ECONOMIC FLUCTUATIONS & INTERNAL MIGRATION IN THE UNITED STATES

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INTRODUCTION

Investigations relating to factors influencing internal migration decisions contribute to better understanding of why people move and help to improve judgments about the extent and magnitude of future population adjustments. Such analyses permit insights into the relative importance of causal factors underlying population change.

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 represent one major group of factors influencing migration decisions. The level of economic activity in the whole economy is an important determinant included in this group. Another major group of causes stems from socio-cultural environment of the areas of origin of migrants and their anticipated evaluation of corresponding socio-cultural situations in the areas of potential in-migration. Migration decisions are also affected by information, costs, existence of programs of assistance and kindred factors.

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 non-observable, 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 reasonably small homogeneous age, sex and race groups.

It is hypothesized that the supply of net migrants from area A to the rest of the nation or to area A by the rest of the nation is a function of several variables, some of which are measurable and some of which are not. Mathematically we may write:

$$(I) \quad Y = f(X_1, X_2, \ldots X_k, Z_1, Z_2, \ldots Z_n)$$

Where Y represents the supply of net migrants, $X_1, X_2, \ldots X_k$ are k measurable variable and $Z_1, Z_2, \ldots Z_n$ are n non-measurable variables.

This paper is particularly concerned with analyses of internal migration in response to changes in economic activity. Hence, this study investigates the relationship between the rate of unemployment and the rate of internal net migration in a model of the form:

$$(II) \quad Y_{it} = \alpha_i X_t^{\beta_i} Z_t^{\gamma_i} e_{it}$$

where Y represents the rate of internal net migration, X the rate of unemployment, Z the non-observable omnibus variable representing all other variables, and e the residual term, the subscripts i and t denoting area and time interval respectively, and α, β and γ are elasticity parameters. Non-linear iterative least squares estimation procedure is used to estimate the model parameters and the non-observable independent variable Z.

Taking logarithms and minimizing Σe_{it}^2, the system of estimating relations is derived in the usual way. The results are given below. Note that x, y and z are deviations from the mean while corresponding capital letters X, Y and Z represent original values of the variables.

$$\hat{\alpha}_i' = \bar{Y}_i' - \hat{\beta}_i \bar{X}' - \hat{\gamma}_i \bar{Z}'$$

where

$$\bar{Y}_i' = \sum_t Y_{it}'/N_t; \quad \bar{X}' = \sum_t X_t/N_t; \quad \bar{Z}' = \sum_t Z_t'/N_t$$

$$\hat{\beta}_i = \frac{\sum_t z_t'^2 \cdot \sum_t y_{it}' x_t' - \sum_t x_t' z_t' \cdot \sum_t y_{it}' z_t'}{\sum_t x_t'^2 \cdot \sum_t z_t'^2 - (\sum_t x_t' z_t')^2}$$

$$\hat{\gamma}_i = \frac{-\sum_t x_t' z_t' \cdot \sum_t y_{it}' x_t' + \sum_t x_t'^2 \cdot \sum_t y_{it}' z_t'}{\sum_t x_t'^2 \cdot \sum_t z_t'^2 - (\sum_t x_t' z_t')^2}$$

$$\hat{z}_t' = \frac{\sum_i \hat{\gamma}_i y_{it}' - \sum_i \hat{\alpha}_i \hat{\gamma}_i - x_t' \sum_i \hat{\beta}_i \hat{\gamma}_i}{\sum_i \hat{\gamma}_i^2}$$

Empirical Model and Some Data Problems

The model was applied to state time series data covering six decades, 1900-10 through 1950-60, separately to each of the four color-sex categories further subdivided into five age groups. The dependent variable was the rate of internal net migration during the decade. For the measurable independent variable, the "aggregate" value X for each decade was taken as the unweighted arithmetic average of the annual average national unemployment rates. It was recognized that the proper variable to use would be some function of area A unemployment rate and national rate of unemployment or the rate of unemployment in those relevant major occupations in area A where out-migration was taking place and the rate of unemployment in those relevant major occupations in the principal labor markets in the nation into which the net migrant labor was moving. It was unemployment in these particular occupations in which in-migrants engage that was relevant for the purpose. Data considerations, however, precluded the use of such a strictly valid variable. The use of overall national unemployment rate instead would mean that the investigation pertained to the behavioral response of area population to general employment conditions reflecting the phase of the business cycle. [1]

Another important data issue was whether or not theoretical/empirical considerations warranted the imposition of constraints on the minimum and maximum values assumed by X. This aspect of the issue translated into a question of the type: Would the number of net migrants have been materially different if the rate of unemployment in any year during the depression decade was say 10 percent and not 18 percent? It might reasonably be hypothesized that for any given Z, there existed a certain ceiling level at which the adjustment process came to a halt and beyond which higher levels of unemployment would not at all materially affect net migration; and similarly, there existed a certain minimum level beyond which for any given Z, a fall in unemployment rate would not lead to any perceptible increase in the number of net migrants. That is for any given Z, the number of net migrants was influenced by unemployment rate varying within a certain range but it was completely inelastic beyond the end values of this range.

There is empirical evidence in support of these assumptions regarding the existence of a range of variation of X outside which higher or lower values have no further effect on net migration rate. For example, during periods of high unemployment rate, the availability of non-farm jobs to off-farm migrants is sharply reduced. As Schultz (1961, p. 562) observed:

> "The post-war behavior of the economy clearly indicates that the rate of off-farm migration is highly sensitive to changes in unemployment that have characterized these post-war booms and recessions in businesses. Sjaastad's study leaves little room for doubt on this point. Let me put this relationship as follows: when 5, 6 or 7 percent of the labor force is unemployed, the adjustment process under consideration is brought to a halt; on the other hand, when unemployment declines to 3 or 4 percent, off-farm migration becomes large."

Empirical Results

The results of the model using decennial average values for unemployment variable X for all the six decades based on unadjusted annual rates without any upper bound restriction (set (a) Table 1) proved puzzling. Table 2 shows that the signs of the response coefficients β i's pertaining to unemployment rate variable, X, in the case of net out-migration data was negative in nearly 50 percent of the cases. Normally, it should be expected that elasticity of net out-migration with respect to unemployment would be negative; that is, when the rate of unemployment went up, the number of net out-migrants should fall. When $|M_{it}|$ declined, $Y_{it} = 1 + M_{it} / E_{it}$ would rise since M_{it} was negative; and hence there was a positive relationship between Y_{it} and X_t. By identical reasoning one would expect inverse relationship between Y_{it} and X_t in the case of net in-migration. Hence β_i should be positive in net out-migration analysis and negative in net in-migration analysis.

Detailed scrutiny of the empirical results in the case of net in-migration data also showed that a high proportion of β's had positive signs contrary to what one would expect to find on theoretical considerations. Further, the distribution of the signs of β_i's was haphazard and there was no observable pattern of β_i's for individual states. In general, positive and negative β_i's were found for different age groups in each state. [2]

It was considered possible that the unsatisfactory results might be substantially improved if (i) the 1930-40 decade which had a very high value for X was kept out of the regression analyses (set (a) with 1930-40 out) or (ii) an upper limit of say, 7 percent was imposed on individual annual average rates of unemployment and the decennial average calculated accordingly (set (b)). Both these alterations were tried, but the final results did not indicate any substantial improvement and the haphazard distribution of signs of β_i's persisted. The proportion of β_i's,

Table 1. Unemployment Rates, Annual Averages, United States, 1900-1959[a]

Year of Decade	Unemployment Rate (percent) (X)					
	1900-09	1910-19	1920-29	1930-39	1940-49	1950-59
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0	5.0	5.9	4.0	8.9	14.6	5.0
1	2.4	6.2	11.9	15.9	9.9	3.0
2	2.7	5.2	7.6	23.9	4.7	2.7
3	2.6	4.4	3.2	24.9	1.9	2.5
4	4.8	8.0	5.5	21.7	1.2	5.0
5	3.1	9.7	4.0	20.1	1.9	4.0
6	0.8	4.8	1.9	17.0	3.9	3.8
7	1.8	4.8	4.1	14.3	3.6	4.0
8	8.5	1.4	4.4	19.0	3.4	6.8
9	5.2	2.3	3.2	17.2	5.5	5.5
Decennial average						
Set (a)[b]	3.7	5.3	5.0	18.3	5.1	4.2[d]
Set (b)[c]	3.5	4.9	4.4	7.0	4.0	4.2[d]

[a]Annual rate of unemployment calculated as number unemployed as percent of civilian labor force.

[b]Set (a): simple arithmetic average of annual values.

[c]Set (b): simple arithmetic average of annual values subject to $X = 7.0$ whenever $X \geq 7.0$.

[d]Annual rates up to and including 1958 are by old definition. Annual rate for 1959 is by new definition.

Sources of Annual Rates:
1900-1954: National Bureau of Economic Research. The Measurement and Behavior of Unemployment, Princeton University Press, 1957; pp. 215-16 (Table 1). Sources as indicated there: 1900-28 present estimates; 1929-39, Monthly Labor Review, July 1948; 1940-54, Bureau of Census. 1954-1958: Bureau of Census, Annual Reports on the Labor Force 1954, 1955, 1956, 1957 and 1958. 1959: Bureau of Labor, Labor Force, December 1959.

having signs contrary to expectation, was still round 40 to 50 percent.

Possible explanations for this unsatisfactory feature of the result might lie in:

(1) Unsatisfactory structural form of the assumed model. The product form of the model might be unsatisfactory insofar as X was concerned. The implicit assumption of constant elasticity might not be appropriate over the range of variation of X covered by the study in set (a). The fact that even considerable narrowing of the range of variation of X by (i) keeping out the 1930-40 decade or (ii) imposing an upper limit constraint on an individual year's unemployment rates at 7 percent did not improve the results might be viewed in support of this possibility. Besides the crucial assumption underlying the iterative procedure that all age groups were confronted with the same X_t and Z_t might not be appropriate and valid.

(2) High degree of correlation between X and Z or between X and some of the other variables contained in Z. Relative wage ratio is one of the major variables contained in Z and X and relative wage ratio might be regarded as being highly correlated. The degree of this correlation between X and Z might vary as between different age groups within a color-sex category in a state, thus resulting in the observed haphazard distribution of signs of β i's among age groups.

(3) Smallness of underlying parameter values. Estimated negative βi's in the case of net out-migration data might be considered as reflecting zero or small positive response coefficient not significantly different from zero.[3] The observed positive βi's in the case of net-in-migration data might be regarded in the same way. This did not, however, appear to be borne out by a detailed analysis of the distribution of signs and of magnitudes of βi's in the case of net out-migration data in Table 2. (Magnitudes of βi's are not shown but the relative picture can be inferred from the affected age groups.)

(4) Unsatisfactory aggregation procedure of using simple arithmetic average to obtain

Table 2 Analysis of Sign of β_i in Two Independent Variable Model, Net Out-migration Data

Region/state	White male age group (i)					White female age group (i)					Nonwhite male age group (i)					Nonwhite female age group (i)				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
New England																				
Maine	+	+	+	+	-	+	-	+	+	-										
New Hampshire		+	+	+	+	+	-	-		-										
Vermont	-	+	+	+	-	+	-	+	+	-										
Massachusetts	+		+	-	+	+		+	-	+										
Rhode Island			-	+	-															
Middle Atlantic																				
Pennsylvania	+	-	-	+	+	+	-	-	+	-										
East North Central																				
Indiana		-	+		-		+	+	+	-										
Illinois	-			-	+	-		-	-	+										
Wisconsin	+	+	-			+	+	+												
West North Central																				
Minnesota	-	+	-	-		-	-	-	+											
Iowa	-	+	+	-		+	-	-	+	+										
Missouri	+	-	-	+	+	-	-	-	+	+										
North Dakota	+	+	-	-	+	+	-	+	+	+										
South Dakota	+	+	+	-	+	+	-	+	-	+										
Nebraska	+	+	-	+		+	-	+	+	+										
Kansas	-	-	+	+		-	-	+	+	-										
South Atlantic & D. C.																				
Maryland											+			-	-	+			+	-
Dist. of Columbia	-		+	-																
Virginia							-	+	+	+	-	-	+	+	-	+	-	+	+	-
West Virginia	+	+	-	+		+	+	+	-	-	-		-	-	+	-	-	-	-	+
North Carolina	-	-	+	+	+	+	+	+	-	+	-	+	+		-	+	+	+	+	-
South Carolina		-	+	-	-	+	+	+	-	+	+	+	-	+	-	+	+	-	-	+
Georgia	-	+	+	-	-	-	-	+	+	+	+	+	+	+	-	+	+	+	-	+
East South Central																				
Kentucky	-	-	-	+	+	-	-	-	+	+	+	-	+	+	-	+	-	+	+	-
Tennessee	+	-	-	-	+	+	+	+	+	+	+	-	+		+	+	+	-	+	-
Alabama	+	+	-	-	+	+	+	+	-	-	+	+	+	-	+	+	+	+	-	
Mississippi	-	-	+	+		-	-	+	+	+	-	+	-	-	-	-	+	+	-	-
West South Central																				
Arkansas	+	+	-	+	+	+	-	-	+	+	+	+	+		-	-	+	+	+	-
Louisiana		-		+	+						-	+	-	+		-	+	-	+	
Oklahoma	+	+	+	-		+	+	+	-		+	+	+			+	+	+		
Texas											-	+	+				+	-	-	
Mountain																				
Montana	-	+	+	-	-	+	+	-	-	+										
Idaho	-	+	-	+		+	+	+	-	-										
Wyoming	+		-	+	-	+	+		+	-										
New Mexico						-	+		-	-										
Utah	+	+	-	+																
Total +	15	17	14	18	13	20	12	19	17	16	8	9	9	5	3	9	10	8	7	3
-	12	10	15	12	9	8	16	9	11	11	6	3	4	4	8	4	3	5	6	7
Grand Total	27	27	29	30	22	28	28	28	28	27	14	12	13	9	11	13	13	13	13	10

decennial value for X from the individual year's data. The unsatisfactory character might lie either in the type of average used (a geometric average might be regarded as more appropriate in a multiplicative model) or in the use of equal weights. Since individual year's X's varied greatly over each decade, the problem of weighting, when ignored, could cause serious distortions.

(5) Unsatisfactory nature of the national rate of unemployment as a valid proxy explanatory variable reflecting demand relevant for individual states.

Further Search for a Plausible Explanation

The empirical evidence in support of the indeterminate sign of the coefficient of elasticity of Y with respect to X was so overwhelming that it was necessary to look for suitable plausible hypothesis or hypotheses to explain the result.

Reverting to the initial relationship between Y, X and Z, we have:

(III) $Y = \alpha X^{\beta} Z^{\gamma}$

If X and Z are assumed to be independent, elasticity of Y w. r. t. X, $\epsilon^{(x)}$ is equal to β. If, however, X and Z were highly correlated, problems of multicollinearity might arise. Let Z be regarded as a function of X and ζ where X and ζ are independent. Let $Z = f(x, \zeta) = X^{\delta} \zeta^{\lambda}$. (III) may now be written as

(IV) $Y = \alpha X^{\beta + \delta\gamma} \zeta^{\lambda\gamma}$ Hence:

(V) elasticity of Y with respect to X, $\epsilon^{(x)} = \beta + \delta\gamma$

(VI) and elasticity of Y with respect to ζ, $\epsilon^{(\zeta)} = \lambda\gamma$

In this situation, the observed value of the response coefficient pertaining to X is really the value of $\epsilon^{(x)} = \beta + \delta\gamma$ and the observed value of the response coefficient pertaining to Z is really the value of $\epsilon^{(\zeta)} = \lambda\gamma$.

Hypothesis Regarding the Relationship Between Z and X

Z, the omnibus nonobservable variable is the overall representative of all possible explanatory variables affecting Y excepting X.

$$Y = \alpha X^{\beta} Z_1^{\gamma_1} \ldots Z_k^{\gamma_k} \text{ and}$$

$$Z^{\gamma} = Z_1^{\gamma_1} Z_2^{\gamma_2} \ldots Z_k^{\gamma_k}$$

Some of the Z_k's may have a high degree of correlation with X. In the previous section, what has essentially been done is to separate out all those Z_k's which are independent of X from those that are correlated with X and to replace the latter group by $X^{\delta} = Z_1^{\gamma_1} \ldots Z_j^{\gamma_j}$ and writing the remaining group by $\zeta^{\lambda} = Z_{j+1}^{\gamma_{j+1}} \ldots Z_k^{\gamma_k}$. It is important to note that nothing has yet been assumed for δ; some of the Z_j variables correlated with X may be inversely correlated and hence some of the γ_j's may be negative. Consequently δ which is a function of γ_j's may be positive or negative.

Consider the following hypothesis: Over the business cycle, the amplitude of fluctuations in the index of relative opportunity in net in-migration areas is less than that in areas of net out-migration.

It may be argued that as the rate of unemployment in the national economy increases, downward pressure on wages and other opportunity factors will be felt in both types of areas. In a net in-migration area, however, the burden of adjustment will partly be borne by potential in-migrants and will be felt in reduced net in-migration. Potential net in-migrants thus serve as an initial safety valve against the downward pressures on wages and other opportunity factors in net in-migration areas. In a net out-migration area, on the other hand, the downward pressure on wages, etc., caused by a general decline in economic activity is additionally reinforced by reduced out-migration. Similarly, in an upswing, the upward pressures on wages, etc., in net in-migration areas are partly neutralized by increased net in-migration. In a net out-migration area, on the other hand, the upward pressures on wages, etc. as a result of general economic expansion are reinforced by increased pace of out-migration.

On the above reasoning, the hypothesis states that during the upswing of the business cycle there is less tendency for the index of relative opportunity to rise in net in-migration areas than in net out-migration areas. Since the 'rest of the nation' in relation to a net in-migration area A will include net out-migration areas also, we would assume that wages and opportunity factors in area A rise less than the rest of the nation during the upswing of the business cycle. Z, the index of relative opportunity, will thus tend to fall. Similarly, for area A, a net in-migration area, wages and other opportunity factors will tend to fall less than in the rest of the nation in the declining phase of the business cycle. This means that the index of relative opportunity will tend to rise. Conversely, for a net out-migration area B, during the upswing of the business cycle, the upward pressure on wages and other opportunity factors will be more than that in the rest of the nation; hence, the index of relative opportunity would tend to rise.

In the declining phase of the business cycle, the downward pressure on wages, etc., in these areas will be more than in the rest of the nation, so that Z would tend to fall. The above hypothesis is, therefore, equivalent to $\delta<0$ for net out-migration and $\delta>0$ for net in-migration areas.

Let us use subscript (1) to denote net out-migration analyses and subscript (2) to denote net in-migration analyses. Let $\varepsilon_{(1)}^{(x)}$ and $\varepsilon_{(1)}^{(\zeta)}$ denote elasticity of Y with respect to X and ζ, respectively, for net out-migration areas; similarly let $\varepsilon_{(2)}^{(x)}$ and $\varepsilon_{(2)}^{(\zeta)}$ refer to net in-migration areas. We have

$$\varepsilon_{(1)}^{(x)} = \beta_{(1)} + \gamma_{(1)}\,\zeta_{(1)};\quad \varepsilon_{(1)}^{(\zeta)} = \gamma_{(1)}\,\lambda_{(1)}$$

$$\varepsilon_{(2)}^{(x)} = \beta_{(2)} + \gamma_{(2)}\,\zeta_{(2)};\quad \varepsilon_{(2)}^{(\zeta)} = \gamma_{(2)}\,\lambda_{(2)}$$

For net out-migration areas, $\beta_{(1)}$ is expected to be positive; but $\delta_{(1)}$ is expected to be negative on the basis of the hypothesis advanced in the earlier section. The sign of $\varepsilon_{(1)}^{(x)}$ will, therefore, be indeterminate only if $\gamma_{(1)}$ is positive. Similarly, for net in-migration areas, $\beta_{(2)}$ is expected to be negative; but $\delta_{(2)}$ is expected to be positive on the basis of the hypothesis of the earlier section. The sign of $\varepsilon_{(2)}^{(x)}$ will, therefore, be indeterminate only if $\gamma_{(2)}$ is positive. Thus, for both types of areas, a hypothesis that leads to $\gamma>0$ together with the hypothesis of the earlier section will serve to explain satisfactorily the observed haphazard distribution of ε's, i.e., of the coefficient associated with X in the empirical results.

γ is the power of Z term in the basic relationship $Y = \alpha \times {}^{\beta}Z^{\gamma}$. $\gamma>0$ implies direct relationship between Y and Z. One important variable covered in Z is the relative wage ratio and we may reasonably regard this as the dominant variable included in Z. The number of people who live in an area, divided by appropriate exposed to risk, Y, and the relative wage ratio, Z, are, by the following reasoning, directly related in net out-migration and net in-migration areas.

Thus, there exists a reasonably valid basis for the observed haphazard distribution of signs of the response coefficients associated with X. The hypothesis of the previous section together with expected positive sign of γ yields the desired results. $\varepsilon_{(1)}^{(x)} = \beta_{(1)} + \delta_{(1)}\gamma_{(1)}$, $\beta_{(1)}>0$, $\gamma_{(1)}>0$ and $\delta_{(1)}<0$; hence the sign of $\varepsilon_{(1)}^{(x)}$ is indeterminate. Similarly $\varepsilon_{(2)}^{(x)} = \beta_{(2)} + \delta_{(2)}\gamma_{(2)}$, $\beta_{(2)}>0\gamma_{(2)}>0$ and $\delta_{(2)}>0$; hence the sign of $\varepsilon_{(2)}^{(x)}$ is indeterminate.

Elasticity of Y with Respect to ζ

The empirical results showed that a very high proportion of coefficients connected with ζ carried a positive sign. $\varepsilon_{(j)}^{(\zeta)} = \gamma_{(j)}\,\lambda_{(j)}$ (j = 1, 2) and $\gamma_{(j)}>0$ (j = 1, 2). Hence $\lambda_{(1)}, \lambda_{(2)}>0$. Consequently, it must be assumed that Z and ζ are positively associated both in the case of net out-migration and net in-migration areas. ζ is the aggregate index of the net effect of all variables affecting wage ratio other than employment rate X, after the effect of X has been separated out of all those variables.

Unanswered Questions

In the above discussion, it has been implicitly assumed that the iterative procedure applied to Y, X data yields estimates of ζ, where ζ and X are independent. Little is known of the properties of the parameter estimates yielded by the two variable models or about the character of the nonobservable variable whose estimates are thrown up by the iterative process. In the nature of things, no empirical basis can exist for proving the character of ζ and its independence or otherwise of X.

Footnotes

[1] Segal (1962) faced a similar problem in investigating the influence of the strength of the demand for labor on occupational wage differentials. In the absence of reliable data pertaining to unemployment in individual areas, he also used national rates.

Jerome (1926, p. 54) observes: The cycle of employment is the aspect of the business cycle which is of direct meaning to the immigrant. It is the most tangible measure of the conditions affecting his economic welfare; and hence it affords the obvious and logical basis for appraising the influence upon migration of fluctuations in economic opportunities and the celerity with which immigration and emigration currents respond to such changes.

Jerome (1926, p. 121) further observes that: Inasmuch as good employment conditions would presumably encourage the prospective immigrant, ... we may reasonably assume, ... that business conditions are in fact a dominating determinant of cyclical fluctuations in immigration.

[2] Sjaastad (1961 p. 50) in his analysis of income and net migration in the United States also ran into a comparable situation. He found that "the unemployment coefficient, although erratic in

sign, is negative whenever significant, implying paradoxically that higher level of unemployment attracts larger shares of migrants; however the causation is probably the other way around, with the larger shares of migrants contributing to unemployment."

[3] Johnston's (1963) analysis also yielded some negative βi's contrary to expectation, but he regarded them as essentially nonsignificant.

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