

THE RELATIONSHIPS BETWEEN STRUCTURAL CHANGE OF STATE ECONOMY
AND INTERSTATE MIGRATION IN THE UNITED STATES: A REGRESSION ANALYSIS

by

SOO CHI PARK

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Approved by:


Major Professor

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES..... ii

Chapter

I. INTRODUCTION: THE PROBLEM AND SETTING 1

The Design of Study
The Hypothesis

II. CONCEPTS AND INDICATORS OF ECONOMIC STRUCTURE AND MIGRATION ... 8

Introduction
Regional Economic Structure and Change
Indices of Economic Structure: Shift Analysis of
Sectoral Employment
Interpretation of Migration Data
Approximation of Labor Mobility for Migration of
General Population
Summary

III. PRESENTATION OF A MODEL RELATING SECTORAL ECONOMIC CHANGE
TO NET MIGRATION 26

Introduction
Empirical Indicators of the Variable

IV. TESTING THE MODEL: SECTORAL INFLUENCE ON NET MIGRATION 30

Sectoral Influence and Total Prediction
Relative Influence of the Sector

V. CONCLUSION 45

Appendix

A. NET MIGRATION BY STATE: 1950-1960

B. SECTORAL EMPLOYMENT CHANGE: 1950-1960 (ADJUSTED BY SHIFT ANALYSIS)

C. COMPUTER PROGRAM

BIBLIOGRAPHY

LIST OF TABLES AND FIGURES

Table

I.	Interstate Migration as Percentage of Total Population	22
II.	Results of Stepwise Regression Analysis	31
III.	Sectoral Employment and Percentage Change in Employment	34
IV.	Net Change in Rural-Farm Population by Migration, United States and Regions, 1920-30, 1930-40, 1940-50	37
V.	Location Quotients for Manufacturing Employment with Respect to Population by Census Divisions, Selected Dates, 1899-1964 ...	39
VI.	Percentage Distribution of Sources of Personal Income: 1966	41

Figure

I.	Movers by Type of Mobility as Percent of the Population 1 Year Old and Over for the United States: April 1948-1967	23
II.	Reasons for Migrating Given by Males Aged 18-64 Who Changed Residence Between March 1962 and March 1963	42

CHAPTER I

INTRODUCTION: THE PROBLEM AND SETTING

The Design of Study

Migration represents the areal mobility of human population. It is considered the major mechanism in which the population redistributes itself spatially in response to different socio-economic opportunities and constraints. In the United States, approximately 20 percent of the nation's population is estimated to be affected annually by the migration process.¹

When people move from one location into another, it is noted that certain regularities tend to characterize the movement. This fact that -- migration is not a random behavior but subject to a certain systematic order -- has invited many attempts to generalize the motivational and behavioral pattern of migration, making it one of the most studied aspects of human behavior.²

A number of viewpoints are prevalent in the migration literature with respect to the way the various components of the forces affecting migratory patterns are identified and generalized. Even with the diversity of viewpoints that have emerged, a commonly shared viewpoint maintains that migration is a

1 The areal moves are classified on a distance scale; intracounty moves which usually involve a change of residence within commuting distance of a given job, intercounty shifts involving a change to a new job and interstate movement. The Bureau of Census defines the latter two movements, intercounty, or Intra-State movement, and Inter-State movement as migration. During 1950-1960, approximately 9 percent of the population was affected by Interstate movement. See U.S. Department of Commerce, Bureau of Census, "Current Population Characteristics," Series P-20, Np.171, April 30, 1968

2 Halil Sanli reported over 7,000 studies conducted by American and foreign scholars on the subject of human migration. See Halil Abiahim Sanli, "Effects of Metropolitan Area Attractiveness on Intermetroplitan Migration", unpublished Doctoral Dissertation, New York University, 1971, pp. 2

phenomenon related intimately to economic forces. It was manifest that except for a crude form of gravity model in which migration is strictly conditioned by the physical law of distance and population size, economic factors are invariably incorporated into theories of migration.

As a consequence, developing numerical parameters to determine the degree of association of economic factors with migration has been an area of extensive concern. Traditionally, the association was measured by employing one or combination of such indices as (1) areal differentials in wage and income, (2) local job vacancy rates, or (3) the rate of unemployment in the local labor force. Particularly, considering income level as a strong welfare indicator, scholars developed the hypothesis that interregional migration is a function of interregional differentials in wage and income level.

The so-called wage and similar economic theories of migration, however, have diminishing power in describing the economic aspect of migration. There are at least three reasons for this, all deriving from empirical observations of the migration activities in the U.S.. The first is the trend which indicates the narrowing geographical variations in wages and income over the past decades. The second is the surge of historical studies demonstrating that migration is less affected by local differences in wages and income than by what are presumed to be other social, demographic, environmental, personal as well as economic factors.³ A third is the time dimension in which the economic structure transforms itself from a labor-oriented operation into a capital-

3 As an example, Lloyd G. Reynolds has written; "...there are indications that geographical movement is mainly job oriented rather than wage oriented and migration sometimes occurs in the face of adverse wage differentials", See L.G. Reynolds, "The Impact of Collective Bargaining on the Wage Structure in the United States," in the Theory of Wage Determination, J.E. Dunlop, ed., St. Martin's Press, New York, 1967. pp.218

oriented operation. Here the income index of the labor force will not reflect the general economic condition of the region.

These evidences obviously point to the fact that the income and related elements are partial and isolated indices and, when placed against the total picture of areal economy, provide insufficient information as to the overall dimension of the economic force as it relates to migration.

The need for developing a comprehensive index to measure the attributes of the economic force behind migration has been justified for a long time. One of the concepts devised to meet the need is the so-called "regional attractiveness" concept. Incorporating various economic factors into other social and environmental variables, it appears to hold conceptual appeal as a proxy for the quality of living environment for geographical areas both social and economic. The problem it presents, however, is how to quantify the various factors in question in objective fashion. Attempts to isolate economic factors from indices of "regional attractiveness" are weak and fail to comprehensively represent the economic condition of regions.

This study is, basically, an attempt to identify the economic force of migration from a different position. The major element in this position is that the pattern of the population convergence in various geographical regions is primarily the result of the economic changes that take place in different regions. The scope of the paper will deal with the parameter of the economic change primarily in terms of the change in the income-generating structure of the regional economy and relate it to regional variations in net migration. Careful examination will be made of the attributes associated with each structural change in relation to its influence on net migration activity. Ultimately, it is designed to develop a model that can determine numerically the relationship between net migration and structural change in the regional economy.

The design of the paper will first advance the hypothesis that net migration is intimately related to change in regional economic structure. For empirical observation, it will then demarcate each contiguous state in the United States as a geographical region. It will, next, observe by the method of statistical inference the possible interactions between the structural change in state economy and interstate net migration activity. The observation will be made over the time period from 1950 to 1960. In this way, it will attempt to ascertain whether there is any systematic relationship between changes in economic structure and the movement of population, and if there is, try to measure this relationship.

The organization of the paper will be as follows: It will elaborate in the Chapter I the hypothesis. Conceptual basis to approximate structural change in areal economy will be discussed in Chapter II, together with interpretative problems in migration data and justification for approximating labor force movement for general population migration. Basic principles in model building will also receive reference in this chapter. Chapter III will be devoted to building a multiple regression model with nomenclature of variables and a mathematical statement to specify the relationship among the variables. Chapter IV will be a discussion of major findings from the study. The shortcomings, limits and contributions of this model will be discussed in the final chapter. The organization reflects this paper's concern with the economic side of migration and developing a framework in which structural change in areal economy can be considered as an influence upon migration. Accordingly, it is not a thesis developing a model which deals with generalized migratory patterns. Rather, the outcome of this study may hopefully provide an economic index that can be incorporated as an explanatory variable in the prevailing multivariate migration models.

The Hypothesis

This study views migration basically as an economic phenomenon. It is based upon the assumption that migration occurs in individual pursuit of economic well-being and that population flows from economically less attractive into attractive regions.

As stated earlier, this study also assumes that the change in the income-generating structure in the regional economy is an effective index to determine the general economic viability of regions. This proposition is derived from the historical observations that the regional economic personality and strength is characterized for the most part by the relative position of various income generating structures in the economy. It is apparent that the changes in resource endowment, market relations, production technology, supply of labor force and a host of other factors that prevail in the region affect the income-generating structure constantly. What is considered the most salient attribute of the change in each income-generating structure is its growth behavior. In particular, the multiplier effect of the change is considered to generate a far-reaching effect upon the quality of the total economic environment for the region. The change in regional economic structure, primarily represented by the growth behavior, is consequently indicative of the regional economic attractiveness in terms of economic opportunity and, to some extent, economic well-being. It also appears that the structural change of the economy takes into account the spatial characteristics of the region, environmental, institutional and cultural, which are conducive to the growth. When we view migration as the spatial response of the population to varying economic opportunities, it is possible to postulate that the change in the income-generating structure in the economy has a different quantitative and qualitative influence upon net migration.

The possible impact of the change in the income-generating structure upon migration is not a concern of recent origin. The effort to probe into the relationship between them was notably represented by studies examining the impact of agricultural sector of the economy upon migration. It was well known by the studies that because of the low returns to human efforts, very low income and associated areal characteristics plus the rapid pace of urbanization; agriculture has become a positive sector of the economy responsible for out-migration of people.⁴

A more recent study concerning the relation was conducted by Robert Raimon. According to his study, matching 1950 to 1957 percent changes by states in employment volume of productive workers of all industries against the percent change in net migration by state provided a rank correlation coefficient of .89.⁵ This is an evidence of a significant relationship existent between migration and change in industrial employment.

Harvey Perloff and his associates have done an extensive research on the regional influence of industrial activities. In the analysis of regional economic growth in the U.S. from 1870 to 1954, they devoted considerable attention to the implications of industrial structure and change for geographical shift of the population. Their findings showed that significant secular changes in the industrial structure held positive correlation with regional income level and, ultimately, upon in-migration or out-migration of people.⁶

4 See Dale E. Hathaway, "Migration from Agriculture: The Historical Record and Its Meaning", The American Economic Review, Vol.49 (May 1960) pp.474-486

5 Robert L. Raimon, "Interstate Migration and Wage Theory", The Review of Economics and Statistics, XLIV (November, 1962) pp. 428-38

6 Harvey S. Perloff et al., "Regions, Resources and Economic Growth", The Johns Hopkins Press, Baltimore, 1960, pp. 489-600

Studies thus illustrated, although indirectly referring to the influence of economic structural change upon migration, all allude to the possible relationships between them. It may be a deserving attempt to extend the notions implicit in the earlier studies and try to determine how change in each sectoral activity in the overall regional economy influences net migration activity. Considering change in economic structure as highly related to net migration, it may be also possible to ascertain which income-generating sector of the economy should be supported in attempts to retain population or to stem population growth.

The hypothesis to be pursued by this paper, accordingly, is that interstate variations in net migration is a function of the changing state economic structure. Symbolically, it may be expressed as follows:

$$M_n = f(E)$$

where: M_n = net migration

E = change in sectoral economic structure in each state

CHAPTER II

CONCEPTS AND INDICATORS OF ECONOMIC STRUCTURE AND MIGRATION

Introduction

This chapter, reflecting the study scheme outlined previously, will discuss concepts and procedures necessary to design a model to test the hypothesis. As this involves the articulation of the operational basis for building the model, it appears appropriate to summarize the general principles in model building.

The first problem in model building is concerned with how to reduce the complexity of real world phenomena into basic relations among relevant variables. This is typically accomplished by expressing the relations and their structures in a rigorous mathematical language and equation. (For this reason, model is commonly defined as "the mathematical statement of observed relationships"⁷ or "logico-mathematical construct of interrelated variables"⁸.) By the transformation of the complex real world relations into a basic skeleton, two advantages can emerge: (1) the reality becomes analytically manageable and (2) clearer understanding of their attributes and interactions can be obtained.

The second problem in model design is concerned with how to determine the property of the model the designer wants to build. The determination is neces-

7 Voorhees Alan M., "The Nature and Uses of Models in City Planning", Journal of American Institute of Planners, XXX (May, 1965) pp. 57

8 Lowry Ira S., "A Short Course in Model Design", Journal of American Institute of Planners, XXX (May, 1965) pp. 158

sary because, depending upon the designer's purpose, the nature of the model will differ. Lowry has grouped models into three categories according to their property: descriptive, predictive and planning.⁹ According to him, if a model is designed to "simulate the relevant features of existing relations or an already observed process of changes",¹⁰ it is a descriptive model. A variety of simulation models fall into this category. If a model is designed to logically establish a causal relation among variables and obtain the future value of the "effect" from the future value of the "cause", it is called a predictive model. Lowry cited the so-called impact analysis as a typical conditional predictive model. Finally, if a model is designed to assist model builder with developing several programs and determining the most optimum alternatives, it is a planning model. Linear programming is listed as the best known planning model. As the significance of model building is to serve the researcher's intention of investigation, with different methods of solution anticipated, the determination of its basic character is essential.

The third process in model building is concerned with the problem of "fitting a model". In rare case, historical and real world situations exactly benefit the theoretical perspective and logical framework developed by a researcher. This raises the problem of accommodating existing data into a model framework. Typically, this problem is resolved by approximating historically available data for a proxy satisfying a specific research design and model paradigm. Caution is required at this point to keep the existence of regularities among relations from being distorted by the employment of proxies.

9 Lowry, Ira S., op. cit., pp. 158-166

10 Ibid., pp. 159

Finally, a model, thus formulated, must be tested in order to determine whether it holds relevance to the real-world system. The criteria for testing the performance of a model vary depending on its property. But the limitations of the model is apparent when its structure and parameters is so closely locked into the pattern evident in a particular area and time that it has no generality to apply to other situations. In this case, the model fails.

The model developed in this paper is basically a descriptive one designed to describe the interrelationships between economic changes and net migration. A high significance of statistical value at regression, however, may make it possible to attempt prediction. The prediction will be operative when the logical relationships between the variables is fully identified.

Taking these principles into account, the discussion of this Chapter will relate primarily to the problems of identifying basic indices of regional industrial structure and change, of interpreting migration data, and of approximating basically labor mobility for migration of general population.

Regional Economic Structure and Change

Studies in regional economic structure and change can be categorized in at least two ways, as (1) those which deal primarily with theoretical questions of regional development and growth, and (2) those which, largely taking theory as given, are concerned with defining specific operational indices of change and growth. The first task of this paper, largely taking theory as given, is to organize a conceptual construct in which sectoral changes in areal economy can be approximated for an indicator of economic force behind migration. This involves basically the search for the operational indices to define and measure the major components of the spatial structure of the economy and their changes over the time.

Identification of the major components of the spatial structure of economic activity proceeds from the study of relative resource domination of regions, the economic factors of production and the returns to them, and the distribution of employment among sectors of the economy. As stated earlier, the basic economic structural components of regions may be augmented by considerations of the environmental and social characteristics of the region. Identification of processes of change requires examination, perhaps from a normative viewpoint of equity and efficiency criteria or within an equilibrium/ disequilibrium framework, of the uneven spatial distribution of increases and decreases in economic output, employment and welfare.

Against this background, one approach to the measurement of spatial economic structure is the characterization of stages of economic development as functions of the evaluation and exploitation of regional resource endowments at different point of time. Perloff and Wingo have identified such stages in the history of the United States' economic development.¹¹ In the first such stage, resources involved in agricultural production were of greatest importance for regional development: arable land, favorable climate and water. The second stage was one of the relative dominance of mineral resources, with the growth of primary processing industries. The third and most recent stage of resource evaluation was characterized in two ways: first, as a period of "amenity resource" and, second, as a period of growth of "footloose" activities. The Perloff and Wingo analysis suggests the classification of economic activity as measured by the amount of employment, value added and personal income contributed by various occupational categories, into their major resource

¹¹ Harvey Perloff and Lowdon Wingo, Jr., "National Resource Endowment and Regional Economic Growth", In National Resources and Economic Growth, ed. by Joseph J. Spengler, Resources for the Future, Inc., Washington, 1961, pp. 191-212

types: agriculture-oriented, mineral-oriented and amenity-oriented.

An alternative approach to the measurement of spatial structure of economic sector derives from the view that regional levels of economic and sectoral change are a function of the efficiency of operation of regional capital and labor market. Using this approach, Nicholls attempted to explain county per capita non-agricultural payrolls as an index of economic welfare in terms of population density, per capita value added in manufacturing, per worker gross farm income, and per worker farm capital investment.¹² The factor-market approach seems to concentrate on income and productivity measures.

A third approach to spatial economic structure is exemplified by Friedmann's study of the Tennessee Valley region.¹³ He investigated the patterns of technological innovation, changing social organization, natural resource endowment, and the changing value system of the population. Paying particular attention to the spatial distribution of the labor force, he found that specialized employment in manufacturing and tertiary activities was concentrated spatially, as opposed to the more nearly ubiquitous distribution of the agricultural labor force. The activity sector approach to spatial economic structure emphasizes detailed employment distribution data.

Each of the above approaches represents a partial approach to describing the regional spatial structure of economic activity. Combined, however, they may suggest a reasonably comprehensive set of variables for which data should

12 William H. Nicholls, "Industrialization, Factor Markets and Agricultural Development", Journal of Political Economy, LXIX (August, 1961), pp. 319-330

13 John Friedmann, "Spatial Structure of Economic Development in the Tennessee Valley: A Study of Regional Planning", Department of Geography Research Paper, no. 39, University of Chicago, Chicago, 1955

be generated in the analysis of migration and regional economic strength. The efforts to aggregate these variables are varied: A compilation of state historical data estimates was attempted by Lee and his associates.¹⁴ An input-output analysis was tried by Moses to observe the trading patterns on inter-regional basis.¹⁵ The regional accounts framework was designed by Leven as an effort to organize these variables and broad economic categories.¹⁶ He established the framework using the following set of data:

- (a) Agriculture: Number employed
- (b) Manufacturing: Number employed (totals in durable goods and non-durable goods) and value added (total and per worker)
- (c) Tertiary: Number employed in wholesale-retail trade and in construction
- (d) Unemployment

The net results by these efforts provide valuable suggestions as to a comprehensive understanding of the regional economic activities and change. But it will be difficult to claim that they create an exhaustive basis for defining these economic variables as related to migration.

Indices of Economic Structure: Shift Analysis of Sectoral Employment

This paper places emphasis upon shifts in employment patterns as evidence of all changes taking place in the regional structure of the American economy.

14 Everett S. Lee et. al., "Methodological Considerations and Reference Table", Vol. I of Population Redistribution and Economic Growth: United State, 1870-1950, American Philosophical Society, Philadelphia, 1957, pp. 59

15 Charles L. Leven, (ed.), "Design of National System of Regional Accounts", Institute for Urban and Regional Studies Working Paper DRA-9, Washington University, St. Louis, 1967

16 Leon Moses, "The Stability of Interregional Trading Patterns and Input-Output Analysis", American Economic Review, Vol. 45 (Dec., 1955), pp.803-832

The best over-all view of the regional distribution of economic activity and its change is provided by the employment data, for they enable one to study in detail what has been taking place in specific sectors of economic activity. It will be misleading to argue that employment will reflect all of the factors determining the comparative economic importance of industries in the regional economy. But it provides the only uniform basis for measuring and comparing the distribution and changes of all types of economic activities¹⁷

The type of economic change that occurs within a given region depends mainly on two things: (a) the economic activities that are subject to the nation-wide change and (b) the nature of the given region. This suggests that development of indexes covering regional economic changes must be viewed against the background of the national economy and in relation to the developments in other competitive regions. Perloff and his associates, in the study of the regional economic development patterns in the United States, sharpened the idea.

According to them, to understand change in economic structure within a particular region, it is necessary (1) to relate the region's development to developments in the nation as a whole; (2) to "weight" its growth in relative terms -- that is, in terms of departure from the national norm; (3) to examine the characteristics of its growth pattern; (4) to evaluate its changing position with regard to its ability to hold and attract population and economic

17 Furthermore, in some ways employment is a better measure of relative importance of activity than either "value of products" or "value added", which are available for manufacturing only. While employment alone is far from a perfect measure of relative changes and importance in economic activities, it would seem to be the best measure, and employment changes are the most significant and uniform indicator of the change in regional industrial structure. See Harvey S. Perloff et al., "Regions, Resources and Economic growth", The Johns Hopkins Press, Baltimore, 1960, pp. 295

activities and (5) to study how it reacts to changes in the national "parameters" that influence supply and demand conditions for the major industrial activities.¹⁸

The operational advantage of employment is apparent at this point; it provides a methodological basis for clarifying, measuring and explaining these problems. This is possible through the elaboration of the statistical technique called shift analysis. The technique is based upon the fact that the shifts in total employment observed among the states and regions in relation to the national average are generated by two distinct types of phenomena called regional share effect and industrial mix effect. The regional share effect in employment arises from the fact that some regions are expanding in certain employment sectors (e.g., the steel industry or personal services) more than other region. The regions that show upward share effect are those in which over-all access to basic inputs or to markets has been improved relative to other regions engaged in the same activity; they have gained because of their greater locational advantages for the operation of given activities or industries.

Industrial mix effect is distinct from regional share effect. It arises from the fact that, nation-wide, some of the employment sectors or industries expand more rapidly than others. As a consequence, those regions that tend to specialize in the slow-growth sectors (e.g., agriculture) show net downward industrial mix effect in total employment, while those that tend to specialize in the rapid-growth sectors show upward industrial mix effect.

The over-all range of problems to be covered by this method is extensive.

18 Harvey Perloff et. al., op. cit., pp. 295-306

they include: (1) why have some sectors of the economy grown more rapidly than other? (2) where are the rapid-growth and slow-growth sectors located and why? (3) why do some employment sectors of the national economy expand more than other? (4) why does the same employment sector expand more rapidly in some regions than in other?¹⁹

Identification of the two sources of change in the regional structure of the economy, competitive effect and industrial mix effect identified by this technique, provide the most useful device for analysis of all of these factor.²⁰ In other words, the regional share effect reflects the fact that some regions gain, over time, a differential advantage vis-a-vis other regions in their access to important markets and production inputs and other locational advantages. The industrial share effect is suggestive of the total demand and supply relationships, changing tastes, technological developments in relations to the national whole and to specific regional circumstances. In this way, the shift analysis presents a greater magnitude of the personality and changes characterizing the regional economic structure. The spatial implications of these economic parameters reflected by this method is especially suggestive. The analytical clarity associated with this method has proven in many studies.²¹ Considering these operational advantages, it can be stated that it will give an inclusive index of regional economic force as a determinant

19 Harvey Perloff et. al., op. cit., pp. 305-306

20 When a long run analysis of economy is involved, changes in production technology and methods of business operation may have accelerated the transformation of economic organization from a labor-intensive to capital-intensive form. In this case, it will be unadvisable to use the shift analysis because the index of labor force changes, however sophisticated, will not be a realistic measure of the whole structural changes that might have occurred. For this reason, shift analysis is effective when short run analysis is involved.

21 A notable example is the work of Perloff and his associates, from which this discussion is heavily drawn. See Harvey Perloff et. al., "Regions, resource and Economic Growth", Resources for the Future, Inc., Washington, D.C., 1960

of the patterns of net migration.

Conceptually, shift analysis is designed to identify and measure the spatial allocation of three components of economic growth. The three components are: (1) that part attributable to national growth, (2) that part attributable to the difference between rates of growth of the mix of activity in the region and the national rate of growth of industrial activities, and (3) that part due to differences between rates of growth of the industries within any particular region and the rates of growth of the same industries in other regions.²² Symbolically, this may be expressed as follows:

$$D_{ij} = G_{ij} + K_{ij} + C_{ij}$$

where: G_{ij} = the national growth element for industry i in region j

K_{ij} = the industry mix effect for industry i in region j

C_{ij} = the regional competitive effect for industry i in region j

D_{ij} = the absolute change in employment between two points in time for industry i in region j

Interpretation of Migration Data

Traditionally, there are two broad categories in viewing the spatial aspect of human mobility. The first is represented by the so-called socio-economic push-pull theory. This theory hypothesizes that migration results from socio-economic imbalance between geographical regions. It holds that migration tends to proceed from less to more attractive areas and that the inter-regional factor mobility is a force equalizing prices for homogeneous factors

22 Brian Berry and Frank Horton (ed.) "Geographic Perspectives on Urban Systems: with Intergrated Reading", Prentice-hall, Inc., New Jersey, 1970, pp. 94-105

in different regions.²³ The socio-economic push-pull theory presupposes the existence of spatial disequilibrium in economic and social opportunities and interpretes migration as individual response to the disequilibrium. The conceptual assumption behind the push-pull theory is suited for explaining variations in net migration among regions.

The second view of migration behavior is represented by the gravity model. It maintains that migration activities arise from the forces centering on the cost of movement and the number of persons available to move.²⁴ The gravity model attests to the predominance of distance and population size as the distinctive force behind migration. Originally, the gravity model, in its general form $I_{ij} = \frac{M_i M_j}{D_{ij}}$, has been used in interaction analysis, including exchange of persons, goods and information. Simply stated in human migration terms, the concept states that migration between two places, i, j , is related directly to the product of sizes of these places and inversely to the distance separating the two places, D_{ij} .²⁵ The original model has undergone various modifications to meet varying theoretical needs and real-world situations. One example of the modification is Stouffer's "intervening opportunities" concept". Denying the direct relevance of the distance factor in the $\frac{M_i M_j}{D_{ij}}$ formula, he substituted for it the notion of intervening opportunities, proposing that the number of persons migrating a given distance is directly proportional to the

23 Theodore R. Anderson, "Intermetropolitan Migration: A Correlation Analysis", The American Journal of Sociology, LXI (March, 1956) pp. 459-62

24 Gerald A. P. Carrothers, "An Historical Review of the Gravity and Potential Concepts of Human Interaction", Journal of American Institute of Planners, XX (Spring, 1956) pp. 94-103

25 See John G. Steward and William Warntz, "Physics of Population Distribution", Journal of Regional Science, I (Summer, 1958), 99-123 and Georgy K. Zipf, "The $P_1 P_2 / D$ Hypothesis: On the Intercity Movement of Persons". American Sociological Review, XI (December, 1946), pp. 677-86

number of opportunities at that distance and inversely proportional to the number of intervening opportunities.²⁶ To some extent, the gravity theory is relevant to explaining net migration patterns. But it is more inclined to describe total migration activities.

In recent studies, the theoretical distinction between these two approaches is not quite rigid. Most migration researchers commonly focus on the distance/population variables and economic and other regional attractiveness variables for distinctive subjects of inquiry. One author called the model combining these approaches a multivariate migration model.²⁷

Within this theoretical boundary, three distinctions were identified with measuring migration: (1) quantitatively, whether migration is expressed as a volume or a rate; (2) locationally, whether migration is recorded at one place at a time, or between pairs of places; and (3) directionally, whether total flows or net population shifts are at issue.²⁸

Migration rates signify the numerical expression of the relative significance of particular flows as proportions of a total migration or population system. The problems associated with migration rates are; firstly, they provide nothing about the magnitude of the system itself. Secondly, they are significantly affected by both the size and shape of spatial units chosen for study. Lee states that "in general, the greater the size of spatial unit by which migration is defined the smaller the number of migrations".²⁹ Isard warned that

26 Samuel A. Stouffer "Intervening Opportunities: A Theory relating Mobility and Distance", American Sociological Review, Vol.V (December, 1940)

27 Haril Sanli, op.cit..

28 Paul J. Schwind, "Migration and Regional Development in the U.S.: 1950-1960", University of Chicago Department of Geography Research Paper, 1971, pp.133

29 Everett S. Lee et. al., op. cit., pp. 1

even when a given type of political or administrative unit has been selected for migration study, frequently, the area varies greatly among units of the given type. For instance, as of 1967, the largest state in the United States was over 200 times the size of the smallest. Hence, migration rates based on the state as the relative political unit are not comparable; they are biased toward high values in the very small states and toward low values in the very large states.³⁰ Even among states of equal size, disparity of shape also introduces bias. According to Isard, Ohio and Tennessee have approximately the same area, yet because of Tennessee's elongated shape, more short migration cross the state line than they do for Ohio.³¹

Concerning measurement location, Lowry advised that measuring and forecasting migration at one location at a time is simpler and more useful as a planning tool than for pairs of places.³² He, however, qualified the statement by saying that measurement for pairs of places may be useful to those who are concerned with regional interactions and groupings.

On the third distinction, it was argued that "the total amount of movement" of population may be of greatest interest to the student of aggregate population mobility, but to speculate on the relative attractiveness of regions, it is not of great use. Instead, net direction of migration between places, which may be representative of the net preference expressed by all migrants during a given time period, is noted as more suggestive.³³

30 Walter Isard et. al., "Methods of Regional Analysis", the M.I.T. Press Cambridge, 1960, pp. 153

31 Ibid., pp. 154

32 Ina S. Lowry, "Migration and Metropolitan Growth: Two Analytical Models", Chandler Publishing Co., San Francisco, 1966, pp. 61-64

33 Paul Schwind, op. cit., pp. 4

It is apparent from the interpretation of the migration data that the analytical purpose of this study can best be served by net migration flow. The reason is that the locational preference of the population is best expressed by the net migration data, which are specified by the difference between total population change and that portion of the change due to national increase (births minus deaths).³⁴

In the similar fashion, actual number of persons that migrated during the specified time period was used. This is to reflect more fully the total volume involved in the interaction and to reduce the bias in estimating interstate migration level that might arise from the irregular size of each state.

Approximation of Labor Mobility for Migration of General Population

During the 1950's, the proportion of movers was estimated to be about the same from year to year in the U.S. -- approximately twenty per cent of the nations population. Analysis of this proportion shows that the largest component of the movement, about thirteen per cent of the population age one year and over, was of the intracounty type. Another group, numbering some five and one-half million persons each year or between three and four percent of the population age one year and over, were intercounty migrants within the same state. The third group, the one of central concern to this paper, those who moved across state lines, were of the same size and proportion as the intercounty movers. Table I contains the decadal percentage of interstate migration.

The recent record reveals a stability in the rates for various types of

³⁴ This calculation is based on indirect measurement. There is direct measurement which records and counts movements across a boundary between an origin area (e.g., place of birth) and a destination area (present residence). See Walter Isard et. al., "Methods of Regional Analysis"

movement. Figure I in the following page depicts this record for the past 18 consecutive years for which the relevant data has been collected. It shows also that about two-thirds of the moves are within the same county, less than one-six are to another county in the same state and approximately one-six are to another state.

TABLE I

INTERSTATE MIGRATION AS PERCENTAGE OF TOTAL POPULATION

<u>year</u>	<u>percentage</u>	<u>year</u>	<u>percentage</u>
1850 - 1860.....	11	1910 - 1920	7
1860 - 1870.....	8	1920 - 1930	7
1870 - 1880.....	7	1930 - 1940	4
1880 - 1890.....	6	1940 - 1950	9
1890 - 1900.....	7	1950 - 1960	9
1900 - 1910.....	7		

Source: Ben J. Watterberg and Richard M. Scammon, "This U.S.A.", Pocket Books, New York, 1960, pp.136

Estimates by the Bureau of the Census of net population migration by state, however, do not separate labor force members from non-members. These estimates are useful for present study only when there is evidence that interstate mobility patterns are traced predominantly through members of employment. The evidence which follows is designed to support such an approximation.

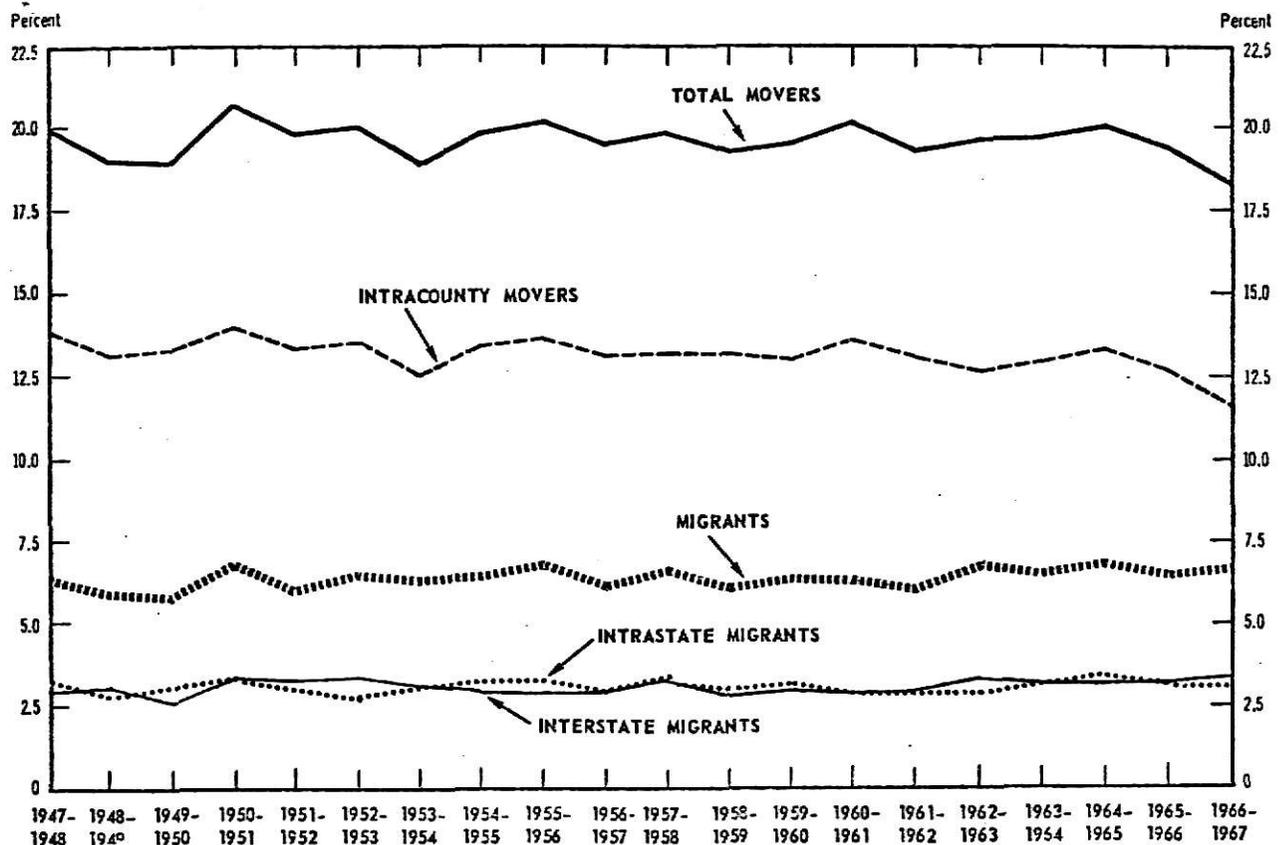
As local labor force market studies universally have found that most of the job changing is done by short-service personnel, usually young persons, so with respect to interstate mobility, one finds that most of the moving is done by the young.³⁵ Between April 1958 and April 1959, for example, almost eight percent of

³⁵ The argument was advanced by Robert Raimon in "Interstate Migration and Wage Theory", Review of Economics and Statistics, XLIV (November, 1962) pp. 428-438

the men and women between the ages of 20 and 24 changed states as against a little less than three per cent of the total population age one year and over. The 25-29 groups are the next most mobile with seven per cent made interstate moves.³⁶ These persons in their twenties, while accounting for 12 percent of

FIGURE I

MOVERS BY TYPE OF MOBILITY AS PERCENT OF THE POPULATION 1 YEAR OLD AND OVER FOR THE UNITED STATES: APRIL 1948-1967



Source: U.S. Bureau of Census, Current Population Reports, "Population Characteristics", Series P-20, No. 171, April 30, 1968, Cover

³⁶ Bureau of the Census, Current Population Reports, "Mobility of the Population of the United States," March, 1957-1958, Series pp.85

the total civilian population, accounted for 30 percent of the interstate migration. For those 45 and over, the age-specific mobility rate declines to less than 1.3 per cent. Still more numerous in interstate migration than the group of young adults in their twenties, were children. The detailed figure is presented in the table A. Thus, if one includes the numbers of the families of labor force members as associated with the labor force for present study, the age data on migration suggest that labor force members and their families, with whom they might normally be expected to travel, predominate in interstate migration flows.

To take another example from the Census reports, it showed that from April 1954 to April 1955, 2,450,000 males of all ages, are one year and over, changed states. Of these, 1,789,000 were age 14 years or over, among whom 83 per cent were members of the labor force.³⁷ It would seem reasonable to assume that those not members of the labor force were either boys or retired men, with virtually all of the boys and many of the aged persons having changed states in the company of heads of families who themselves were members of the labor force.

Finally, the evidence that it is the labor force members and their families who dominate interstate migration stream is strengthened by the close correspondence between changes over time in employment volume by state with changes in interstate populations resulting exclusively from net civilian migration. Raimon has demonstrated a rank correlation coefficients of .89 between these factors for the 1950-1957 period.³⁸ Perloff and his associates showed that the rank correla-

37 Bureau of the Census, Current Population Reports, "Mobility of the Population of the United States, April, 1954 to 1955", Series P-20, No. 61

38 Raimon, Robert L., "Interstate Migration and Wage Theory", Review of Economics and Statistics, SLIV (November, 1962) pp. 429

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TABLE-A: LABOR FORCE STATUS, MARITAL STATUS, AND AGE OF THE CIVILIAN MIGRATION 18 YEARS AND OVER, BY MOBILITY STATUS AND TYPE OF MOBILITY, FOR THE U.S. MARCH 1958

Age, marital status, and labor force status	Total civilian population	Same house (nonmovers)	Different house in the United States (movers)					Abroad on March 1, 1957
			Total	Same county	Different county (migrants)			
					Total	Within a State	Between States	
Total, 18 years old and over.....	57,679,000	46,662,000	10,756,000	2,256,000	3,478,000	1,739,000	1,759,000	213,000
Married, spouse present.....	38,981,000	31,506,000	7,475,000	1,742,000	2,592,000	1,235,000	1,267,000	131,000
Labor force.....	11,816,000	9,107,000	2,709,000	570,000	836,000	335,000	299,000	33,000
Not in labor force.....	27,165,000	22,399,000	4,766,000	1,172,000	1,756,000	900,000	968,000	100,000
Other marital status.....	18,698,000	15,156,000	3,542,000	2,314,000	728,000	504,000	492,000	80,000
Labor force.....	9,381,000	7,468,000	1,913,000	1,457,000	456,000	270,000	265,000	56,000
Not in labor force.....	9,317,000	7,688,000	1,629,000	857,000	272,000	234,000	227,000	24,000
18 to 24 years.....	7,651,000	4,504,000	3,087,000	1,976,000	1,111,000	519,000	522,000	60,000
Married, spouse present.....	4,076,000	1,805,000	2,271,000	1,462,000	778,000	356,000	422,000	31,000
Labor force.....	1,243,000	507,000	736,000	506,000	226,000	119,000	107,000	6,000
Not in labor force.....	2,833,000	1,298,000	1,535,000	956,000	552,000	237,000	315,000	25,000
Other marital status.....	3,575,000	2,699,000	876,000	514,000	333,000	163,000	170,000	29,000
Labor force.....	2,232,000	1,623,000	599,000	359,000	230,000	116,000	114,000	20,000
Not in labor force.....	1,343,000	1,076,000	277,000	155,000	103,000	47,000	56,000	9,000
25 to 34 years.....	11,903,000	8,718,000	3,096,000	2,068,000	1,029,000	520,000	508,000	89,000
Married, spouse present.....	9,847,000	7,283,000	2,564,000	1,642,000	862,000	436,000	426,000	60,000
Labor force.....	2,704,000	1,944,000	760,000	516,000	244,000	94,000	95,000	15,000
Not in labor force.....	7,143,000	5,339,000	1,794,000	1,126,000	618,000	342,000	331,000	45,000
Other marital status.....	2,056,000	1,435,000	592,000	426,000	166,000	84,000	82,000	29,000
Labor force.....	1,474,000	1,052,000	400,000	292,000	108,000	49,000	59,000	22,000
Not in labor force.....	582,000	383,000	192,000	134,000	58,000	35,000	23,000	7,000
35 to 44 years.....	11,794,000	10,164,000	1,630,000	1,208,000	593,000	279,000	314,000	29,000
Married, spouse present.....	9,922,000	8,523,000	1,399,000	1,073,000	487,000	234,000	253,000	26,000
Labor force.....	3,646,000	3,133,000	513,000	381,000	129,000	73,000	55,000	4,000
Not in labor force.....	6,276,000	5,390,000	886,000	692,000	358,000	161,000	198,000	22,000
Other marital status.....	2,072,000	1,641,000	428,000	322,000	106,000	45,000	61,000	3,000
Labor force.....	1,509,000	1,210,000	296,000	229,000	68,000	35,000	33,000	3,000
Not in labor force.....	563,000	431,000	132,000	94,000	38,000	10,000	28,000	...
45 years and over.....	26,081,000	23,275,000	2,770,000	2,004,000	766,000	421,000	345,000	35,000
Married, spouse present.....	15,138,000	13,795,000	1,327,000	952,000	375,000	209,000	166,000	16,000
Labor force.....	4,211,000	3,813,000	390,000	259,000	91,000	49,000	42,000	8,000
Not in labor force.....	10,927,000	9,982,000	937,000	693,000	284,000	160,000	124,000	8,000
Other marital status.....	10,943,000	9,481,000	1,443,000	1,052,000	391,000	212,000	179,000	19,000
Labor force.....	4,166,000	3,583,000	572,000	443,000	129,000	70,000	59,000	11,000
Not in labor force.....	6,777,000	5,898,000	871,000	609,000	262,000	142,000	120,000	8,000
PERCENT DISTRIBUTION								
Total, 18 years old and over.....	100.0	80.9	18.7	12.6	6.1	3.0	3.1	0.4
Married, spouse present.....	100.0	80.6	19.1	12.7	6.4	3.2	3.2	0.3
Labor force.....	100.0	79.6	20.1	14.7	5.4	2.9	2.5	0.3
Not in labor force.....	100.0	80.9	18.7	11.8	6.9	3.3	3.6	0.4
Other marital status.....	100.0	81.8	17.8	12.5	5.3	2.7	2.6	0.4
Labor force.....	100.0	79.6	19.8	14.1	5.7	2.9	2.8	0.6
Not in labor force.....	100.0	84.0	15.7	10.7	5.0	2.5	2.5	0.3
18 to 24 years.....	100.0	59.9	40.3	25.8	14.5	6.8	7.7	0.8
Married, spouse present.....	100.0	44.2	55.0	35.9	19.1	8.7	10.4	0.8
Labor force.....	100.0	40.8	58.7	40.5	18.2	9.6	8.6	0.5
Not in labor force.....	100.0	45.8	53.3	33.8	19.5	8.4	11.1	0.9
Other marital status.....	100.0	75.5	23.7	14.4	9.3	4.6	4.7	0.8
Labor force.....	100.0	72.7	26.4	16.1	10.3	5.2	5.1	0.9
Not in labor force.....	100.0	80.1	19.2	11.5	7.7	3.5	4.2	0.7
25 to 34 years.....	100.0	73.2	26.1	17.4	8.7	4.4	4.3	0.7
Married, spouse present.....	100.0	74.0	25.4	16.7	8.7	4.4	4.3	0.6
Labor force.....	100.0	71.8	27.6	20.6	7.0	3.5	3.5	0.6
Not in labor force.....	100.0	74.8	24.6	15.2	9.4	4.8	4.6	0.6
Other marital status.....	100.0	69.8	28.8	20.7	8.1	4.1	4.0	1.4
Labor force.....	100.0	71.4	27.1	19.8	7.3	3.3	4.0	1.5
Not in labor force.....	100.0	65.8	33.0	23.0	10.0	6.0	4.0	1.2
35 to 44 years.....	100.0	84.8	15.0	10.1	4.9	2.3	2.6	0.2
Married, spouse present.....	100.0	85.9	13.8	8.9	4.9	2.4	2.5	0.3
Labor force.....	100.0	85.9	14.0	10.5	3.5	2.0	1.5	0.1
Not in labor force.....	100.0	85.8	13.8	8.0	5.8	2.6	3.2	0.4
Other marital status.....	100.0	79.3	20.6	15.5	5.1	2.2	2.9	0.1
Labor force.....	100.0	83.2	19.6	15.1	4.5	2.3	2.2	0.2
Not in labor force.....	100.0	76.6	23.4	16.7	6.7	1.8	4.9	...
45 years and over.....	100.0	89.3	10.6	7.7	2.9	1.6	1.3	0.1
Married, spouse present.....	100.0	91.1	8.8	6.3	2.5	1.4	1.1	0.1
Labor force.....	100.0	90.5	9.3	7.1	2.2	1.2	1.0	0.2
Not in labor force.....	100.0	91.3	8.6	6.0	2.6	1.5	1.1	0.1
Other marital status.....	100.0	86.6	13.2	9.6	3.6	2.0	1.6	0.2
Labor force.....	100.0	86.0	13.7	10.6	3.1	1.7	1.4	0.3
Not in labor force.....	100.0	87.0	12.9	9.0	3.9	2.1	1.8	0.1

Source: Bureau of the Census, "Current Population Reports, 'Mobility of the Population of the United States, March 1957 to 1958,'" Series P-20 no.85

tion for the 1939-1954 period was .991.³⁹

Thus, while labor force migration is highly related to total population movement, the influence of the various economic sectors is not self-evident. The Chapters that follow will focus on the relative influences of each sector upon net population movement thus approximated.

Summary

In this Chapter, discussions involved determination of units of analysis as the basis for constructing a model. The first part of the discussion was concerned with the adaptation of employment as the economic unit of analysis. The rationale was based upon the shift analysis by which historical employment data can be manipulated for an inclusive indicator of a broad range of economic activities and changes taking place in regions. The second part relates to the merits and limits of the various ways in which migration data are arranged and interpreted. As the pattern of population convergence is best investigated by the use of net migration data, this study adopted use of net migration. Instead of migration rate, actual number of migrants was also used. This is to match the volume of migration activities to the volume of economic activities; and to minimize a twisted impression of the level of net migration flow that might arise from the different geographical area and population size of each state.

It may not be invalid to assume that population movement is nearly synonymous with labor force mobility. Through a brief documentary survey, however, the approximation was attempted more carefully. In this way, the operational basis for building the model to test the hypothesis is provided.

39 Harvey Perloff et. al., op. cit., pp. 296

CHAPTER III

PRESENTATION OF A MODEL RELATING SECTORAL ECONOMIC CHANGE TO NET MIGRATION

Introduction

Using data of the forty-eight contiguous states as geographical units of analysis, multiple regression analysis will be conducted in this chapter to construct a model relating changes in sectoral employment to net migration.

The problem involved in delimitating geographical units for analysis is an area of serious discussion. Even not to mention the theoretical and practical issues concerning regional delimitation, depending upon the demarcation, the statistical results will vary for this study. To reflect more realistic considerations, other units, such as State Economic Area or Standard Metropolitan Statistical Area, may be profitably utilized. But solely for practical convenience in data collecting and handling for this study, each state was designated as a separate unit, representing a region.

Multiple regression analysis was used to demonstrate input of each of a series of independent variables in determining the value of the dependent variable. Past researches (Perloff, 1960 and Raimon, 1962) have shown that net migration and total labor force change are highly related. In this analysis, it will be determined; (1) if by taking each economic sector separately in the equation, the relation between labor force change and net migration is increased and (2) which economic sectors are most influential in determining net migration.

The basic model is an additive equation of the sectoral labor force change related to migration.

Empirical Indicators of the Variable

(A) Dependent Variable: Net Migration

The dependent variable for the multiple regression model is represented by the state-wise variations in net migration between 1950 and 1960. It is calculated by the formula:

$$M = P_{60} - P_{50} - B + D$$

where: M = net migration

P₆₀ = population in 1960

P₅₀ = population in 1950

B = Total births between 1950 and 1960

D = total deaths between 1950 and 1960

The general conceptual implications of the migration data was discussed in the previous chapter. Appendix I contains the actual figures computed by the Bureau of Census.⁴⁰

(B) Independent Variables: Changes in Economic Structure

The independent variable was represented by the change in employment in various economic sectoral categories between 1950 and 1960. Since the employment data are from the Census of Population, the census definition of employment applies. Appendix II contains the employment figure reflecting changes that arose from both industrial mix and regional share effect. These changes in sectoral employment by state were calculated by the shift analysis method. The calculation was provided by U.S. Office of Business Economics.

⁴⁰ For a statement of the estimating procedure, see "Estimate of the Population of States and Selected Outlying Areas of the United States: July 1, 1958 and 1957," Series P-25, No. 208 (December 7, 1959)

One weakness in determining economic sectors as the framework for shift in economic structure is that the classification can be viewed as arbitrary. It is possible that different ways of grouping economic activities may lead into different statistical results. Consequently, it may be misleading not to state that the integrity of the present model depends considerably on the way the economic sectors are categorized.

The present study, based primarily on intuitive judgement, grouped sector activities into eight categories roughly following the census one-digit industrial classification unit. They are agriculture (abbreviated AG), manufacturing (MA), transportation and communication (TR), wholesale and retail trade (WR), finance, insurance and real estate (FI), hotels, entertainment and other personal services (PE), medical and other professional services (PR), and public administration and armed services (PA). Unfortunately, both mining and construction viewed by many as theoretically important, were omitted from the analysis.

It may be added that for a more precise examination of regional economic structure, more sensitive two-digit or three-digit classification units in the Census may be desirable. The methodological basis of the present model, however, can be extended to reflect the more detailed classification. In this case, the statistical result will be more reliable, with increased descriptive power of independent variables.

The mathematical function to express the relation between the dependent and explanatory variables is written as follows:

$$Y = a + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + e$$

where Y is the net migration in each state; a, regression intercept; B_1-7 are the regression exponents; X_1 , change in the adjusted number of employment in agriculture sector; X_2 , change in the adjusted number of employment in the manufacturing sector; X_3 , change in the adjusted number of employment in the

transportation and communication sector; X_4 , change in the adjusted number of employment in finance, insurance and real estate sector; X_5 , change in the adjusted number of employment in wholesale and retail trade sector; X_6 , change in the adjusted number of employment in the hotel, recreation, entertainment and other personal services sector, X_7 , change in the adjusted number of employment in medical and other professional services sector; X_8 , change in the number of employment in public administration and armed services sector and e regression residual (error term).

The regression exponents, or beta weights, are crucial in determining which sector is most important vis-a-vis net migration. The degree to which the right-hand side of the equation approximates the net migration by state (the R^2 in multiple regression terms) tells the utility of considering each sector separately in the equation.

CHAPTER IV

TESTING THE MODEL: SECTORAL INFLUENCES ON NET MIGRATION

Sectoral Influence and Total Prediction

One purpose of this study, as stated in the preceding chapter, is to relate the sum of the separate economic sectors to variations in net migration. For this, multiple regression analysis presented an impressive statistical value. Using initial eight independent variables, the multiple correlation coefficient squared was 0.962. This value attests to the utility of considering the industrial sectors separately as independent variables.

A high R^2 was predicted by the tautological relationship between dependent and independent variables. The value in the model is that (1) by taking the sectors separately, prediction is increased, and (2) the relative inputs of each sector can be determined.

Relative Influences of the Sectors

Stepwise regression analysis was the analytic technique used to determine which sectoral changes were most related to net migration. This statistical procedure computes a sequence of equations at each step adding an additional explanatory variable. The variable added at each step is the one which concurrently (1) makes the greatest reduction in the residual of squares, (2) has the highest partial correlation coefficient with the dependent variable, holding constant other variables already in the equation; and (3) has the highest F value (if removed) and t value of the remaining explanatory variables. In other words, the particular variable added at each step makes the most significant increase in explanation of the dependent variable.

Table II presents the results of the stepwise regression analysis for the eight hypothesized variables. It shows that of the eight specified income-generating activities of the state economy, the agricultural sector has the highest input on net migration. As indicated in the table, the change in the agricultural sector alone explains nearly 83 percent of the total changes in state-wide net migration. This statistical value confirms the historical fact that the outflow of farming population from rural regions is the most powerful and persistent single factor of net migration in the United States.

TABLE II
RESULTS OF STEPWISE REGRESSION ANALYSIS

Variable	Partial B's	Partial Standard B's	T-test value	R ²
2	0.0045	0.3875	11.5562	0.8353
3	0.0029	0.4771	6.7363	0.9185
4	0.0142	0.4030	4.1538	0.9464
5	0.0017	0.1175	0.9642*	0.9619
6	0.0114	0.4203	2.5867	0.9564
7	0.0021	0.0998	-0.6262*	0.9624
8	0.0005	0.0614	-0.3843*	0.0626
9	0.0026	0.1884	-2.4358	0.9571

* variables not significant at 0.05 level of significance

Notation of Variables

- 2 = Agriculture
- 3 = Manufacturing
- 4 = Transportation and Communication
- 5 = Wholesale and Retail
- 6 = Finance, Insurance and Real Estate
- 7 = Hotel, Recreation, Entertainments and other personal Service
- 8 = Medical and other Professional Service
- 9 = Public Administration and Armed Services

The stepwise regression analysis determined the sector of manufacturing as the second highest influence upon net migration. When the sector was added

to the scene, the total explanatory power of the two activities, agriculture and manufacturing, was 0.91 per cent. Statistically, the addition of manufacturing accounted for approximately eight percent more of the net migration variation.

The third industry responsible for statewide change in net migration was identified with the sector of transportation and communication. The introduction of that sector into the regression improved cumulative R^2 approximately three percent and the three sectoral activities - agriculture, manufacturing and transportation/communication combined - explain 94 percent of the total change in net migration.

The next economic sector determined as highly related to net migration is finance, insurance and real estate. When this activity entered the regression, the cumulative coefficient of determination was 0.96. Introduction of this activity has raised one additional per cent of explanation to the interstate net migration pattern as related to sectoral economic force.

The sector of public administration and armed services was determined as the fifth influence on net migration. When this sector was isolated to compose the best combination of economic activities at alpha level of 0.05, the cumulative R^2 was 0.957. But the improvement of the explanatory power by this sector remained less than one per cent.

It may be noteworthy that the wholesale and retail trade was placed sixth in importance; hotel, recreation, entertainment and other personal services, seventh; and medical and other professional services eighth. This suggests that these three sectors are insignificant as a force to affect the convergence of the population in the specific state. The stepwise regression analysis dropped the three variables as unretainable at 0.05 level of significance with their low T-test values. If retained, the three sectors combined would have

contributed less than one half percent of additional explanation of the net migration change.

A crucial question arises at this point. If the change in each income-generating structure of the state economy is related to interstate net migration in such a way as specified in the stepwise regression equation, what are the basic attributes that account for such relationships?

In order to answer this question, one thing must be emphasized; that regional economic change is geographical phenomenon, whose performance is peculiar to specific regions. In other words, the influence of each sectoral activity is subject to the prevailing regional characteristics and the relative position of the sector in question as the unique force contributing to the regional economic viability.

To be more specific, whether a region is economically attractive or not is not necessarily represented by any universal patterns of sectoral changes. A region may grow for instance, by gathering in a greater and greater proportion of the slower-growth industries. In the same manner, industry aggregates include a variety of industrial sub-categories some of which are expanding more than others. Regions may grow even when they specialize in those activities which may be on the decline on the whole. Hence, it is unrealistic to attempt to identify any uniform feature of each sectoral change without regard to the relative position of the sector in specific regional context.

From the perspective taken by this study, it is beyond its capacity to trace the subtle relative influence of each sector in the specific state economic structure. Considering this limit, the effort to uncover the properties associated with each sectoral activity must proceed on the aggregated scale of the state economy without regard to its specific sub-regional implications. Consequently, the basic attribute of the sectoral change of the state economy

as the influence on net migration must be general and consistent so that it may have some universal relevance regardless of geographical dimension.

Logically, a desirable approach to this problem is to begin with examining the growth behavior of each income-generating sector, because growth is the most universal feature of the areal economic behavior. The table III provides the growth rate for each sectoral category.

TABLE III

SECTORAL EMPLOYMENT AND PERCENTAGE CHANGE IN EMPLOYMENT

Industrial Sector	Employment		percent change
	Number in Thousands 1950	1960	
Agriculture	6,917.7	4,256.7	0.62
Manufacturing	14,600.9	17,513.1	0.19
Transportation & Communication	3,449.2	4,558.1	0.32
Wholesale & Retail Business	10,584.6	11,792.7	0.11
Hotel, Entertainment & other personal services	5,309.1	5,972.1	0.12
Medical and other professional Service	4,792.2	7,555.8	0.19
Public Administration & Armed Services	3,539.9	4,936.0	0.34
Finance, Insurance & Real Estate	1,920.2	2,694.6	0.41

Source: U.S. Office of Business Economics, "Growth Patterns in Employment by County 1940-1950 and 1950-1960"

The examination of the growth rate and the regression results of each activity shows that the sectors highly interrelated to net migration are those experiencing high rate of growth, either positive or negative. To determine the relationships more carefully rank correlation analysis was conducted.

The first part of the rank correlation analysis applied to the relation

of the sectoral order in the regression to its ranking in growth for the initial eight sectoral activities. In this case, the Spearman's rank correlation coefficient was 0.67. Next, considering their insignificance in the regression, the sectors of wholesale and retail trade, professional services, and hotel, entertainments and other personal services were combined for a single unit of analysis. In this case, the rank correlation rose to 0.85.

The high correlations between the sectoral order of importance and growth make it clear that net migration is predominantly affected by sectoral growth performance.

If sectoral growth behavior alone accounts for the variation in net migration, it may be suspected that the model is, to some extent, tautological in nature. If any tautological nature is involved in the logical system of the model, the advantage of the model will be; that quantitative magnitude of each sectoral influence in the state economic structural change can be obtained from it.

It is also clear from the statistics that the growth factor alone does not provide the full explanation of the sectoral change and migration relation. There are noticeable deviations from the growth-migration relationships. A good case is the sector of manufacturing. In terms of growth, manufacturing ranked fourth (together with the sector of medical and other professional services) among the eight sectors, while determined as the second greatest influence on interstate net migration activity.

Against this generalization and qualification, it may be appropriate to attempt to describe in more detail the interrelationship between sectoral change and net migration.

The first description concerns the change in the agricultural sector of the state economy. As revealed by the stepwise regression analysis, the change in

the agricultural sector has the highest input on net migration activities among the states. The actual working of the sector as a force of net out-migration was well described by many scholars. An outstanding example is by Dale Hathaway.

According to him, since 1920 more than 25 million people have migrated from farms to urban area and nonfarm occupations. To be more specific, in the 1920-1930 decade, more than 6 million people left agriculture, a rate of 19 per cent of the beginning population. During the thirties slightly over 3.5 million migrated, a rate of about 13 percent. In the ten years from 1940 to 1950, the net migration exceeded 9 million persons, giving a rate of 31 percent. During the period of 1950 and 1960, the decade which this study is concerned about, the number of out-migration was estimated about the same as in the forties, a rate exceeding one-third.⁴¹

Although all regions of the country have experienced an out-migration, the rates have varied between regions. The table IV indicates the regional variations in migration from agriculture.

Even with the areal differences, there are common factors associated with the out-migration: some derivable from intrinsic attributes of agricultural industry - low returns to human effort and very low income that results - and some others from the areal characteristics with which agriculture is associated - lack of educational, cultural and social opportunities and of incentives to activities.

Other studies uncovered additional push and constraining factors for out-migration from agriculture.⁴² Personal characteristics, land ownership, land-

⁴¹ Dale E. Hathaway, "Migration from Agriculture: The Historical Record and its Meaning", The American Economic Review, Vol. 49 (May, 1960) pp. 474-486

⁴² William H. Nicholls, "Industrialization, Factor Markets and Agriculture Development", The Journal of Political Economy, Vol. 69 (August, 1961) pp. 440-461

lord-tenant relations and race were some of these factors. But generally speaking, it was clear that superior non-farm opportunities in comparison of lack of economic opportunities in agriculture, as the result of the declining position of agriculture as an income-generating force in the economy, is the primary reason behind the out-migration.

TABLE IV

NET CHANGE IN RURAL-FARM POPULATION BY MIGRATION, UNITED STATES
AND REGIONS, 1920-30, 1930-40, 1940-50

Area	Rate of Change in Farm Population Due to Migration		
	1920-30	1930-40	1940-50
United State.....	-19.3	-12.7	-30.9
New England	-13.0	+ 2.6	-21.8
Middle Atlantic.....	-18.7	- 1.3	-20.7
East North Central.....	-19.7	- 5.3	-22.6
West North Central.....	-17.5	-17.7	-29.2
South Atlantic.....	-25.0	-13.8	-31.9
East South Central.....	-19.8	-13.2	-33.4
West South Central.....	-17.3	-19.9	-44.0
Mountain.....	-19.4	-16.3	-32.6
Pacific.....	- .3	- 4.9	-15.1

Source: Net Migration from the Rural Farm Population, 1940-50, Statistical Bulletin No. 176, June, 1956, Table 1, p. 16

Concerning the influence of the manufacturing sector of the state economy on interstate net migration, the quest for possible explanations for it is not as easy as that for agriculture. First, as stated earlier, the growth behavior of the sector was not self-evident. Secondly, the sector was composed of many sub-industrial categories, with varying and, sometimes, conflicting impacts on sub-regional economic scenes. It is, for this reason, difficult to generalize the attribute of the influence of the influence of this sector except in the given situation as provided by the design of this study.

Within this limit, several general factors may be identified as partially responsible for the high contribution of this sector to net migration, even with its lower order in growth rate. The first may concern the absolute size of the population engaged in this sector of the economy. The absolute size of sectoral employment and its relative influence upon migration is distinguishable. The need of the distinction does not, however, mean that net migration activities will occur absolutely independent of the size of labor force. The principle is well organized by the gravity model of migration as summarized in an earlier chapter. In other words, when the "mass" (population or labor force) is involved, the prevailing law hypothesized is that the greater the size of the mass, the greater will be their influence upon net migration pattern.

In order to isolate the impact of sheer size from the overall influence of manufacturing activities, rank correlation analysis was conducted, relating the rank of each industrial sector on absolute size to its rank in the stepwise regression equation. Spearman's rank correlation coefficient vis-a-vis the rank in absolute size by the rank in entry to the stepwise regression analysis was 0.31. This suggests that when the magnitude of labor force is sizeable, the impact coming from it can be appreciable.

Another explanation of the high input of manufacturing upon net migration may be derived from the examination of the historical trends in the areal shift of the relative importance of manufacturing activity. The geographical shift of manufacturing activities is commonly presented by the analytical measure called locational quotient.⁴³

⁴³ The general formula for the calculation of LG is as follows:

$$\frac{\text{Employment in industry A in state A}}{\text{Total Employment in state A}} \div \frac{\text{Employment in industry in the U.S.}}{\text{Total Employment in the U.S.}}$$
See Edgar M. Hoover, "An Introduction to Regional Economics", Alfred A. Knopf, New York, 1971, pp. 59-89

The trends and direction of the areal shift of manufacturing activities over the decades was presented in the table V.

TABLE V

LOCATION QUOTIENTS FOR MANUFACTURING EMPLOYMENT WITH RESPECT TO POPULATION BY CENSUS DIVISIONS, SELECTED DATES, 1899-1964

	1899	1929	1949-1953 average	1964
Total, United States	100	100	100	100
New England	241	183	157	143
Middle Atlantic	168	139	134	126
East North Central	110	140	147	136
West North Central	43	51	63	73
South Atlantic	69	76	77	85
East South Central	37	51	59	81
West South Central	28	34	43	55
Mountain	43	39	32	41
Pacific	82	83	76	83
Ratio of largest regional quotient to smallest	8.6	5.4	4.9	3.5

Source: U.S. Department of Commerce, Bureau of the Census, Long-Term Economic Growth, 1860-1965 (Washington, D.C.: Government Printing Office, 1966), p. 77.

At the first glance, it is apparent that the different geographical regions of the United States have become progressively more similar in their degree of industrialization as measured by manufacturing employment per 100 persons.

To be more specific, in 1899 in the U.S. as a whole, 6.49 percent of the population were employed in manufacturing industries. In New England, the percentage was 16.3, which was 241 percent of the national average. This 241 percent is the location quotient for manufacturing employment relative to population in New England and normalized to the United States in 1899. Referring to the table, it is also noted that in the same year the West South Central region had a location quotient of only 28 per cent, indicating a marked underrepresent-

tation of manufacturing in that region.

As read across to the later years, it is noted that New England's coefficient was dropping, while the East North Central region became more specialized in manufacturing until around 1950.⁴⁴ Most of the regions that were less industrialized than the rest of the United States in the earlier period have had rising location quotients for manufacturing. This is an undeniable indication that labor force in manufacturing has closely followed the geographical shift of the manufacturing. The relative shifts of industrial activities were also discernible in other categories, but their intensity and magnitude is hardly be comparable to that of manufacturing.

Thirdly, the high influence of manufacturing sector on net migration may be viewed from the standpoint of its income-generating power. Even with the qualification that sub-industrial categories comprising this sector may have different-income generating effects in the sub-regional context, generally speaking, it may be stated that manufacturing is the greatest income-generator for regions among the eight specified sectors. The table VI in the following page suggests the relative income-generating position for different categories of industry.

From the table, it is evident that the manufacturing is the highest income-generating sector in SMSAs and outside SMSAs. Against the conventional hypothesis that higher-income regions attract more migrants, it may not be invalid to assume that this sector may contributive to augmenting regional economic attractiveness.

Theoretically, it may be possible to analyse the probable influences of other sectors on net migration in light of their specific properties. In this

⁴⁴ Edgar M. Hoover, op. cit., Chapter 8

way, in the case of the strong input registered by the sector of finance, insurance and real estate, the factor of urbanization may be considerable, because net migration activity is sensitive to urbanization and the sector in question is heavily concentrated in urban areas.

TABLE VI

PERCENTAGE DISTRIBUTION OF SOURCES OF PERSONAL INCOME: 1966

	total personal income	All activities	Govt.	Mfg.	Agri.	Mining	Residen- tiary**
United States, total	100.0	80.8	13.0	24.4	3.2	.9	39.3
All SMSAs	100.0	81.5	12.4	25.5	1.0	.5	42.1
Outside of SMSAs	100.0	79.3	14.9	20.9	10.3	2.0	21.2
Type of SMSA							
Manufacturing- intensive	100.0	84.0	7.3	43.9	1.3	.2	31.3
Manufacturing- moderate	100.0	82.1	9.1	33.0	.7	.3	39.0
Government- military-oriented	100.0	83.2	35.8	10.9	1.3	.5	34.7
Government-other	100.0	82.0	28.8	10.7	1.5	.4	40.6
Agriculture	100.0	79.2	19.5	9.7	12.4	1.9	35.7
Mining	100.0	79.3	9.1	14.2	.6	12.5	42.9
Recreation	100.0	77.6	11.4	8.8	1.0	.3	56.1
Retirement	100.0	68.9	11.2	11.0	2.2	.8	43.7
Regional center	100.0	83.6	9.1	19.9	1.1	1.6	51.9
National center	100.0	79.7	10.2	22.2	.2	.2	46.9
Mixed	100.0	81.0	13.6	20.5	1.2	.8	44.9

* Construction, transportation, communication, public utilities, trade, finance, insurance and real estate, and services.

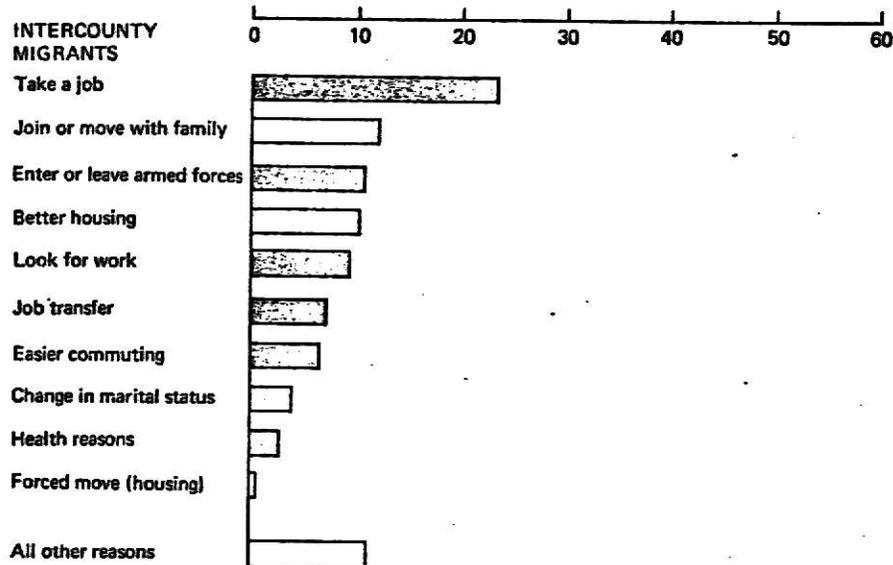
Source: Robert E. Graham, Jr., and Edwin J. Coleman, "Metropolitan Area Incomes, 1929-66," Survey of Current Business, 48,8 (August 1968), p.29.

With respect to the entry of public administration and armed services in the regression, the sub-sector of armed services as a force of inter-county migration may be suggestive. As presented in the figure II in the following page, the military reason of entering or leaving armed forces was a strong

factor of inter-county migration. There is no reason why this may not prevail in interstate movement.

FIGURE II

REASONS FOR MIGRATING GIVEN BY MALES AGED 18-64 WHO CHANGED RESIDENCE BETWEEN MARCH 1962 AND MARCH 1963



* Length of bars shows percentage of all reasons given.

Source: U.S. Department of Commerce, Bureau of the Census, Current Population Reports: Population Characteristics, Series P-20, No. 154 (August 22, 1966), Table E, p.4.

For the insignificance of the wholesale and retail business, the geographical ubiquity of service activities, with least locational characteristics associated, may be considerable. Thus, the attempt to identify the features of the sectors highly placed in the regression other than the growth performance of them, are purely descriptive. In order to better substantiate these descriptive arguments, all features involved must be scrutinized. It is beyond the capacity of this paper.

In summary, it may be observed from the model that the changes in the income-generating sector of the state economy are intimately related to interstate net migration activities, and that whose intensity can be numerically determined. From the statistics, it became apparent that the structural change of the economy was represented by the growth behavior of each component of the economy, and that net migration is basically related to the growth behavior of each sectoral activity.

An implicit expectation that each sectoral change, with its unique and peculiar properties, will probably affect net migration was generally not supportable. The reasons are; firstly, the effort to identify these properties was purely descriptive in nature, which may be valid only subject to specific regional circumstances. In other words, as each component of the state economy holds varying impacts on the state economic environment and viability, any generalization on an aggregated basis will not hold true to specific economic pictures of each state. As the result of this, even something suggestive can be derived from such a descriptive analysis, it is doubtful that they hold much universal relevance. Secondly, even the descriptive analysis is relevant on the aggregated basis, there is no way of determining to what extent net migration is ascribable to the universal growth behavior and to what extent to the specific properties of the sector specifically involved, and further how they interact with each other.

Consequently, what should be drawn from this analysis is that the universal phenomenon of the sectoral influence on net migration is the growth phenomenon associated with such sector, and that the growth patterns of the economy made up of these sectors is the only general factor identified in interaction with net migration.

Returning to our original scheme of study and hypothesis, it can be derived from such findings that the change in the regional economic structure as viewed

as synonymous with the growth phenomena of each sectoral components of the economy is the primary and universal force behind interstate net migration activities in the United States. Such an understanding enables the author to conclude that net migration is a function of the changes in the income-generating structure of the regional economy.

CHAPTER V

CONCLUSION

The basic design of this study was to present a model relating sectoral changes in regional economic structure to net migration activities. The conceptual basis for the model was the shift analysis by which the factual data in employment can present the level of economic activities and changes of the various components of the economy in their specific regional context. In other words, what was the concern here was not to observe how people move from one job into another but how people move from one location into another, involved with such a job. By the employment of the shift analysis, this spatial implication of employment was reflected. This is the fundamental departure of this type of analysis from those using factual employment data.

As stated in the preceding pages, the perspective taken by this study was predetermined by the specific way the sectoral categories were classified and the geographical units were arranged. When the perspective is altered from the particular way or regions, the statistical result will change, and the description of sectoral behaviors relevant to statewide changes will no longer hold relevance to other areas. When the analysis is for purely descriptive purposes relating specifically to certain regions, this may not hurt the integrity of the model. But the true significance of a model is to present a general statement which can be applicable to different situations and must hold universal relevance.

Concerning this model, its ability to confirm statistically the relation of net migration to industrial growth performance may be noted. In this analy-

sis, the priori expectation that the unique sectoral influences characteristic to specific sectors would probably have different quantitative and qualitative impact on net migration behavior was not generally supportable (except for the purely descriptive and hypothetical context). What was evidenced by the analysis was that the state-wide net migration was primarily the function of the changes taking place in the state economic structure, regardless of which sector is involved in the change. In other words, it was evidenced that sectoral influence was just the influence of the change from whatever sector rather than any unique and matchless property peculiar to that sector. From here, a universal statement may be derivable; when a certain region is under intensive impact of change from whichever industry it may be, the region will be susceptible to population redistribution. When the upward change of the economy, or growth, is prevalent, influx of the population from outside and slackening displacement of the population from inside will be the expected response. The expansion of the economic opportunities and activities will be the primary cause for this element. Likewise, when the downward change of the economy, or decline of industrial activities is involved, just the reverse may hold the truth. This model confirms this intuitively appealing notion statistically.

But it seems that mere estimate of the direction of the population movement is not sufficient; its magnitude and characteristics must be specified. For such a question, especially involving demographic and personal elements, this type of analysis offers nothing; nor can it reflect any information on the migration process in which people form perception of different economic opportunities at different regions and draw migration decisions.

This model is also based on the assumption that the population movement is purely economically-oriented, with zero migration cost. But in the real world,

this assumption may not be supportable; people do not move solely for economic reasons.

What is considered of good of this analysis is that it suggests a possibility of utilizing the sectoral changes in employment adjusted by the method of shift analysis for an operative index for the study of economic aspect of migration behaviors.

It is the judgement of the advisory committee that the model and analysis presented in this report represents an attempt, by the author, to extend his knowledge into an area of quantitative investigation. It is recognized that there are deficiencies both in model formulation and analysis, in part, as result of the author's prior lack of knowledge of the techniques utilized. The utility of this study lies in its extension, including further study, of the variables utilized, a possible model reformulation to reflect other variables prevalent, and subsequently a greater in-depth analysis of the identified relationships.

APPENDIX I

NET MIGRATION BY STATES: 1950-1960 *

State	Number	Percent
Maine	-67,000	-7.300
New Hampshire	12,000	2.200
Vermont	-38,000	-10.100
Massachusetts	-96,000	-2.000
Rhode Island	-26,000	-3.300
Connecticut	234,000	11.600
New York	210,000	1.400
New Jersey	578,000	12.000
Pennsylvania	-475,000	-4.500
Ohio	407,000	5.100
Indiana	61,000	1.600
Illinois	124,000	1.400
Michigan	155,000	2.400
Wisconsin	-53,000	-1.600
Minnesota	-98,000	-3.300
Iowa	-234,000	-8.900
Missouri	-134,000	-3.400
North Dakota	-105,000	-17.000
South Dakota	-95,000	-14.500

* Net migration comprise both net immigration from abroad and net interregional, interdivisional, and interstate migration according to area shown; includes movements of persons in Armed Forces. Minus (-) sign denotes net out migration.

APPENDIX I - Continued

State	Number	Percent
Nebraska	-117,000	-8.800
Kansas	-44,000	-2.300
Delaware	63,000	19.900
Maryland	321,000	13.700
Virginia	15,000	0.500
West Virginia	-446,000	-22.300
North Carolina	-328,000	-8.100
South Carolina	-222,000	-10.500
Georgia	-212,000	-6.200
Florida	1,616,000	58.300
Kentucky	-390,000	-13.200
Tennessee	-274,000	-8.300
Alabama	-369,000	-12.000
Mississippi	-433,000	-19.900
Arkansas	-433,000	-22.700
Louisiana	-49,000	-1.800
Oklahoma	-219,000	-9.800
Texas	121,000	1.600
Montana	-25,000	-4.300
Idaho	-40,000	-6.800
Wyoming	-20,000	-6.800

APPENDIX I - Continued

State	Number	Percent
Colorado	164,000	12.400
New Mexico	52,000	7.600
Arizona	329,000	44.000
Utah	86,000	1.300
Nevada	86,000	53.700
Washington	87,000	3.600
Oregon	16,000	1.000
California	3,142,000	29.700

Source: Department of Commerce, Bureau of Census, "Current Population Reports", Series P-25, No. 460

APPENDIX II

SECTORAL EMPLOYMENT CHANGE: 1950-1960 (ADJUSTED BY SHIFT ANALYSIS)

State	Sector	AG	MA	TR	WR	FL	PE	PR	PU
Maine		-11,577	2,977	-2,231	5,774	2,565	-842	11,970	17,998
New Hampshire		-6,286	11,303	-1,019	3,770	2,816	-538	10,463	7,565
Vermont		-8,422	1,674	-1,162	2,622	1,051	-230	6,250	1,168
Massachusetts		-10,687	26,428	-13,128	-6,199	18,754	-3,859	85,370	22,509
Rhode Island		-1,055	-9,339	-2,623	-2,068	2,107	-1,513	11,431	11,502
Connecticut		-6,361	54,274	2,913	17,155	6,053	6,238	45,747	12,211
New York		-55,719	112,511	-24,766	-38,317	72,454	-21,300	245,932	56,688
New Jersey		-16,253	105,719	7,850	44,281	22,4281	18,281	86,235	40,149
Pennsylvania		-53,700	106,566	-44,200	18,095	29,918	471	142,456	36,458
Ohio		-82,963	174,885	-13,265	51,150	31,215	15,475	147,518	32,466
Indiana		-64,079	79,798	-5,284	37,236	19,037	7,620	68,497	18,153
Illinois		-79,645	105,046	-27,605	10,487	34,786	-861	138,658	26,239
Michigan		-67,749	57,778	2,842	62,770	25,120	28,730	138,725	24,148
Wisconsin		-84,754	67,141	-4,228	24,263	12,318	1,103	55,601	13,773
Minnesota		-82,248	53,318	-6,394	13,011	13,023	6,659	56,904	9,974

APPENDIX II - Continued

State	Sector	AG	MA	TR	WR	FI	PE	PR	PU
Iowa		-75,048	37,678	-6,201	6,221	8,972	-941	41,225	3,333
Missouri		-117,662	55,849	-10,929	-277	13,798	-2,991	55,584	40,870
North Dakota		-28,776	1,337	-2,196	3,394	2,467	1,072	9,406	6,081
South Dakota		-25,414	4,042	-1,087	1,978	1,706	1,879	9,697	3,882
Nebraska		-40,137	17,191	-3,336	5,173	4,731	3,302	22,274	13,870
Kansas		-58,370	41,108	-1,023	19,085	9,437	6,121	42,894	28,232
Delaware		-2,918	12,283	62	6,168	1,978	731	7,720	9,107
Maryland		-18,451	54,576	856	29,537	15,827	6,177	60,360	62,732
Virginia		-67,654	64,511	2,143	40,664	17,068	17,607	62,418	55,550
West Virginia		-37,952	7,205	-6,564	-365	2,456	-3,665	17,212	2,641
North Carolina		-155,209	100,240	7,899	47,818	18,308	17,800	55,741	43,216
South Carolina		-103,019	46,725	2,338	24,091	9,050	11,920	26,949	48,845
Georgia		-145,585	76,424	9,686	43,074	19,712	20,749	49,037	53,955
Florida		-13,685	116,517	50,893	135,198	53,171	92,047	107,175	72,431
Kentucky		-113,134	47,294	-7,320	15,140	7,601	-157	33,916	23,807
Tennessee		-115,991	78,440	845	25,364	14,128	16,387	43,412	14,709
Utah		-10,882	20,477	1,735	13,276	4,641	4,712	18,953	11,713
Alabama		-148,632	58,272	3,077	27,590	10,632	18,685	36,570	34,907

APPENDIC II - Continued

State	Sector									
	AG	MA	TR	WR	PI	PE	PR	PU		
Mississippi	-159,227	40,467	4,078	15,340	6,185	17,180	21,042	13,481		
Louisiana	-78,279	24,786	11,015	30,733	14,162	26,839	47,055	18,436		
Arkansas	-116,704	28,383	-976	6,274	4,700	7,152	16,163	9,796		
Oklahoma	-81,257	30,013	2,001	15,092	6,773	-382	30,515	33,320		
Texas	-153,454	167,253	15,762	113,745	49,416	55,490	150,963	154,566		
Montana	-14,626	4,924	-1,957	5,467	3,017	2,268	11,497	6,803		
Idaho	-12,321	12,325	-854	7,707	2,587	3,700	9,073	6,752		
Wyoming	-6,003	2,804	-1,403	4,846	1,315	1,774	5,520	-3,462		
Colorado	-23,956	40,610	4,401	27,470	12,615	12,044	18,668	26,457		
New Mexico	-17,528	9,524	4,845	16,216	5,010	16,335	19,877	21,494		
Arizona	-1,093	33,980	7,561	34,331	13,928	18,448	31,144	22,238		
Nevada	-1,636	3,776	1,315	7,571	2,425	17,438	5,946	8,635		
Washington	16,466	68,509	-617	22,286	10,741	11,559	49,455	1,717		
Oregon	23,887	18,870	186	11,310	1,409	3,609	32,208	9,539		
California	-27,870	627,430	67,802	209,121	11,932	157,022	326,926	234,859		

Source: U.S. Office of Business Economics, "Growth Patterns in Employment by County: 1940-1950 and 1950-1960"

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XX UNIT=(SYSDA,SEP=(FT12FC01,FT11FC01)),

XX

```

XX          SPACE=(CYL,(1,2)),
XX          DCB=(BLKSIZE=3236,LFEC=404,RECFM=VBS)
XX          DSN=88WORK12,DISP=(NEW,DELETE),
XXFT13FC01 DD UNIT=(SYSDA,SEP=(FT10F001,FT11F001,FT12F001)),
XX          SPACE=(CYL,(1,2)),
XX          DCB=(BLKSIZE=3236,LFEC=404,RECFM=VBS)
XXFT14FC01 DD UNIT=(SYSDA,SEP=(FT11F001,FT12F001,FT13F001)),
XX          SPACE=(CYL,(1,2)),
XX          DCB=(BLKSIZE=3236,LFEC=404,RECFM=VBS)
XXFT15F001 DD UNIT=(SYSDA,SEP=(FT11F001,FT12F001,FT13F001)),
XX          SPACE=(CYL,(2,1))
XXFT17FC01 DD DSN=STATLAB.NORMAL,DISP=SHR
XXFT19F001 DD DSN=88FILE19,DISP=(NEW,DELETE),UNIT=SYSDA,
XX          DCB=(RECFM=VS,LFEC=2052,BLKSIZE=2056),
XX          SPACE=(CYL,(1,1)),VCL=SER=IPLVCL
XXFT20F001 DD DSN=STATLAB.USERACCT,DISP=SHR
XXFT21F001 DD DSN=STATLAB.USERACCT,DISP=SHR

```

```

00005300
00004000
00004100
00004200
00004300
00004400
00004500
00004600
00004700
00004800
00004900
00005000
00005100
00005200
00005300
00005400
00005500
00005600

```

```

//STATPRG.SYSIN DC *
//
IEF236I ALLOC. FOR ACC00189 STATPRG
IEF237I 136 ALLOCATED TO STEPLIB
IEF237I 08C ALLOCATED TO FT01F001
IEF237I 04D ALLOCATED TO FT02F001
IEF237I 05E ALLOCATED TO FT03F001
IEF237I 132 ALLOCATED TO FT08F001
IEF237I 133 ALLOCATED TO FT10F001
IEF237I 136 ALLOCATED TO FT11F001
IEF237I 131 ALLOCATED TO FT12F001
IEF237I 132 ALLOCATED TO FT13F001
IEF237I 133 ALLOCATED TO FT14F001
IEF237I 136 ALLOCATED TO FT15F001
IEF237I 133 ALLOCATED TO FT17F001
IEF237I 130 ALLOCATED TO FT19F001
IEF237I 136 ALLOCATED TO FT20F001
IEF237I 133 ALLOCATED TO FT21F001
IEF285I COGG. STATPRG
//

```

IEF285I	COGG•STATPRCG			KEPT
IEF285I	VCL SER NCS= 222227.			
IEF285I	SYS72114•T171437•RF000•A0000189•RC000894			DELETED
IEF285I	VOL SER NCS=			
IEF285I	SYS72114•T171437•RF000•A0000189•RC000893			CELETED
IEF285I	VOL SER NCS=			
IEF285I	SYS72114•T171437•RF000•A0000189•WCRK8			DELETED
IEF285I	VOL SER NCS= LNKVCL.			
IEF285I	SYS72114•T171437•RF000•A0000189•DATA			PASSED
IEF285I	VCL SER NCS= 333333.			
IEF285I	SYS72114•T171437•RF000•A0000189•WCRK11			DELETED
IEF285I	VCL SER NCS= 222222.			
IEF285I	SYS72114•T171437•RF000•A0000189•WCRK12			DELETED
IEF285I	VOL SER NCS= LIBPAK.			
IEF285I	SYS72114•T171437•RF000•A0000189•WCRK13			CELETED
IEF285I	VCL SER NCS= LNKVCL.			
IEF285I	SYS72114•T171437•RF000•A0000189•WCRK14			DELETED
IEF285I	VOL SER NCS= 333333.			
IEF285I	SYS72114•T171437•RF000•A0000189•WCRK15			DELETED
IEF285I	VCL SER NCS= 222222.			
IEF285I	COGG•NORMAL			KEPT
IEF285I	VCL SER NCS= 333333.			
IEF285I	SYS72114•T171437•RF000•A0000189•FILE19			DELETED
IEF285I	VOL SER NCS= IPLVCL.			
IEF285I	COGG•USELIST			KEPT
IEF285I	VCL SER NCS= 222222.			
IEF285I	COGG•USERACCT			KEPT
IEF285I	VOL SER NCS= 333333.			
KSUC03I	PARTITION SIZE - 256K, MAXIMUM CORE USED - 92K			
KSUC01I	STEP 1 STATPRG EXECUTION TIME = .006 HRS.			RETURN CODE = 0
IEF285I	SYS72114•T171437•RF000•A0000189•DATA			CELETED
IEF285I	VOL SER NCS= 333333.			
KSUC03I	PARTITION SIZE - 256K, MAXIMUM CORE USED - 92K			
KSUC02I	JOB A0000189 EXECUTION TIME = .007 HRS.			

DEPARTMENT OF STATISTICS AND THE STATISTICAL LABORATORY - STEPWISE DELETION REGRESSION PROGRAM
EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.

JCB .. A0000189

PROGRAMMER .. PARK

DATA,9,0,2.

INPUT CHECK OF PARAMETERS

NUMBER OF VARIABLES READ IN = 9

NC. OF TRANSFORMED VARIABLES = 0

CPTION NC. IS 2

DATA DISPOSITION IS

OUTPUT, ALL

MODEL, 1=2+3+4+5+6+7+8+9

END OF PARAMETERS

FORMAT(F7.3,8F8.3)

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.
DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELETION)

INPUT CHECK ON DATA

FIRST OBSERVATION

	3	4	5	6	7	8
42199993	1.67399979	-1.16199970	2.62199974	1.04999924	-0.22999996	6.25000000

NO. RAW DATA INPUT = 48

NO. TRANSFORMED OBSERVATIONS = 48

NO. OF OBSERVATIONS DROPPED = 0

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.
DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELETI

INPUT CHECK ON DATA

FIRST OBSERVATION

1	2	3	4	5	6
-0.0380000	-8.42199993	1.67399979	-1.16199970	2.62199974	1.04999924

-0.

9

1.16799927

NO. RAW DATA INPUT = 48

NO. TRANSFORMED OBSERVATIONS = 48

NO. OF OBSERVATIONS CROPPED = 0

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE CELE)

VARIABLE NAME	VARIABLE NUMBER	MEAN	VARIANCE	STD. DEV.	STD. ERR.
	2	-55.08989	2380.57974	48.75118	7.04240
	3	60.49747	8798.73341	93.80156	13.53909
	4	0.45287	255.03811	15.96991	2.30506
	5	26.27548	1519.06708	38.97520	5.62559
	6	16.71230	429.03976	20.71327	2.98970
	7	13.48041	740.95556	27.22049	3.92894
	8	61.01711	4602.86887	67.84444	9.79250
	9	21.31972	1627.82542	40.34631	5.82349
	1	0.05750	0.31481	0.56108	0.08098

48 OBSERVATIONS

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE SELECTION)

MEAN	VARIANCE	STD. DEV.	STD. ERR.	C.V.
-55.08989	2380.57974	48.79118	7.04240	-88.57%
60.49747	8798.72341	93.80156	13.53909	155.05%
0.45287	255.03811	15.96991	2.30506	3526.34%
26.27548	1519.06708	38.97520	5.62559	148.33%
16.71230	429.03976	20.71327	2.98970	123.94%
13.48041	740.95556	27.22049	3.92894	201.93%
61.01711	4602.86887	67.84444	9.79250	111.19%
31.31972	1627.82542	40.34631	5.82349	128.82%
0.05750	0.31481	0.56108	0.08098	975.79%

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELETION)

CORR MATRIX

NO.	2	3	4	5	6	7	8	9	1
2	1.0000								
3	-0.1463	1.0000							
4	0.0575	0.5468	1.0000						
5	-0.1230	0.8041	0.7975	1.0000					
6	-0.1079	0.8485	0.4050	0.7167	1.0000				
7	-0.0444	0.8067	0.8576	0.9611	0.7221	1.0000			
8	-0.1151	0.7643	0.1937	0.5951	0.9518	0.5750	1.0000		
9	-0.1355	0.8102	0.5620	0.7959	0.8684	0.8036	0.8124	1.0000	
1	0.3182	0.8117	0.7484	0.7929	0.7382	0.8431	0.5962	0.7010	1.0000

A (M f g) C W R F I R
 J Per Med Push
 ADJ.

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELETION)

ANOVA TABLE
ANALYSIS OF REGRESSION FOR VARIABLE 1---
(TABLE 1)

SOURCE	D.F.	SS	MS	F	SIGNIFICANCE
REGRESSION	8	14.2453	1.7807	126.0832	0.0000
RESIDUAL	39	0.5508	0.0141		
TOTAL	47	14.7961			

IS 0.96277
ACCEPT IS 0.03003

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELETES)

ANALYSIS OF REGRESSION FOR VARIABLE 1---
(TABLE 2)

VARIABLE NUMBER	VARIABLE NAME	PARTIAL B'S	PARTIAL STANDARD B'S	PARTIAL SSQ	T-TEST VALUES	R**2 DELETES
2		0.0045	0.3875	1.8860	11.5562	0.8353
3		0.0029	0.4771	0.6409	6.7263	0.9191
4		0.0142	0.4030	0.2437	4.1538	0.946
5		0.0017	0.1175	0.0131	0.9642	0.961
6		0.0174	0.4203	0.0945	2.5867	0.956
7		-0.0021	-0.0958	0.0055	-0.6262	0.962
8		-0.0005	-0.0614	0.0021	-0.3843	0.962
9		-0.0026	-0.1684	0.0838	-2.4358	0.957

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE SELECTION)

ANALYSIS OF REGRESSION FOR VARIABLE 1---
(TABLE 2)

PARTIAL B'S	PARTIAL STANDARD B'S	PARTIAL SSQ	T-TEST VALUES	R**2 DELETES	ALPHA HATS
0.0045	0.3875	1.8860	11.5562	0.8353	0.0000
0.0029	0.4771	0.6409	6.7363	0.9195	0.0000
0.0142	0.4030	0.2437	4.1538	0.9463	0.0002
0.0017	0.1175	0.0131	0.9642	0.9619	0.3409
0.0174	0.4203	0.0945	2.5867	0.9564	0.0136
-0.0021	-0.0998	0.0055	-0.6262	0.9624	0.5349
-0.0005	-0.0614	0.0021	-0.3843	0.9626	0.7029
-0.0026	-0.1884	0.0838	-2.4358	0.9571	0.0196

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELETION)

INVERSE MATRIX

2	1.142E CC							
3	2.671E-CI	5.206E CO						
4	-2.707E-CI	6.856E-01	6.113E CC					
5	1.000E CC	-7.094E-01	9.737E-CI	1.486E CI				
6	-2.916E-CI	-2.567E 00	2.300E CC	7.732E-CI	6.516E CO			
7	-8.938E-CI	-2.308E 00	-8.291E CC	-1.435E CI	-2.596E CO	2.662E CI		
9	2.622E-CI	8.474E-C2	-1.407E-CI	-8.252E-01	-3.443E CO	-1.216E CO	5.672E 00	

NO. 2 3 4 5 6 7 9

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELETION)

ADV TABLE
ANALYSIS OF REGRESSION FOR VARIABLE 1---
(TABLE 1)

SS	MS	F	SIGNIFICANCE
14.2432	2.0347	147.2108	0.0000
0.5529	0.0138		
14.7961			

ADV TABLE
ANALYSIS OF REGRESSION FOR VARIABLE I---
(TABLE 1)

SOURCE	D.F.	SS	MS	F	SIGNIFICAN
REGRESSION	7	14.2432	2.0347	147.2108	0.0000
RESIDUAL	40	0.5529	0.0138		
TOTAL	47	14.7961			

R**2 IS 0.96263

INTERCEPT IS 0.02900

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELETION)

INVERSE MATRIX

2	1.112E 00							
3	1.896E-C1	5.006E 00						
4	-5.492E-C1	-3.329E-02	3.530E CC					
5	5.167E-C1	-1.957E 00	-3.509E CC	7.074E CC				
6	-3.788E-C1	-2.792E 00	1.491E CC	-6.304E-01	6.263E CC			
9	2.214E-C1	-2.067E-02	-5.193E-C1	-1.483E CC	-3.561E 00	5.617E 00		
NO.	2	3	4	5	6	9		

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELETION)

ANALYSIS OF REGRESSION FOR VARIABLE 1---
(TABLE 2)

PARTIAL R'S	PARTIAL STANDARD B'S	PARTIAL SSC	T-TEST VALUES	R#2 DELETES	ALPHA HATS
0.0044	0.3852	1.9232	11.7959	0.8327	0.0000
0.0029	0.4797	0.6541	6.8790	0.9184	0.0000
0.0150	0.4260	0.4393	5.6375	0.9329	0.0000
0.0015	0.1076	0.0115	0.5132	0.9619	0.3666
0.0009	0.3657	0.3037	4.6875	0.9421	0.0000
-0.0021	-0.1008	0.0056	-0.6392	0.9623	0.5263
-0.0027	-0.1975	0.1018	-2.7136	0.9558	0.0099

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELE

ANALYSIS OF REGRESSION FOR VARIABLE 1---
(TABLE 2)

VARIABLE NUMBER	VARIABLE NAME	PARTIAL B'S	PARTIAL STANDARD B'S	PARTIAL SSC	T-TEST VALUES	R**2 DELETE
2		0.0044	0.3853	1.9232	11.7959	0.832
3		0.0029	0.4797	0.6541	6.8790	0.918
4		0.0150	0.4260	0.4393	5.6375	0.932
5		0.0015	0.1076	0.0115	0.9132	0.961
6		0.0099	0.3657	0.3037	4.6875	0.942
7	U	-0.0021	-0.1008	0.0056	-0.6392	0.962
9		-0.0027	-0.1975	0.1018	-2.7136	0.955

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELETION)

INVERSE MATRIX

2	1.074E CC							
3	3.325E-C1	4.464E CO						
4	-2.928E-01	-1.004E 00	1.789E CO					
6	-3.327E-C1	-2.967E 00	1.178E CC	6.207E 00				
9	3.297E-C1	-4.309E-C1	-1.255E CC	-3.693E CO	5.306E CO			

NO. 2 3 4 6 9

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELETION)

ANOVA TABLE
ANALYSIS OF REGRESSION FOR VARIABLE 1---
(TABLE 1)

SS	MS	F	SIGNIFICANCE
14.2375	2.3729	174.1905	0.0000
0.5585	0.0136		
14.7961			

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELTA)

ADV TABLE
ANALYSIS OF REGRESSION FOR VARIABLE 1---
(TABLE 1)

SCURCE	D.F.	SS	MS	F	SIGNIFICAN
REGRESSION	6	14.2375	2.3729	174.1905	0.0000
RESIDUAL	41	0.5585	0.0136		
TOTAL	47	14.7961			

R**2 IS 0.96225
INTERCEPT IS 0.02958

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELETION)

ANALYSIS OF REGRESSION FOR VARIABLE 1---
(TABLE 2)

VARIABLE NUMBER	VARIABLE NAME	PARTIAL B'S	PARTIAL STANDARD B'S	PARTIAL SSC	T-TEST VALUES	R**2
2		0.0043	0.3780	1.9682	12.1020	0.828
3		0.0029	0.4857	0.7818	7.6272	0.909
4		0.0148	0.4209	1.4652	10.4418	0.862
6		0.0098	0.3606	0.3100	4.8030	0.940
9		-0.0027	-0.1910	0.1017	-2.7515	0.955

TERMINATION ON END OF FILE - UNIT 1

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELETION)

ANALYSIS OF REGRESSION FOR VARIABLE 1---
(TABLE 2)

PARTIAL B'S	PARTIAL STANDARD B'S	PARTIAL SSQ	T-TEST VALUES	R**2 DELETES	ALPHA HATS
0.0044	0.3819	1.9406	11.9354	0.8311	0.0000
0.0028	0.4710	0.6556	6.9375	0.9179	0.0000
0.0139	0.3946	0.6526	6.9215	0.9181	0.0000
0.0008	0.0531	0.0059	0.6577	0.9619	0.5144
0.0096	0.3559	0.2992	4.6867	0.9420	0.0000
-0.0028	-0.2021	0.1076	-2.8109	0.9550	0.0076

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.
 DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEP

ANALYSIS OF REGRESSION FOR VARIABLE 1---
 (TABLE 2)

VARIABLE NUMBER	VARIABLE NAME	PARTIAL B'S	PARTIAL STANDARD B'S	PARTIAL SSG	T-TEST VALUES
2		0.0044	0.3819	1.9406	11.9354
3		0.0028	0.4710	0.6556	6.9375
4		0.0179	0.3946	0.6526	6.9215
5		0.0008	0.0531	0.0059	0.6577
6		0.0096	0.3559	0.2992	4.6867
9		-0.0028	-0.2021	0.1076	-2.8109

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.
DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELETION)

ADV TABLE
ANALYSIS OF REGRESSION FOR VARIABLE 1---
(TABLE 1)

SS	MS	F	SIGNIFICANCE
14.2316	2.8463	211.8037	0.0000
0.5644	0.0134		
14.7961			

Handwritten signature or initials, possibly "R. B."

Handwritten notes: "Y", "1000", and other scribbles.

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.
 DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DEL

ADV TABLE
 ANALYSIS OF REGRESSION FOR VARIABLE 1---
 (TABLE 1)

SOURCE	D.F.	SS	MS	F	SIGNIFICA
REGRESSION	5	14.2316	2.8463	211.8037	0.000
RESIDUAL	42	0.5644	0.0134		
TOTAL	47	14.7961			

R**2 IS 0.96185
 INTERCEPT IS 0.03448

1200
 Y 10

EFFECT OF INDUSTRIAL STRUCTURE ON INTERSTATE MIGRATION IN THE U.S.

DEPARTMENT OF STATISTICS AND THE STAT. LAB. - MULTIPLE REGRESSION (STEPWISE DELETION)

ANALYSIS OF REGRESSION FOR VARIABLE 1---
(TABLE 2)

PARTIAL B'S	PARTIAL STANDARD B'S	PARTIAL SSC	T-TEST VALUES	R**2 DELETES	ALPHA HATS
0.0043	0.3780	1.9682	12.1020	0.8288	0.0000
0.0029	0.4857	0.7818	7.6272	0.9090	0.0000
0.0148	0.4209	1.4652	10.4418	0.8628	0.0000
0.0008	0.3606	0.3100	4.8030	0.9409	0.0000
-0.0027	-0.1910	0.1017	-2.7515	0.9550	0.0088

TERMINATION ON END OF FILE - UNIT 1

DATE 23 APR 72 JCB ACCNT CAG1112 PARK

TIME ON 17.15.44 RESIDENT TIME 3.24 MIN
PRINTED 17.20.18 EXECUTION TIME .42 MIN

CPU TIME .CC7 HRS \$0.84
(CLASS C, RATE = \$120/HR)

59 CARDS READ .0295 UNITS
372 LINES PRINTED .1860 UNITS
20 PAGES PRINTED .0600 UNITS

TOTAL I/O .2755 UNITS \$0.28
(I/O RATE = \$1/UNIT)

TOTAL COST \$1.12

ACCOUNT BALANCE \$14.83

BIBLIOGRAPHY

- Anderson, Theodore R. "Intermetropolitan Migration: A Comparison of the Hypotheses of Zipf and Stouffer". American Sociological Review, XX (June, 1955), pp. 287-91
- Anderson, Theodore R. "Intermetropolitan Migration: A Correlation Analysis". American Journal of Sociology, LXI (March, 1956) pp. 453-61
- Ashby, Lowell. "The Geographical Redistribution of Employment: An Examination of the Elements of Change". Survey of Current Business, XLIV (October, 1964) pp. 13-20
- Blanco, Cicely. "The Determinants of Interstate Population Movements". Journal of Regional Science, I (January, 1969), pp. 5-14
- Bogue, Donard J. "Internal Migration", the Study of Population, edited by Philip M. Hauser and Otis D. Duncan, University of Chicago Press, Chicago 1959
- Bright, Margaret J., and Thomas, Dorothy S. "Interstate Migration and Intervening Opportunities". American Sociological Review, VI (December, 1941) pp. 773-85
- Carrothers, Gerald A.P. "An Historical Review of the Gravity and Potential Concepts of Human Interaction", Journal of the American Institute of Planners, XX (Spring, 1956) pp. 94-103
- Gallaway, Lowell E. "Variations in Geographic Labor Mobility Patterns". Journal of Human Resources, II (Fall, 1967), pp. 461-74
- Goodrich, Carter. "Internal Migration and Economic Opportunity". Annals of American Academy of Political and Social Science, CLXXXVIII, (November, 1936)
- Greenwood, Michael J. "An Analysis of the Determinants of Geographic Labor Mobility in the U.S.A.". Review of Economics and Statistics LI (1969), pp. 189-94
- Haenszel, William. "Concepts, Measurement and Data in Migration Analysis". Demography, IV, No. I (1969), pp. 253-61
- Hathaway, Dale E. "Migration from Agriculture: The Historical Record and Its Meaning". American Economic Review, L (May, 1960) pp. 379-91
- Kariel, Herbert G. "Selected Factors Areally Associated with Population Growth Due to Net Migration". Annals of the Association of American Geographers, LIII (June, 1963) pp. 210-23
- Stewart, Charles T., Jr. "Migration as a Function of Population and Distance". American Sociological Review, XXV (June 1960) pp. 346-56

- Schwind, Paul J. "Migration and Regional Development in the United States: 1950-1960". Department of Geography Research Paper, No. 133 University of Chicago, Chicago, 1970
- Thomlinson, Ralph. "A Model for Migration Analysis". Journal of American Statistical Association, LVI (September, 1961), pp. 675-82
- Borts, George H. "An Approach to Measuring Regional Growth Differentials". Papers and Proceedings of Regional Science Association, IV (1958), pp. 207-20
- Duncan, Otis D., et. al., "Metropolis and Region". Johns Hopkins Press Baltimore, 1960
- Friedmann, John. "The Spatial Structure of Economic Development in the Tennessee Valley: A Study in Regional Planning". Department of Geography Research Paper No. 39, University of Chicago, Chicago 1955
- Keeble D.E. "Models of Economic Development", in Models in Geography, Ed. R.J. Chorley and P. Haggett (Methuen & Co., Ltd., London, 1967)
- Perloff, Harvey S., and Wingo, Lowdon, Jr. "Natural Resource Endowment and Regional Economic Growth," in Natural Resources and Economic Growth, ed. by Joseph J. Spengler, Resources for the Future, Inc., Washington, 1961
- Perloff, Harvey S.; Dunn, Edgar S., Lampard, Eric E.; and Muth, Richard F. "Regions, Resources and Economic Growth," Johns Hopkins Press, Baltimore, 1960
- Nicholls, William H. "Industrialization, Factor Market and Agricultural Development". Journal of Political Economy, LXX (August 1961) pp. 319-330
- Lee, Everett S. et. al. "Methodological Considerations and Reference Table", Vol. I of Population Redistribution and Economic Growth: United States, 1870-1950, American Philosophical Society, Philadelphia, 1957
- Leven, Charles L. "Design of National System of Regional Accounts", Institute for Urban and Regional Studies Working Paper ERA-9, University of Washington, St. Louis, 1967
- Berry, Brian and Horton Frank (ed.) "Geographical Perspective on Urban Systems: with Intergrated Reading", Prentice-hall, Inc., New Jearsey 1970, pp. 94-105
- Isard, Walter et. al., "Methods of Regional Analysis", the M.I.T. Press Cambridge, 1960
- Lowry, Ira A. "Migration and Metropolitan Growth: Two Analytical Models", Chandler Publishing Co., San Francisco, 1965
- Advisory Commis-sion on Intergovernmental Relations. "Urban and Rural America: Policies for Future Growth", A Commission Report A-32, Washington: Government Printing Office, 1968

- Bogue, Donald J. and Harris, Dorothy L. "Comparative Population and Urban Research via Multiple Regression and Covariance Analysis", Studies in Population Distribution No. 8, Scripps Foundation for Research in Population Problems, Oxford, 1954
- Rogers, Andrei A. "A Regression Analysis of Interregional Migration in California", The Review of Economics and Statistics, XLIX, (May, 1967) pp. 262-87
- Reynolds, L. G. "The Impact of Collective Bargaining on the Wage Structure in the United States", in the Theory of Wage Determination, J.E. Dunlop, ed., St. Martin's Press, New York, 1957
- Fuchs, Victor R. "Statistical Explanational of the Relative Shift of Manufacturing among Regions of the United States", Regional Science Association Papers, Vol. VIII, 1962, pp. 105-125
- Raimon, Robert L. "Interstate Migration and Wage Theory". Review of Economics and Statistics, XLIV (November, 1962) pp. 428-438
- Greenwood Michael J. and Gomerly Patrick J. "A Comparision of the Determinants of White and Nonwhite Interstate Migration" Demography Vol. 8, No.1 (February, 1971) pp. 141-155
- U.S. Department of Commerce, Bureau of Census, "Current Population Reports Series P-20, No. 171, No. 61, No.85 and No. 104
- U.S. Department of Commerce, Bureau of Census, "Current Population Reports Series P-25 No. 460
- U.S. Office of Business Economics "Growth Patterns in Employment: 1940-1950 and 1950-1960", Government Printing Office, Washington, D.C.
- Bowles, G. K. and Tarver, J. D., "Net Migration of the Population, 1950-1960 by Age, Sex, and Color", Vol. III. (Economic Research Service, USDA)

THE RELATIONSHIPS BETWEEN STRUCTURAL CHANGE OF STATE ECONOMY
AND INTERSTATE MIGRATION IN THE UNITED STATES: A REGRESSION ANALYSIS

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SOO CHI PARK

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The purpose of a migration study is to explain the amount (magnitude) and distribution (net direction) of population movement. A common analytical procedure for estimating migration is to employ single equation linear multiple regression models, and to measure the trends and relations among variables affecting migration activities.

Development of numerical parameters defining the degree of associations of economic factors with migration behavior has traditionally been an area of extensive concern. But the typical indices employed for measurement of such associations have not been inclusive enough to represent the overall economic dimension of regions. Interpretations of economic aspect of migration behavior by such partial indices as wage rates, income level and employment may lead into insufficient understanding of the true attributes of such behavior.

This study is designed to advance the hypothesis that an economic index expressing the structural change of sectoral income-generating activities may serve as an explanatory device for economic aspect of migration behavior. As the conceptual basis for determining an inclusive economic index, the shift analysis of the productive employment was adopted. As a way of distinguishing relative influence of different sectors of activity upon migration, eight industrial categories were determined following the census classification system. The changes in economic structure thus defined were measured over the time period from 1950-1960. Next, a multiple regression model was constructed to ascertain statistically whether the hypothesis thus conceived may apply to interstate migration pattern in the United States over the same time period.

The analysis presented several remarkable results. Firstly, the coefficient of determination, or the explanatory power of the hypothesized eight industrial parameters, was 0.96 at 0.05 level of significance. The high R^2 signifies the utility of the independent variables as device for estimating interstate net

Migration.

Next, through a step-wise regression analysis, the influence of each economic sector upon state-wise changes in net migration was determined. The regression analysis identified the sector of Agriculture as the most powerful single factor of net migration activity. It is explained by the high rate of out-migration of persons from agriculture. The next highest sector of economic activity as related to net migration was represented by the sector of Manufacturing. Because of its absolute size and position as a leading income generator in most regions, it is not surprising that the Manufacturing activity is highly related to net migration behavior. The third category of industry determined as influential for net migration activities was the sector of Transportation and Communication. The next sector in importance was that of Finance, Insurance and Real Estate which was followed by the sector of Public Administration and Armed Services. As the structural change is explainable only in specific regional context, an effort was made to identify the basic attributes of the changes to see whether they may have relevance to different situations.