployment and migration ranged between a half year and a year and a half (Makower, et al., 1939).

In the involuntary-impellent decision to migrate, the individual encounters factors which compel him in the sense that he is ejected by them rather than being rejected by them. For the purpose of this study, only one factor was selected to represent this type of migration; namely, movements among armed forces personnel.

Based on the above conceptual framework as schematically outlined, the process of migration is conceived in this study as an epiphenomenal behavior produced by socio-cultural compulsions whose influences on individuals vary according to the social division of labor in which they are involved and the incentives to move, which vary in time and space.

The Hypotheses

In view of the above conceptualization, one can state the hypotheses of this study as follows:

<u>Hypothesis 1</u>: Net migration is functionally related to shifts within occupational and industrial structures. Implicit in this hypothesis is the assumption that the changes within these structures contribute differentially to migration.

<u>Hypothesis 2</u>: There is a relationship between changes in civilian employment and net migration.

Figure 1. Schema of the Theoretical Model for Predicting Internal Migration in the United States



- a. If the change in number of employed civilians is used, the relationship is direct.
- b. If the change in number of unemployed persons is used, the relationship is inverse.

<u>Hypothesis 3</u>: There is a direct relationship between change in real median income of families and unrelated individuals and net migration.

<u>Hypothesis 4</u>: There is an inverse relationship between underemployment and net migration.

<u>Hypothesis 5</u>: There is a direct relationship between change in armed forces personnel and net migration.

Universe of Analysis and the Data

For purpose of illustration, an aggregation of eight OBEA's are selected. These nodal economic areas constitute the whole state of Georgia and portions of the contiguous states of Alabama, Florida, South Carolina, and Tennessee. The observational unit in this study is the county. There are 201 counties in the selected eight areas. For application on the national level, however, a whole area may be taken as a single observation (Trott, 1971). The data were compiled from Bowles and Tarver (1965); U. S. Bureau of the Census (1952, 1961, 1962); Ashby (1965); Kampe and Lindamood (1969). The underemployment estimates are based on "man-years economically unutilized labor"; and the income purchasing power was adjusted by using the reciprocals of the U.S. consumer price indices for 1949 and 1959, respectively.

The Variables and the Statistical Model The variables among which the various hypothesized relationships are to be measured and analyzed are symbolized as follows:

Dependent Variable:

m_i = estimate of the net migration of persons 25 to 64 years of age, 1950- 1960, of the ith county; i = 1,..., 201.

Independent Variables:

 0_{ij} = occupational change of the jth oc-

cupational group in the ith county, $1950-1960; j = 1, \dots, 11.$

- Iik = industrial change of the kth industrial group in the ith county, 1950-1960; k = 1,...,14.
- E_i = change in total civilian employment of the ith county, 1950-1960.
- U₁ = change in total unemployment of the ith county, 1950-1960.
- R_i = real change in median income for families and unrelated individuals in the ith county, 1949-1959.
- D_i = underemployment estimate in the ith county, 1960.
- A_i = change in the number of armed forces in the ith county, 1950-1960.

The relation between net migration and the independent variables is assumed to be a functional linear relationship. The regression model specifying the relation between migration and occupational change may be stated as follows:

 $m_i = B_0 + B_j 0_{ij} + e_i$

where m_i and O_{ij} are defined above. The stepwise regression method is a suitable statistical technique for this research, since it shows those independent variables which account for the most variation in the dependent variable by order of entry of each independent variable. The computations were performed by means of the BMD computer programs (Dixon, 1968).

Analysis of Findings

The findings of the study and the tests of the hypotheses are provided in three major parts as follows:

Occupational and Industrial Changes

Here one is concerned with testing the first hypothesis. Thus, in the case of occupational change, the null hypothesis to be tested is that

 $H_0: B_1 = B_2 = ... = B_{11}$, and $B_j = O(j=1,...11)$. This is equivalent to saying that there is no relationship between the net migration of persons 25-64 years of age, and changes in the occupational structure of employed civilians during 1950-1960. The same conceptualization is applicable to industrial changes by analogy.

Occupational change. -- Table 1 presents the

TABLE 1. CUMULATIVE R², REGRESSION COEFFICIENTS AND THEIR STANDARD ERRORS, AND PARTIAL AND SIMPLE CORRELATIONS BETWEEN NET MIGRATION OF PERSONS 25-64 YEARS OLD AND OCCUPATIONAL CHANGES IN EIGHT SELECTED OBEA'S OF THE UNITED STATES, 1950-1960

Occupation		Coeffi	cients of	n na series de la companya de la com La companya de la comp	
		Regression		Correlation	
and	Cumulative	and	Standard		
Intercept	<u>R</u> 2	Intercept	Error	Partial	Simple
Sales	0.778	6.152	. 549	.632	.882
Craftsmen	0.878	4.565	.477	.571	.872
Farmers	0.924	2.128	.228	.562	.199
Professional	0.935	-3.657	.410	544	.698
Not Reported	0.954	1.051	. 286	. 258	.398
Managers	0.956	1.327	.803	.120*	.847
Farm Laborers	0.957	0.665	.365	.131*	.210
Serv. Workers	0.957	0.432	.464	.068*	.551
Laborers	0.957	0.553	.581	.069*	.212
Clerical	0.957	0.290	.476	.044*	. 843
Operatives	0.957	0.114	.267	.031*	.722
Intercept		-472.415			

*Not significant at .05 level.

cumulative R², the coefficients of regression, the standard errors, and the coefficients of partial and simple correlations, for the relation between the net migration of persons 25-64 years of age and occupational changes in eight selected OBEA's of the United States, 1950-1960.

Differentiation in the effect of occupational changes on migration is reflected in the patterns of the arrangements of the occupational categories and in the magnitude and signs of the regression coefficients. The direction of the relationship is given by the signs of the partial correlation coefficients. In all, the first hypothesis is confirmed. For instance, the "sales" category was the first in importance since it accounted for 78 percent of the variation in net migration. Other occupational categories of major importance were craftsmen, farmers, and professional workers. Change in the employment of these three occupational categories accounted for 16 percent of the variation of net migration. The four occupational categories taken together accounted for 94 percent of the variation of net migration. This level of R^2 is high, which indicates the success of the theoretical model, especially when we state that this high value of R^2 is not affected by either "saturation" or "multicollinearity," as detected from the covariance matrix and standard errors of estimated regression coefficients.

All regression coefficients are significantly different from zero at the five percent level. Values and signs of the regression coefficients show differentiated relations between shifts in occupational structure and migration. The regression and partial correlation coefficients of the occupational category of professional, technical, and kindred workers are nega-There are two possible explanations for tive. this phenomenon.

According to the first explanation, the reversed relation of the professional category from a direct relationship in the zero order correlation to inverse relationship in the partial correlation (and consequently a negative regression coefficient), implies that the professional category disturbs rather than enhances the prediction of migration (Table 1).

The second explanation which, in fact, clarifies the first, is that professional workers have a much higher propensity to migrate than other workers (Tarver, 1964; Saben, 1964; Miller, 1967; U. S. Department of Labor, 1965). Professional, technical, and kindred workers are very heterogeneous group, not only in terms of detailed occupational categories, but also with regard to age, sex, color, education, marital status, and family size. Moreover, the heterogeneity of this group means that the substitution among its members is inelastic.

Industrial change. -- The null hypothesis to be tested is as follows:

 $H_0: B_1 = B_2 = ... = B_{14}$, and $B_k = 0$ (k=1,...,14). The multiple regression model used in estimating the regression coefficients and testing the hypothesis is as follows:

 $m_i = B_0 + B_k I_{ik} + e_i$. Table 2 presents the cumulative R², the regression coefficients, the standard errors of the estimates, and the coefficients of partial and simple correlations, for the relation between net migration of persons 25-64 years of age and industrial changes in the eight selected OBEA's of the United States, 1950-1960. As was the case with occupational change, the industrial categories were arranged according to the importance of the variable in explaining the variation in net migration.

The relative importance of the industrial categories and the magnitude and signs of the regression coefficients support our hypothesis. As an example, the trade category was the first variable of importance since it accounted for 85 percent of the variation in net migration. Other industrial categories of major importance were agriculture, construction, professional services,

TABLE	2.	CUMULATI	VE R ² ,	REGRE	SSION	COEF	FICI	ENTS	AND	THEIR	STANDA	RD ERF	RORS,	AND	PARTIAL
		AND SIMPLE	CORREL	ATION	S BET	JEEN	NET 1	MIGRA	TION	OF P	ERSONS	25-64	YEAR	S OLI)
A	ND	INDUSTRIAL	CHANGE	S IN 3	EIGHT	SELE	CTED	OBEA	's 0	F THE	UNITED	STATE	ZS, 1	950-1	.960

	Coefficients of							
Industries		Regression	Correlation					
and	Cumulative	and	Standard Errors	Partial	Simple			
Intercept	K	Incercept	DIIOIS	141 1141	01mp10			
Trade	.845	1,904	.390	.338	.919			
Agriculture	.876	1,590	.115	.713	.263			
Construction	.916	2.495	.447	.378	.826			
Professional Services	.942	-2,123	.195	623	.591			
Manufacturing	.947	.944	.135	.456	.754			
Public Administration	.952	1.100	. 212	.355	.520			
Finance, etc.	.957	3.642	.676	.367	.770			
Services	.959	1,560	.532	. 210	.655			
Transportation, etc.	.960	1.587	.447	.237	.675			
Business Services	.962	-2.774	1.353	149	.667			
Entertainment Services	.963	4.108	2.890	.103*	.735			
Armed Forces	.963	.103	.108	.070*	.418			
Mining	.963	.827	1.117	.054*	.059*			
Forestry	.963	299	1.055	021*	015*			
Intercept		-574.189						

*Not significant at .05 level.

and manufacturing. Employment changes in these four industrial categories accounted for 10 percent of the variation of net migration. Taken as a unit, industrial changes of the five categories accounted for 95 percent of the variation of net migration, a one percent improvement over the occupational categories. The partial correlation coefficient of professional services, not only reversed the sign of the total correlation coefficient from positive to negative but also uncovered the real strength of the inverse relationship. This negative direction is also apparent in the sign of regression coefficient of this industrial category. This negative relationship is consistent with the relation obtained from the occupational category of professional, technical, and kindred workers. It is also consistent with the percentage change of employment in this industrial category (62.3 percent) and with the inference of migration selectivity.

Other Selected Variables and Migration

In this section one is concerned with a set of five variables which influence the decision of an individual to migrate. These five variables are (1) change in total civilian employment, 1950-1960; (2) change in total unemployment, 1950-1960; (3) estimated underemployment, 1960; (4) change in real median income of families and unrelated individuals, 1949-1959; and (5) change in armed forces personnel. Computation of results was achieved by the following multiple regression model.

 $m_i = B_0 + a_i E_i - b_i D_i + c_i A_i - f_i U_i + g_i R_i + e_i$, where a, b, c, f, and g are regression coefficients. Table 3 gives the basic results on the relationship between the five selected variables and migration.

Employment and migration. -- The basic goal

here is in testing the hypothesis that there is a direct relationship between changes in the number of employed civilians and net migration. This hypothesis is confirmed, since the regression coefficient and simple and partial correlation coefficients between net migration and changes in total employment are positive and significant at the five percent level. Moreover, the change in total civilian employment emerged as the first variable of importance by explaining 70 percent of the variance in migration.

Underemployment and migration. -- The hypothesis to be tested here states that migration is inversely related to underemployment. This hypothesis emerged to be true as shown by the partial correlation and regression coefficients. Although the total correlation is positive, the computation of the partial correlation reversed the sign and provided a higher association. The interpretation of this is that, other things being equal, the lower the number of man-years of economically utilized labor in these areas, the greater is the out-migration from them. With regard to the total variation explained in migration, underemployment was the second variable in importance where it accounted for 13 percent of variation in migration. These results lead to the conclusion that underemployment is useful in predicting net migration.

<u>Armed forces and migration</u>.--A direct relationship between changes in the number of armed forces personnel and net migration was hypothesized. This direct relationship is proved to be true, as provided by the zero order correlation, the partial correlation and regression coefficient in Table 3. All coefficients are significant at the five percent level. Moreover, changes in armed forces personnel seem to be a useful variable in predicting migration, for it accounted for more than one percent of the variation in miTABLE 3. CUMULATIVE R², REGRESSION COEFFICIENTS, STANDARD ERRORS OF ESTIMATES, AND PARTIAL AND SIMPLE CORRELATIONS BETWEEN NET MIGRATION OF PERSONS 25-64 YEARS OLD AND SELECTED VARIABLES IN EIGHT SELECTED OBEA'S OF THE UNITED STATES, 1950-1960

		es a C	oefficients of			
Selected	Cumulativo	Regression	Ctondord	Correlation		
Intercept	R ²	Intercept	Errors	Partial	Simple	
Employment	. 696	.976	.047	.831	.834	
Underemployment	.828	-1.269	.102	666	.196	
Armed Forces	.841	. 698	.159	.300	.418	
Unemployment	.843	-1,620	.908	127*	.606	
Median Income	. 844	. 369	.404	.065*	.371	
Intercept		411.015			en de la composition de la composition La composition de la c	

*Not significant at .05 level.

gration with a small magnitude of the standard error.

Unemployment and migration. -- The hypothesis to be tested states an inverse relationship between unemployment and net migration. This hypothesis is confirmed by the partial correlation coefficient and coefficient of regression. However, the partial association is not significant at the five percent level. This conclusion is consistent with other findings (Tarver, 1964a; Lowry, 1966). The association might be improved if the lagged relationship between unemployment change and migration were considered, for there is a time lag between unemployment as a cause and migration as an effect (Makower, et al., 1939). Our conclusion is that the change in unemployment as presented in this study is not a useful variable in the prediction of migration.

<u>Real median income and migration</u>.--The last hypothesis to be tested states a direct relationship between net migration and changes in real median income of families and unrelated individuals. Direction of the relationship is confirmed (Table 3). However, the relationship between the two variables became insignificant after the effects of the other variables (employment, unemployment, underemployment, and armed forces) had been removed, as given by the partial correlation coefficient. From this conclusion we can infer that changes in median income may not be very useful in explaining migration.

Summary and Conclusion

In this paper, a theoretical model which embraced those variables to which internal migration was believed to be most related was developed, and relationships were examined between net migration and the stated variables in the theoretical model. The analysis supports all hypotheses. The regression model which was fitted accounts for more than 95 percent of the variability in the 1950-1960 net migration of the eight selected OBEA's in terms of occupational and industrial changes, and 84 percent in terms of selected variables.

In conclusion, the authors believe that the theoretical model developed in this study proved useful in predicting net migration, and that its application to all the OBEA's of the United States will contribute to the refinement of our present knowledge of internal migration.

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