MIGRATION FROM APPALACHIAN KENTUCKY, 1965-1970

By

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CHAPTER I

THE RESEARCH PROBLEM

Introduction

Migration from Appalachia[1] has occurred at such a rapid rate as to create serious impacts on both the origins and destinations of migrants. Fetterman (1967, p. 154) likened the stream of Appalachian migrants to the "Okies and Arkies" who struck out for California in the 1930's searching desperately for "a place to exist" and called it "the most significant migration of our time." From 1900, the Southern Appalachian region[2] lost more people through migration than it gained, with the rate increasing markedly after 1950 (Brown and Hillery, 1962). Between 1950 and 1960, the region lost nearly one-half million people, 341,000 of whom were from Eastern Kentucky (Brown and Hillery, 1962; Dunlop and Whitt, 1981). By the 1960's, the tide had slowed somewhat but Appalachian (Eastern) Kentucky still had a net loss of 46,651 people (Pickard, 1981) and an outmigration of 156,000 (Dunlop and Whitt, 1981).

This mass exodus had profound effects, non-economic as well as

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[1] Appalachia, as defined by the Appalachian Regional Commission (ARC) consists of 397 counties in 13 eastern states. Included in this area are portions of AL, GA, KY, MD, MS, NY, NC, OH, PA, SC, TN, VA, and all of WV (Newman, 1972).

[2] Southern Appalachia consists of the Appalachian portions AL, GA, TN, VA, WV, KY, and part of NC (Brown and Hillery, 1962).

economic. The most visible result was the creation of hillbilly ghettos, slums comprised of former Appalachian residents, in northern Midwest cities. The less visible and more critical problems were those faced by the social service agencies of destination areas as they tried to cope with the newcomers' problems and culture (Fetterman, 1967). A less obvious but equally important problem was the drain of the most productive portion of the Appalachian population; a majority of those who left were the younger, better educated residents (Caudill, 1962). As a result, the population consisted of either the very old or the very young, contributing little to the tax base and drawing heavily on social services (ARC, 1971).

Problem Statement

Migration from Appalachia has been well documented in regard to change in population but the processes involved in the decision to migrate and the choice of destination are understood only vaguely. As in general migration theory, the primary causes are thought to be economic but the exact relationship between Appalachian migration and various economic facets is speculative. The relationship between change in coal production and outmigration has been noted (Dunlop and Whitt, 1981; Caudill, 1962; Brown and Hillery, 1962) as has the relationship between poverty and migration (Brown and Hillery, 1962) and individuals as well as government agencies have speculated about the effects of unemployment (ARC, 1971; Gibbard, 1962; Brown and Hillery, 1962; Belcher, 1962) but few, if any, definitive conclusions have been drawn.

The lack of definitive answers to the question of processes involved in Appalachian migration is accompanied by only a general knowledge of where migrants go. Migration fields between Appalachia and the Great Lakes/Midwest region have been identified (Schwind, 1975; Roseman, 1971) but precise destinations are missing. An influx of migrants to cities such as Chicago, Cincinnati, Cleveland, and Dayton is apparent because of the hillbilly ghettos (Fetterman, 1967) and Brown, Schwarzweller, and Mangalam (1963) noted that communities in Ohio and Illinois receive large number of migrants from Appalachian Kentucky but the pattern of migration to the rest of the country is virtually unstudied.

Outmigration has become part of the Appalachian way of life, beginning during the depression with the exodus of European immigrants brought in to mine coal (Caudill, 1962) and continuing to the present. In the process, the population has changed, the tax base has been eroded and the destinations have been faced with increasing demands on the social service agencies. Efforts to reverse the trends, beginning with the depression era programs and extending through the work of the Appalachian Regional Commission, have been hindered by two factors: the lack of a clear understanding of the processes involved in the migration decision and only a partial accounting of the destinations of the migrants.

Purpose of Research

To partially fill the void in Appalachian migration literature, this study analyzes outmigration between 1965 and 1970 for a small subregion of the area, Appalachian Kentucky. Three components of the phenomenon are examined: geographical distribution of migrants, factors affecting the migration decision and choice of destination, and variations in outmigration within the subregion, to assess the patterns and processes associated with migration from a disadvantaged area.

An assessment is made of the destinations of all outmigrants and the geographical distribution is analyzed to identify patterns of migration. From those patterns, major and minor migration regions are delineated.

Social, economic, and geographical factors which affect the migration decision are identified. A model, composed of these factors, is developed and used to analyze variations in migration from Appalachian Kentucky to the remainder of the country. Additionally, factors identified in the literature as important in the decision to migrate are used to analyze variations in outmigration within the region.

The Study Area and its History

Research for this study focuses on only a small part of the Appalachian region. Emphasis is placed on the 49 counties of Kentucky defined by the Appalachian Regional Commission (ARC) as 'Appalachia' (Figure 1). These counties are located in the eastern portion of the state, from the Appalachian Mountains through the adjacent foothills. Included in this area are the South Central Highlands, SEA 5, the Eastern Hills, SEA 8, the Eastern Coalfields, SEA 9, and the Ashland metropolitan area, SEA C, (Ford, 1964).

The South Central Highlands, extending from the Pennyroyal Plain through the edge of the Cumberland Plateau, is predominatly an agricultural area with some coal mining and very little manufacturing. The Eastern Hills area, located almost entirely in the Appalachian Plateau, is characterized by small scale subsistence farming, relatively low levels of coal production, and a predominatly rural nature. The Eastern Coalfields area, most of which is situated in the Cumberland Mountain

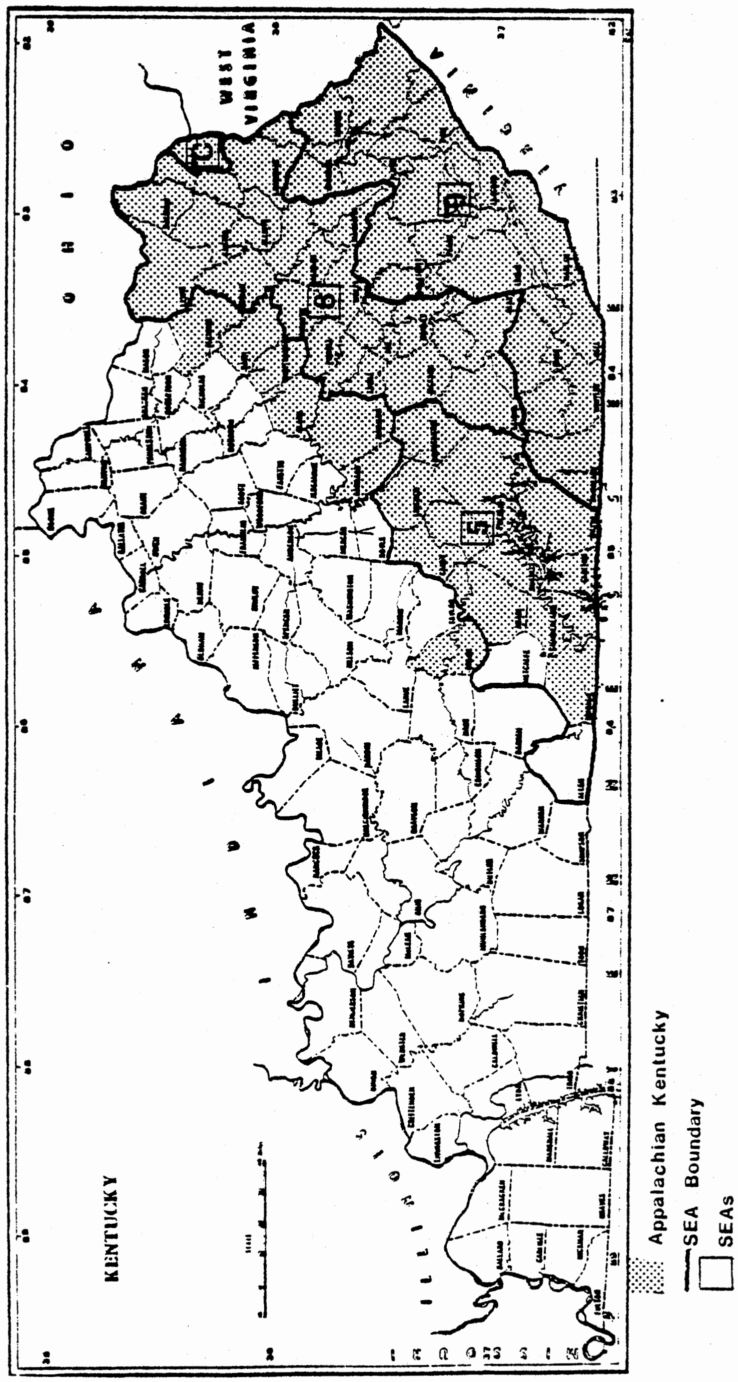


Figure 1. Appalachian Kentucky

portion of the Appalachian Plateau, is characterized by rugged terrain, chronic unemployment, limited agriculture and manufacturing, and declining coal production. The Ashland metropolitan area was founded as an industrial center and continues as such today. The steel industry has declined and with it the number of unskilled and semi-skilled jobs (Bogue and Beale, 1961).

Through the area is not entirely homogenous it shares a common history and many of the same problems. It is a depressed area with few jobs available for the unskilled worker (Brown and Hillery, 1962) and the object of much curiosity and concern because of the poverty and folk life ways of the residents.

The first permanent white migration to the area began around 1787. Migrants continued to come in great numbers until around 1812. From then until around 1830, the inmigration was sporadic and after 1830 there was virtually no inmigration until the coal boom (Caudill, 1962).

Settlers who came during the 1787 to 1830 migration primarily had Irish, English, or Scottish backgrounds. Most were descendents of first generation, underpriviledged American immigrants (Lantz, 1964) and had spent time as indentured servants in the coastal states (Caudill, 1962). They viewed the move to Appalachia as an escape of sorts.

The pioneer spirit was the most pervasive force among the migrants with independence and self-reliance highly valued (Cressy, 1949), especially economic independence (Ford, 1962). Unlike other migrants who traversed America, the Appalachian migrants had no desire to establish communities. They chose instead to scatter throughout the area and were likely to move to a more remote location if neighbors moved nearby (Caudill, 1962). They wanted only to be left alone to make a living from the land and remain isolated from the complications of social change (Lantz, 1964).

The family, with an extensive kinship network, and the community, composed of a few friends and relatives from nearby were the basic social units (Cressy, 1949). Social interaction took place almost exclusively within this realm, with kinship and clan being the most important. All aspects of life were influenced by family ties (Cressy, 1949).

Until the 1870's, Appalachian Kentucky was almost totally isolated. The terrain was rugged and not easily traversed; transportation facilities were virtually nonexistent. There was little contact with outside world and the mountaineer lived a self-contained life (Cressy, 1949).

In the 1870's, businessmen in the eastern United States began to recognize the value of timber and coal in Appalachia. The future of industry depended upon a large energy source and the growing population had a need for products derived from wood so agents were sent to Kentucky to purchase timber and mineral rights (Caudill, 1962).

Changes brought by the sale of mineral and timber rights had long term as well as immediate effects and in part caused problems faced by contemporary Appalachian residents. For the first time the residents had access to relatively large sums of money to purchase luxury items (Caudill, 1962) but at the expense of their land and future livelihood. In most instances, long deeds were signed in transferring mineral rights and allowed companies to employ any methods necessary to remove the minerals including destroying timber, polluting streams, and leveling mountains (Fetterman, 1967). The land remained relatively unchanged for two to three decades, during which time the people's realm of social interaction was expanded and the patterns of self-sufficiency were altered (Cressy, 1949).

With the development of the coal industry, the area underwent radical changes. Clear cuts made in removing timber and land clearing for mines made the subsistence lifestyle increasingly difficult; erosion washed the already marginal soil into streams making both fishing and farming impossible and game which had previously lived upon the timber was forced to move rather than starve (Caudill, 1962). Many natives, faced with dim prospects of living off the land and desirous of the lifestyle previously afforded them through the sale of timber and mineral rights, chose to move to company towns and work in coal mines. Those who remained on the farms often over cultivated the land growing enough food for their families and to sell in the mining towns (Caudill, 1962).

The boom in the coal industry and the prosperity associated with it lasted only a short time. The Depression brought coal mining almost to a halt and ended the prosperity of the mountaineers who had come to expect an abundant life (Cressy, 1949). The economy of the area was devastated and many of the miners were forced to go back to the farm. Those who had no farms to which to return stayed in the mining towns, working as often as possible for any wages (Caudill, 1962).

New Deal programs offered some relief and in the process precipitated basic societal changes. Isolation was reduced through the construction of roads and rural electrification (Caudill, 1962; Ford, 1962). The population composition changed; many of the young people left the area to join the Civilian Conservation Corps and never returned (Caudill, 1962). One of the greatest impacts of the New Deal era was the creation of the welfare state and the demoralization of the residents. Working on projects was a satisfactory replacement for working in the mines but free handouts such as the commodities program caused a loss of self-esteem (Caudill, 1962). In time, the people came to expect government aid.

World War II brought renewed prosperity to Appalachia but not to the same extent as the previous coal boom. Mining jobs were available in the region but opportunities also existed out of Appalachia and many of the youths chose to migrate (Ford, 1962). Coal companies were faced with a shortage of workers and minerals inaccessible by underground mines (Caudill, 1962). New technologies were developed to mine coal more efficiently and with lower labor requirements but at a higher cost to the environment (Gibbard, 1962).

The second coal boom was short lived with the demand for coal declining after World War II. Additionally, changing technology and increased mechanization lowered labor requirements. A mine which employed 2,100 people in 1949 produced the same amount of coal in 1958 with only 749 employees (Gibbard, 1962). During that period, outmigration became critical, medical facilities owned by the coal companies closed and educational structures fell into disrepair (Caudill, 1962).

Poverty and high levels of outmigration continued virtually unnoticed until the organization of the Appalachian Regional Commission in 1964 (The Appalachian Experiment, 1971). The purpose of the ARC was to bring Appalachia into the American mainstream. Most of the programs were directed at improving social welfare but some attenton was given to economic development (Whitt, 1981). Federal funds were used to bring businesses to the region in an attempt to diversify the economy (Deakin, 1979). Improved medical conditions resulted from better medical facilities (Dunlop and Whitt, 1981) and educational opportunities increased.

Despite government intervention, the changes in Appalachian Kentucky have been minimal. Social services have improved but the economy is not healthy. Diversity is lacking as is a strong employment base; many heads of households are forced to leave the area to find work (Dunlop and Whitt, 1981). Appalachian Kentucky has not been moved into the American mainstream and people continue to leave the area in search of a better life.

Definition of Terms

Throughout this thesis, certain terms are used which may not be familiar to the reader or convey a meaning other than the one intended by the author. To limit confusion, the following terms are defined: State Economic Areas, migration, push factors, and pull factors.

State Economic Areas (SEAs) are geographical units, defined by the United States Census Bureau, containing one or more counties within state boundaries. The SEAs are designed to delineate homogeneous regions; 205 of them are metropolitan areas and each of the remaining 205 contain areas which are agriculturally and economically similar (Roseman, 1977).

Migration, for the purpose of this research is defined as permanent changes in residence which occur across SEA boundaries. Only place of residence at the beginning and at the end of a given time period is noted so intermediate moves are unreported. Additionally, intra-county and inter-county moves which do not require crossing SEA boundaries are not considered.

In the migration process, two types of factors are thought to be important: push and pull. Push factors, as defined by Ravenstein, are adverse place attributes, such as taxation or climate, which drive people from their homes and into the migration process. Pull factors are attractive attributes of a place, such as jobs or high salaries, which draw people into the migration process as they attempt to better themselves by changing residence (Weeks, 1978). Though Ravenstein considered the two as separate entities, in reality they may be considered highly interrelated with push factors affecting the decision to migrate and pull factors affecting the choice of destination.

CHAPTER II

SELECTED LITERATURE REVIEW

Introduction

Over the past 15 years, models have been developed and used extensively in the analysis of variation in migration. Three predominant types of models are found in the literature: inmigration, outmigration, and place-to-place. Most have as a basis utility maximization theory and Ravenstein's theory of push and pull (Lee, 1966). This review of literature examines general models of all three types as well as models developed specifically to analyze Appalachian migration. Factors included in the models are discussed and an assessment is made of the relative worth of economic and quality of life components in explaining migration.

Inmigration Models

Review

Inmigration models are used to assess place attributes which attract or repel potential migrants - pull factors. Levels of analysis vary as do the precise components of the models but all represent an attempt to identify factors which will most accurately explain variations in inmigration. Certain types of components are routinely included: income, jobs, and unemployment, while others are defined according to the specific purpose of the research. The relationships between the variables and migration are usually specified according to the economic theory of migration as a utility maximization process. Attributes, such as unemployment, which are thought to have an adverse effect on utility maximization are hypothesized to have a negative relationship with inmigration; attributes beneficial to utility maximization are hypothesized to have a positive relationship.

The five general inmigration models presented in this section and in Table XXI, Appendix A represent a cross section of a large body of literature and provide an indication of measures utilized to represent the basic factors affecting migration. Additionally, they help clarify the relationship between migration and economic as well as non-economic attributes.

Using the economic theory of migration that people move to maximize the utility of income and leisure as a basis, Glantz (1973) developed an inmigration model applicable to the economically disadvantaged. Metropolitan areas with populations of 250,000 or more were used as the level of analysis with inmigration rates of the poor analyzed for two time periods, 1955 to 1960 and 1965 to 1970.

Two of the three economic variables included in the model reflected the idea of maximization of income as the key factor in the migration decision. Employment potential was a measure of the change in jobs in a given area relative to the change in jobs in the nation and the natural increase in the labor force of a given area. The second variable, industrial relocation index, was a measure of growth of industry in the city relative to national growth. The third economic variable, welfare payments per recipient, was a simple measure of economic attractiveness of a city.

Non-economic variables completing the model included population of the area, proportion of the poor residing in the area and racial mix. Population of the area was included to represent two important facets of the migration process: amenities and information. Proportion of poor was seen as a measure of the ability of a city to support the poor. Racial mix was used as a proxy measure for friends.

For each time period, three multiple regressions were done with migration rates to the metropolitan area, central city, and suburbs as the dependent variable. Employment potential and industrial growth were significant in explaining variation in inmigration in most of the cases; proportion poor and welfare payments per recipient were the next most consistent. Population was not very useful and racial mix was not significant in any of the regressions.

For disadvantaged migrants, economic attributes were the most important pull factors. Traditional labor sources of income were important but non-labor sources were becoming increasingly important. Amenities and friendship were found to exert relatively no impact on the choice of destination.

Cebula (1975) developed an inmigration model which incorporated quality of life (QOL) variables as well as economic ones in an attempt to assess the impact of quality of life considerations on the migration process. Migration rates for 12 race-sex-age groups were analyzed for the 1965 to 1970 period with states used as the level of analysis.

Four QOL variables were used: two climate measures, a measure of environmental quality, and a measure of medical care. Temperature and amount of daily sunshine, the climate variables and the medical care variable, physicians per 100,000 people, were considered positive place attributes; air pollution was viewed as a negative attribute.

Two economic variables were also included in the model: per capita income and average monthly welfare payments. Per capita income was theorized to be a positive place attribute for both whites and blacks but average monthly welfare payments were hypothesized to have a different type of relationship with black migration than with white. Blacks, with a higher proportion of their population recipients of the benefits, were expected to view higher welfare payments as an economic incentive. Whites, conversely, were expected to view welfare as a negative economic attribute because of the perceived costs of administering such programs.

For each of the groups a multiple regression was run. The results varied but some patterns emerged. Two QOL variables, doctors per 100,000 people and pollution, as well as the welfare variable, were consistently significant in the regressions of white migration. Temperature was significant but exhibited the wrong sign. The remainder of the variables were not significant in explaining variation in white migration. The model was much less successful in explaining migration for the black groups; none of the variables were consistently significant across all or most of the age-sex categories.

Overall, QOL considerations were found to be important pull factors for white migrants. Economic considerations were less important but still exerted some influence on inmigration.

Navratil and Doyle (1977) developed a model which incorporated variables traditionally associated with the human capital theory of migration and personal characteristic variables. This was done in an attempt to test their hypothesis that migration was a two stage process and could accurately be analyzed only by including personal characteristics influencing the decision to migrate and the labor market characteristics influencing the choice of destination.

Personal characteristics used in the model included percentage of population married, percentage unemployed, percentage in the military, average age, and average education. Marriage and age were thought to have a negative effect on migration; as people became older and more settled they moved less frequently. Unemployment, education, and military service were thought to encourage migration. Labor market characteristics included unemployment rate, employment growth rate, urbanness, education of labor force, income, migrant stock, population, modal distance traveled, and average annual temperature.

Multiple regressions were run with migration rate for four race-sex cohort groups used as the dependent variables. Results varied for the groups in terms of significant model components but in all cases the models explained approximately 50% of the variation in migration. Economic attributes which acted as pull factors included unemployment rate and employment growth rate. Significant personal characteristics included age, education, and marital status. Migrant stock was also significant. Quality of life characteristics of labor market areas contributed little in explaining variation in inmigration.

Kleiner and McWilliams (1977) developed a model comprised of demographic and economic variables to predict migration for all of the states and the District of Columbia. Slightly different models were specified for whites and non-whites.

Variables utilized in both models included rate of natural increase of labor force population, change in jobs, per capita income, change in unemployment rate, inmigration rate in previous census period, and mean January temperature. In the non-white migration model, an additional economic variable was utilized, aid to families with dependent children. A measure of amenities was included in the white model.

Stepwise multiple regressions were performed for 14 race-age groups. Results varied for the white and non-white models, but in both cases previous migration was highly significant. Other variables significant in the white migration models included change in jobs, population, and temperature. For the non-white migration models the only other consistently significant variable was per capita income. Aid to families with dependent children was significant in three of the seven cases. In all cases, the amount of variation in migration explained by the models was greater than 60% with an average of 81%.

Using a series of migration models, Cebula (1980) explored the impact of cost of living on geographic mobility. Net migration rates to 36 metropolitan areas were analyzed to determine if the inclusion of a cost of living variable made inmigration models more effective.

Two models were specified with the second differing from the first only by the inclusion of a variable for the average annual cost of living. Two economic variables: average median family income and average unemployment rate, were included as well as a climate variable, annual 65 days.

Two multiple regressions were run. In the first, which did not include the cost of living variable, only unemployment and temperature were significant. All of the variables were significant in the second multiple regression. Additionally, the explained variation was higher for the model which included cost of living than for the one which did not.

Summary

Three measures of economic opportunity were routinely included in the inmigration models: income, change in jobs, and unemployment, with varying degrees of success. Income and unemployment, in most cases, were not significant but change in jobs was. Non-labor income variables were included in three models but only in Glantz's (1973) study of disadvantaged migrants was the non-labor income variable found significant and exhibiting the hypothesized sign.

In addition to economic considerations, the models demonstrated a growing awareness that utility maximization included quality of life considerations. Though only Cebula's (1975) study focused specifically on quality of life attributes as they affected migration, all of the models utilized some measure of QOL. Temperature was the primary measure used but population and urbanness were also used to measure amenities. In general, temperture was found to be significant but measures of amenities were less consistent in explaining variation in migration.

A third type of variable included in some of the models and found highly significant was previous migration rate, or migrant stock. The past was found to be a good predictor of the future. Most of the variation in migration in Kleiner and McWilliams' (1977) study was explained by previous rate.

Overall, economic factors were less important pull factors than expected, with the exception of change in jobs. QOL considerations were also important pull factors but by far the factor most useful in explaining variation in inmigration was the previous rate.

Outmigration Models

Review

Outmigration models attempt to identify factors which are instrumental in encouraging migration from particular places, push factors. As with inmigration models, the emphasis is on economic attributes with some consideration given to demographic and quality of life factors. Utility maximization theory provides the basis for many of the models but life cycle concepts of migration and chain migration theory are also incorporated in some models. Accordingly, areas with low economic opportunity, low levels of amenities, high proportions of people who previously migrated and high numbers of people in life cycle stages conducive to migration are expected to have high levels of outmigration.

Research on the development of outmigration models is not as extensive as that concerned with inmigration models but studies exist which help clarify the processes involved in outmigration. Three such studies are presented in Table XXII, Appendix A.

To determine the effects of economic conditions and development on outmigration, especially as related to life cycle stages, Petto and Bender (1974) developed a model and applied it to net outmigration of six age cohorts from Ozark counties. In addition to standard measures of economic opportunity such as income, change in unemployment, and change in manufacturing employment, the authors also considered variables reflective of the rural nature of the Ozarks and the corresponding problems. Change in farm size, percentage of population rural-farm, distance to nearest city, and percentage of farmers employed off the farm were included in the latter group.

From the multiple regression analyses, it was determined that though income and economic opportunities were useful in explaining variation in outmigration, other factors were more important in the migration process once people were entrenched in the job market. For the age cohort 20-24, all the variables were significant and explained 77% of the variation in outmigration. For the remainder of the age cohorts, the maximum amount explained was 46%. Additionally, the only variables consistently significant were income and change in manufacturing employment.

The model developed by Miller (1973) represented an attempt to determine if outmigration was affected by economic conditions and to some extent by quality of life while controlling for the propensity of certain segments of the population to migrate. Economic conditions were measured by change in jobs, income, and population of state; temperature was used as the QOL measure, and the control variables for propensity to migrate were the proportion of population living outside their state of birth, inmigration rate, and education.

From the analysis, it was determined that all of the independent variables, with the exception of population of the state and proportion of population living outside their state of birth, were significant and explained 79% of the variation in outmigration. Change in unemployment was the primary economic determinant of outmigration but income was also highly significant. Additionally, the variables measuring the propensity to migrate were also significant in predicting outmigration; those with higher levels of education or a history of migration adapted more readily to changes in economic opportunities by migrating.

In addition to their inmigration model, Kleiner and McWilliams (1977) developed a model to predict outmigration which included the same economic, demographic, and previous migration variables. Again, slightly different models were specified for whites and non-whites.

Variables most consistently significant in explaining outmigration for whites were previous rate, population, and temperature. Economic variables, on the whole, were not useful. For non-whites, only previous rate was consistently significant but the economic variable, aid to families with dependent children, was significant in four of seven regressions.

Summary

Economic attributes were found to be important push factors with quality of life considerations only slightly important in explaining variation in outmigration. All of the models incorporated income variables as well as measures of employment opportunities and in two cases, Miller (1973) and Petto and Bender (1974), both were significant. A climate measure, when included was found to be only slightly significant; population, used as a measure of amenities was not.

A third factor useful in explaining outmigration was past migration. Miller (1973) used the inmigration rate from the previous census and Kleiner and McWilliams (1977) used outmigration rate of the previous census period. Both were significant and previous outmigration rate explained most of the variation in Kleiner and McWilliams' (1977) study.

Place-To-Place Models

Review

Place-to-place migration models differ from inmigration and outmigration models in that they analyze migration from a specific origin to a specific destination rather than looking at generalized rates into or out of areas. They utilize many of the same types of variables discussed in the previous sections, particularly economic ones, but have the flexibility to include origin as well as destination values in the same model. As a result, place-to-place models can be used to determine which origin factors are pushing people to migrate and which destination factors serve as pulls. This attribute would seem, in theory, to make them more useful in assessing the concept of migration as a utility maximization process but some debate exists on this point. Glantz (1973) asserts that place-to-place models falsely assume symmetry between origins and destination and that inmigration models have greater predictive power. Place-to-place models of Greenwood (1969) and Petto and Bender (1974) (Table XXIII, Appendix A) do not substantiate such an assertion.

Greenwood (1969) developed place-to-place migration models to analyze migration between the 48 contiguous states for the period 1955 to 1960. Several origin, destination, and combination origin-destination variables were included and multiple regressions were performed to determine their effects on migration. Two models were specified; the second differed from the first only by the inclusion of a migrant stock variable. Measures utilized in both included distance between the two states, income, education, unemployment rate, urban population, and temperature.

All of the variables in the first model were statistically significant and explained 41% of the variation in interstate migration. Distance contributed the most; the ratio between origin and destination income contributed the least.

Results for the second model were slightly different. Two of the variables, income and destination unemployment, were not statistically significant and migrant stock replaced distance in explaining the majority of the variation. With the inclusion of migrant stock, distance was entered into the stepwise multiple regression fifth. Overall, the second model was more effective than the first, explaining 72% of the variation in interstate migration.

Petto and Bender's (1974) place-to-place model developed to analyze migration from 15 Ozark counties to the 48 contiguous states was similar to Greenwood's, both in variables included and amount of variation explained. In addition to variables equivalent to Greenwood's measures of income, unemployment, education, urbanness, distance, and migrant stock, Petto and Bender included a destination wage variable and destination job variable. All of the variables, with the exception of destination unemployment and urbanness were statistically significant and the model explained 79% of the variation in migration.

Summary

In place-to-place models, economic factors at both the origin and destination were found to be important in the migration process. Push factors included income and unemployment; change in number of jobs acted as a pull factor. Migrant stock also served as a pull factor as did quality of life. Distance helped direct the flow of migration, with fewer migrants going to distant places.

Appalachian Migration Models

Review

Development of models is not an approach often taken in the study of Appalachian migration. Many studies are more qualitatively oriented and focus on a small community, such as the research of Brown, Schwarzweller, and Mangalam (1963) on migration from the Beech Creek area in Eastern Kentucky; others describe general trends or make casual inferences based on one or two economic factors. Despite the trend toward descriptive analysis, a few authors have attempted to develop models to analyze various facets of Appalachian migration; Clark and Ballard (1980) developed both an outmigration model and a place-to-place model for Central Appalachia and Graham (1982) developed an outmigration model for all of Appalachia (Table XXIV, Appendix A).

Clark and Ballard's (1980) outmigration model analyzed migration of employees in six industry groups: mining, construction, trade, manufacturing, finance, and services. All of the variables used in the analysis were economic and included change in jobs, unemployment rate, and wage rate. Change in jobs and wage rate were consistently significant in explaining variation in outmigration but unemployment was significant only for the construction and service industry groups.

Their place-to-place model analyzed migration from Central Appalachia to each of the 50 states without disaggregating the flow for industry groups. An economic variable, change in employment, was included in the model as was a climate variable and a gravity variable reflecting distance and population of destination. All of the variables were found significant and explained 80% of the variation in migration.

Graham's (1982) outmigration model was constructed in a two phase process. Factor analysis was done first to construct an index of development and then multiple regression was used to analyze variations in outmigration with factor scores used as the independent variables. Three factors were identified in the index of development: socio-demographic, infrastructure, and economic deveopment. Only economic development and infrastructure were significant in explaining outmigration. Outmigration was found to be inversely related to economic development.

Summary

Overall, economic attributes were important as push and pull factors in Appalachian migration with wages and jobs more important than unemployment. Amenities were also important; Clark and Ballard (1980) identified temperature as a pull factor and Graham (1982) found housing, health care, and education important quality of life considerations.

CHAPTER III

METHODOLOGY

Introduction

The primary purpose of this thesis is to analyze the patterns and processes of Appalachian Kentucky migration. This task requires answering three questions: where did the migrants go? what factors affected their choice of destination? and what factors contributed to the decision to migrate? Three methodologies are employed in answering the questions: mapping, model development and analysis, and descriptive comparisons.

This chapter outlines the specific methodologies to be used in answering each of the questions. The data base and level of analysis are discussed, as are the statistical techniques.

Level of Analysis and Data Base

Analysis of Appalachian migration is done using State Economic Areas (SEAs) as the geographic units. This scale was chosen for two reasons: availability of data and relative homogeneity of the units. SEAs are the most disaggregated units for which migration data showing both origins and destinations are available from the United States Census Bureau and, as previously noted, are designed to create areas which are socially and economically homogeneous.

Though State Economic Area data represent the best secondary source of migration data available from the Census Bureau, there are problems with its use. As with any other type of aggregated data, it is not accurate or acceptable to make inferences about individual behavior. Therefore, analysis results must be reported in somewhat general terms, as trends rather than as individual actions. A second problem with SEA data is size of geographic units; some SEAs contain 14 counties while others contain only one. This also requires generalizations to be made about migration patterns and processes.

The data base for this thesis contains two parts: origin SEAs and destination SEAs. Boundaries of the portion of Kentucky defined as 'Appalachia' by the ARC do not coincide completely with the SEA boundaries so not all 49 counties of Appalachian Kentucky will be included. Only SEAs which contain at least three-fourths Appalachian counties will be designated as Origin SEAs. Included in this are SEAs 5, 8, 9, and C (Figure 1). SEAs of any of the 48 contiguous states or Washington, D.C. which received one or more migrants from an Origin SEA between 1965 and 1970 have been designated as destination SEAs.

Delineation of Migration Regions

The initial step in analyzing migration from Appalachian Kentucky is the identification of patterns of migration. Using Migration Between State Economic Areas (U.S. Bureau of the Census, 1972), the number of people migrating from each Origin SEA to SEAs in the 48 contiguous states and Washington, D.C. is determined. The number of migrants to each SEA is divided by ten thousands of the origin population, 1965, to create rates, which allows comparisons to be made between patterns of migration for each Origin SEA. The rates are divided into quantiles and mapped. Each map is qualitatively evaluated and migration regions delineated.

After delineating migration regions, comparisons are made between the maps. This is done to determine if a general migration region exists for Appalachia or if there are variations in the patterns of migration from each of the Origin SEAs.

Migration Models

The second step in analyzing migration from Appalachian Kentucky is to determine the processes at work in both the decision to migrate and the choice of destination. To this end, place-to-place migration models consisting of social, economic, and geographical characteristics are developed to analyze push and pull factors and describe the processes at work. Two models are specified. The first, containing only destination characteristics, is used to assess the impact of pull factors on migration. The second, containing both origin and destination characteristics, is used to assess the relative importance of push and pull factors. Comparisons are made between the two models in terms of components and amount of explained variation to determine which origin and which destination characteristics are most important in the decision to migrate and the choice of destination.

Rationale for Independent Variables

Four basic types of variables will be included in the models: economic, quality of life, geographic, and personal. Most have been utilized in previous migration models with some measure of success or are logical for inclusion because of the characteristics of Appalachian Kentucky and its migration patterns. The following outlines the rationale for the model design employed in this thesis.

Economic factors are, in many respects, the most important in the migration process. In classical economic theory, people attempt to maximize the utility of income, which involves migrating from low to high areas of economic gain (Glantz, 1973). Economic incentives tend to direct the flow of migration (U.S. Department of Commerce, 1964) but interpretation of economic incentives is quite varied.

Income and jobs are standard interpretations of opportunities and are used extensively in migration models (Kleiner and McWilliams, 1977; Navratil and Doyle, 1977; Cebula, 1975 and 1980; Greenwood, 1969; and Petto and Bender, 1974). Additionally, the Appalachian migration models of Graham (1982) and Clark and Ballard (1980) utilized measures of income and job opportunities.

Unemployment is also used as a proxy for economic opportunity (Lycan, 1975) and has been utilized successfully in some migration studies (Kleiner and McWilliams, 1977; Cebula, 1980; Navratil and Doyle, 1977). Welfare payments as an interpretation of economic opportunities has not been operationalized in many migration studies but has shown to be somewhat important in the migration of the disadvantaged (Glantz, 1973). It has great potential in an Appalachian migration model for two reasons. The area is without a doubt disadvantaged and since World War II, there has been an increasing dependence upon welfare in Appalachian Kentucky with transfer payments a major source of income (Caudill, 1962). The final standard economic variable, cost of living, is a recent addition to migration models but one worthy of inclusion. Cebula (1980) used a cost of living variable successfully in a migration model and it was found highly significant in explaining variation in migration.

Two regionally important factors will also be included in the model: coal production and coal related employment. The economic health of the area is closely related to the 'boom or bust' nature of the coal industry and migration from the area has been traditionally associated with the decline in the coal industry (Caudill, 1962).

Economic opportunities are not the only factors affecting migration. In recent years, more attention has been placed on the quality of life and many people are becoming aware of the non-monetary aspects of a good life. Researchers are also aware of the interest of people in the nonmonetary attributes of life and have included QOL variables in migration models.

Two QOL attributes commonly considered are climate and amenities. Several models include temperature as a measure of climate (Cebula, 1975 and 1980; Navratil and Doyle, 1977; Kleiner and McWilliams, 1977; Miller, 1973; Greenwood, 1969) with a high degree of success. Additionally, Clark and Ballard's (1980) research on Appalachian migration found temperature significant in directing the flow of migrants. Population and urbanness are often included in migration models as measures of amenities (Glantz, 1973; Navratil and Doyle, 1977; Kleiner and McWilliams, 1977; Miller, 1973; Greenwood, 1969), though they are not as useful in explaining variation in migration.

The third QOL measure, housing quality, was not found in any other migration models but is included because of characteristics of Appalachian Kentucky. Quality of housing in Appalachian Kentucky in the decade of the 1960's could at best have been termed poor. In 1960, housing statistics for four counties: Harlan, Perry, Whitley, and Wolfe, indicated marginal conditions. Twenty-two percent of the families surveyed had a bath or shower, 42% had piped water, 16% had a flush toilet, and 13% had central heating. By 1973, the quality of housing had improved such that 60% of the families had a bath or shower, 74% had piped water, 61% had a flush toilet, and 33% had central heating (Coughenour, 1976). Even with the marked increase in housing quality, the situation was still not ideal.

Two geographical factors: distance and region, will be included. The first has a strong precedent in migration literature; the second reflects an attempt to test assumptions made by researchers concerning Appalachian migration streams. Distance serves as a proxy for the cost of a move, both monetarily and emotionally and there is generally a decay function associated with distance which has an attenuating effect on migration (Lycan, 1975). Two main assertions have been made about Appalachian migration. First, migrants move primarily within the state and to contiguous states (Brown and Hillary, 1962) and second, most migrants go to northern midwest cities (Fetterman, 1962; Brown, Schwarzweller and Mangalam, 1963).

Kinship/previous rate is one of the personal variables included in the model and has a well documented influence on migration. Several studies have noted the importance of kinship in the migration process. Bordeaux and Morgan (1973) conducted a study of 396 migrants from eastern Kentucky between 1955 and 1960 and found that 42% of the initial job sources came from friends and relatives in the destination city. Brown, et al. (1963), in a study of the migration stream from Beech Creek in eastern Kentucky, found that not only were kinship ties important in adjustment to new destinations, they also acted as a strong pull factor. Hyland (1970), Roseman (1971), Glantz (1973), and Morrison and

(1978) also recognized the importance of information networks provided by friends and family in the formation of migration streams.

The other personal characteristic to be included in the models is age. Migration has a strong association with life cycle stage (Navratil and Doyle, 1977) with the greatest migration occurring when people are in their early twenties (Morrison and Wheeler, 1978).

Specification of Models

In Model 1, 16 independent variables: five economic measures, three QOL measures, a distance decay measure, a measure of kinship/ previous rate, and six region designations, will be used to analyze variations in migration from the four Origin SEAs. The dependent variable, migration, will be operationalized as number of migrants to destination j from origin i, 1965 to 1970 (Table I).

The five economic variables include income, employment opportunity, unemployment rate, welfare and cost of living. Income, employment opportunity, and welfare are expected to have a positive relationship with migration; unemployment rate and cost of living are expected to have a negative relationship.

Of the QOL measures, temperature and urbanness are expected to have a positive relationship with migration. Quality of housing, being a measure of poor quality should have a negative relationship. Distance is also expected to have a negative relationship with migration. Kinship/ previous rate is expected to have a positive relationship with migration. Regions 2 and 6 are expected to have a positive relationship with migration; a negative relationship is expected between the remainder of the regions and migration.

TABLE I

MIGRATION MODEL 1

Variable	Abbr.	Type	Operationalized As	Source
Migration	MIG70	D	Migrants to dest. SEA	U.S. Bureau of Census - Migration Between SEAs
Income	MEDINC	I	Median income of families and unrelated individuals	U.S. Bureau of Census - State Economic Areas
Employment Opportunity	JOBS	I	Change in number of jobs 1965-70	County Business Patterns
Unemployment	UNEMP	I	Unemployment rate 1970	U.S. Bureau of Census - State Economic Areas
Welfare	WELF	I	Average payment per recipient-A.F.D.C.	U.S. Bureau of Census - County/ City Data Book
Cost of Living	MEDHOME	I	Median Home Value 1970	Ibid.
Quality of Housing	PLUMB	I	% Housing lacking some or all plumbing	Ibid.
Temperature	TEMP	I	Mean annual temp. of weather station within or nearest to SEA	U.S. Dept. of Commerce - Climatalogical Data
Urbanness	URBAN	I	% population living in urban area 1970	U.S. Bureau of Census County/ City Data Book
Distance	DIST	I	Straight line distance from center of origin to center of dest.	To be calculated
Kinship/ Previous Rate	MIG60	I	Number of people who migrated to dest. from origin 1955-60	U.S. Bureau of Census - Migration Between SEAs
Region 1	REG1	I	CN,DE,DC,ME,MD,MA,NH, NY,PN,RI,VT,NJ,WV	Author
Region 2	REG2	I	IL,IN,MI,OH,MO,WI	Author

TABLE I (Continued)

Variable	Abbr.	Type	Operationalized As	Source
Region 3	REG 3	I	AL,FL,GA,MS,NC,SC,TN,VA	Author
Region 4	REG4	I	AZ,AS,CA,LA,NM,OK,TX	Author
Region 5	REG5	I	CO,ID,IA,KS,MN,MT,NE NV,ND,SD,OR,UT,WA,WY	Author
Region 6	REG6	I	KY	Author

I - Independent Variable
D - Dependent Variable

In Model 2, 27 independent variables will be used to analyze variations in migration from the Origin SEAs (Table II). The variables and destination values from Model 1 are included, as are origin values for the same variables. Additionally, two measures of regional economic attributes are included: change in coal production and change in coal related employment in the origin SEAs, and a demographic measure, median age of the origin population.

The expected relationships between migration and the variables included in Model 1 remain the same. For the origin based variables the hypothesized relationships are as follows: negative for income, employment opportunity, welfare, change in coal production, change in coal related jobs and all three QOL measures, with the exception of housing quality, and positive for unemployment rate, cost of living, and age.

Statistical Analysis Procedures

Statistical tests to be employed in the evaluation of the Appalachian migration models include stepwise multiple regression and in the same cases, residual analysis. For Model 1, five stepwise regressions will be executed: one for each of the Origin SEAs and one for all of the Origin SEAs combined. Final destination characteristics models will be determined from the stepwise runs and will include only those independent variables significant at the 0.05 level. Residuals will be calculated from the final models of each of the Origin SEAs and extreme values will be mapped. For Model 2, only stepwise multiple regression will be used. The final origin-destination characteristics model will contain only those independent variables significant at the 0.05 level.

TABLE II

MIGRATION MODEL 2

Variable	Abbr.	Type	Operationalized As	Source
Migration	MIG70	D	Migrants to dest. SEA	U.S. Bureau of Census - Migration Between SEAs
IncomeO	MEDINCO	I	Median income of families and unrelated individuals Origin SEA	U.S. Bureau of Census - State Economic Areas
IncomeD	MEDINCD	I	Median income of families and unrelated individuals Destination SEA	Ibid.
Employment OpportunityO	JOBSO	I	Change in number of jobs 1965-70 Origin SEA	County Business
Employment OpportunityD	JOBSD	I	Change in number of jobs 1965-70 Destination SEA	Ibid.
WelfareO	WELFO	I	Average payment per recipient-A.F.D.C. Origin SEA	U.S. Bureau of Census - County/City Data Book
WelfareD	WELFD	I	Average payment per recipient - A.F.D.C. Destination SEA	Ibid.
UnemploymentO	UNEMPO	I	Unemployment rate 1970 Origin SEA	U.S. Bureau of Census - State Economic Areas
UnemploymentD	UNEMPD	I	Unemployment rate 1970 Destination SEA	Ibid.
Cost of LivingO	MEDHOMEO	I	Median Home Value 1970 Origin SEA	U.S. Bureau of Census - County/City Data Book
Cost of LivingD	MEDHOMED	I	Median Home Value 1970 Destination SEA	Ibid.

TABLE II (Continued)

Variable	Abbr.	Type	Operationalized As	Source
Quality of Housing	PLUMBO	I	% Housing lacking some or all plumbing Origin SEA	Ibid.
Quality of Housing	PLUMD	I	% Housing lacking some or all plumbing Destination SEA	Ibid.
Tempera-ture	TEMPO	I	Mean annual temp. of weather station within or nearest to Origin SEA	U.S. Weather Bureau - Clima-talogical Data
Tempera-ture	TEMPD	I	Mean annual temp. of weather station within or nearest to Destination SEA	Ibid.
UrbannessO	URBANO	I	% population living in urban area 1970 Origin SEA	U.S. Bureau of Census - County/ City Data Book
UrbannessD	URBAND	I	% population living in urban area 1970 Destination SEA	Ibid.
Coal Jobs	COALJOB	I	Change in number of coal mining jobs 1965-70 Origin SEA	Bureau of Mines Minerals Year-book
Coal Production	COALPRO	I	Change in Coal pro-duction 1965-70 Origin SEA	Ibid.
Distance	DIST	I	Straight line distance from center of origin to center of dest.	To be calculated
Kinship/ Previous Rate	MIG60	I	Number of people who migrated to dest. from origin 1955-60	U.S. Bureau of Census - Migration Between SEAs
Region 1	REG 1	I	CN,DE,DC,ME,MD,MA,NH NY,PN,RI,VT,NJ,WV	Author

TABLE II (Continued)

Variable	Abbr.	Type	Operationalized As	Source
Region 2	REG2	I	IL,IN,MI,OH,MO,WI	Author
Region 3	REG3	I	AL,FL,GA,MS,NC,SC,TN, VA	Author
Region 4	REG4	I	AZ,AS,CA,LA,NM,OK,TX	Author
Region 5	REG5	I	CO,ID,IA,KS,MN,MT,NE NV,ND,SD,OR,UT,WA,WY	Author
Region 6	REG6	I	KY	Author

I - Independent Variable

D - Dependent Variable

Variations in Outmigration

The final step in the analysis of Appalachian migration is to examine the variations in outmigration of the four Origin SEAs and determine if there is any relationship between outmigration and social and economic factors. Factors to be used in this analysis are those identified in the literature as significant in explaining variations in outmigration. Included are outmigration in the previous census period, income, change in jobs, unemployment, age, change in coal production, and change in coal related jobs. The analysis will be descriptive rather than quantitative because of the form of the data but inferences will be made concerning outmigration rate and economic development.

CHAPTER IV

ANALYSIS AND FINDINGS

Introduction

Three forms of analysis were used in determining where migrants who left Appalachian Kentucky went and what factors affected both their choice of destination and decision to leave. This chapter outlines each type of analysis and the basic findings. The migration regions section pertains primarily to where the migrants went. The migration models section addresses the problem of choice of destination and the section of variations in levels of outmigration is directed to the question of the decision to leave.

Migration Regions

Migration rate based on ten thousands of the Origin SEA 1965 population was used as the basis for mapping migration from the four Origin SEAs, 1965-70. The rates were divided into quartiles and maps were constructed for each Origin SEA using quartile divisions as the class intervals: a "1" indicates the first quartile, i.e. the lowest 25% and a "4" indicates the fourth quartile, i.e. the top 25%. Quartiles were chosen over other quantile divisions for ease in interpreting the patterns; other divisions, such as quintiles or sextiles, relayed little additional information and made interpretation more difficult. The same quantile division was used for each map to facilitate comparisons between patterns for the four Origin SEAs though in some instances it was impossible to include exactly 25% of the cases in each class because of the multiple occurrences of some values.

Migration rates were mapped for each Origin SEA primarily to delineate migration regions but other methods were also employed to analyze the geographical distribution of migrants and destinations. For each Origin SEA, the top 10% destination SEAs were noted as well as the number of migrants in an effort to determine if there were core states within a migration region. The figures were also used to compare the percentage of migrants going to core states and the percentage dispersed throughout the country. Variations in rural and urban migration were also explored. Rural and urban SEAs were utilized in the comparisons with urban SEAs composed of areas designated as such by the U.S. Census Bureau based on 1950 Standard Metropolitan Statistical Areas and rural SEAs composed of the remainder of the counties (Roseman, 1977).

Origin SEA 5

Figure 2 depicts migration from Origin SEA 5, known as the South Central Highlands (Ford, 1964), to all destinations in the 48 contiguous states and Washington, D.C. Table III shows the range of the actual number of migrants for each class interval and the percentage of cases within each class.

Migrants from SEA 5, totaling 19,767, went to 207 SEAs in 39 states. Most of the migration was within Kentucky and to Ohio, Indiana, and Tennessee, with somewhat smaller concentrations to Florida and Texas. Additionally, there was a small concentration of migrants to the southern states of North Carolina, South Carolina, Georgia, and Alabama. The

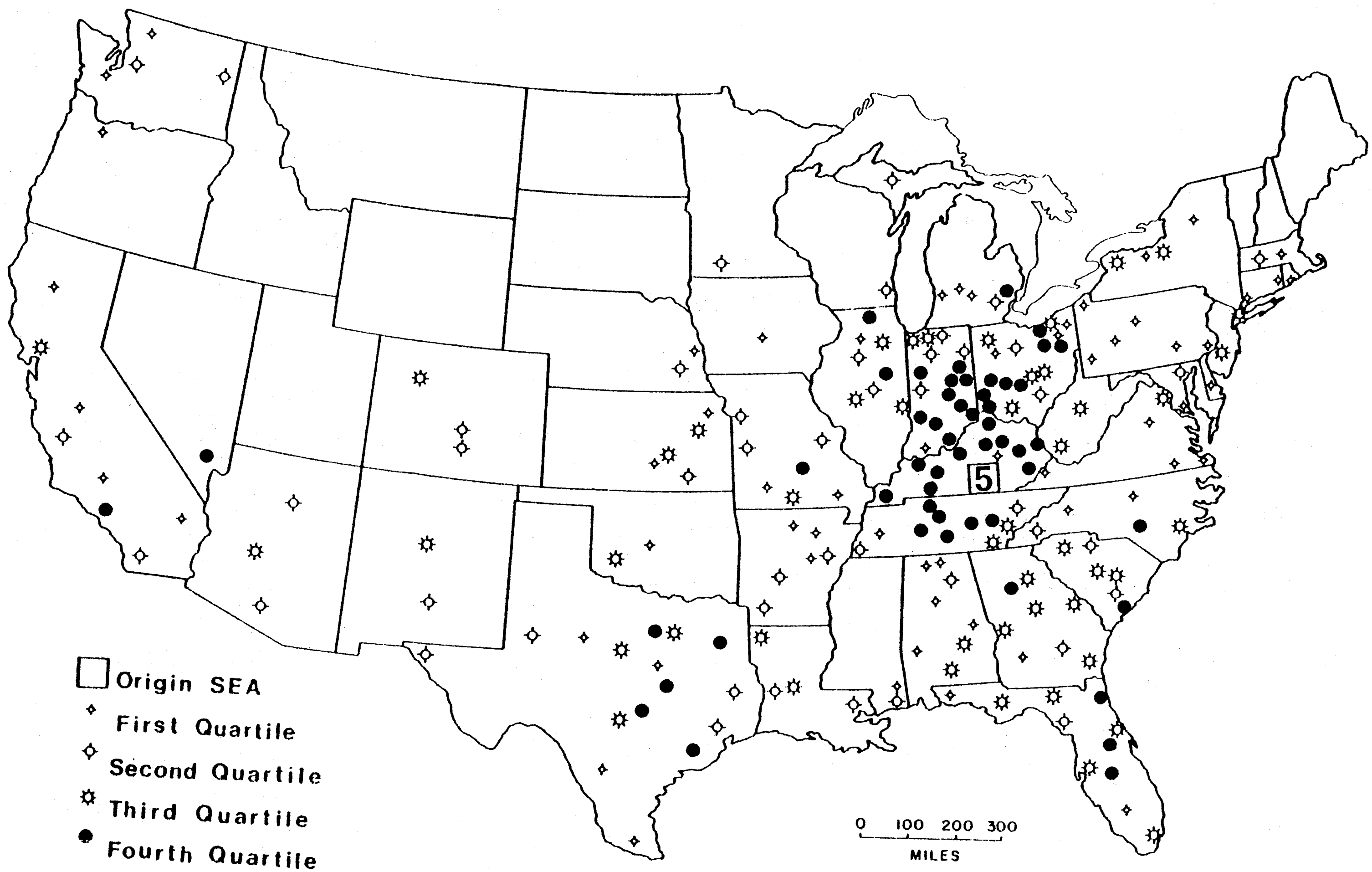


Figure 2. Migration from Origin SEA 5

TABLE III

ORIGIN SEA 5 MAP CHARACTERISTICS

Class Limits	Actual Number of Migrants	% of Cases in Each Class
.01- .51	1-8	29.0%
.52-1.27	9-20	22.2%
1.27-3.04	21-48	24.2%
> 3.04	> 48	24.6%

southwestern states and southern California also received some migrants from Kentucky's South Central Highlands region, as did Michigan and Illinois. Migration to the northwestern and northeastern states was marginal and almost nonexistent to the north central states area.

Despite the apparent diversity of choice of destinations of migrants, as indicated by the map, there seems to be a strong predilection for destinations within Kentucky and the midwestern states of Ohio and Indiana. Table IV shows the top 10% of the destination SEAs and the actual number of migrants to them, in descending order. Over half of the destination SEAs listed in the table are located in Kentucky, Ohio, or Indiana and received 63% of all migrants who left Origin SEA 5.

Table V shows the break-down of Origin SEA 5's destinations by rural and urban locations. Included in the table are the number of each type of SEA, the total number of migrants to each type, and basic descriptive statistics.

The number of rural and urban destination SEAs was almost equally divided but rural destinations received a larger percentage of migrants, 56.2% compared to 43.8% to urban SEAs. This seems to indicate a trend contrary to the rural to urban migration trend common in the 1960's but the percentages are somewhat misleading. When internal Kentucky migration, both to rural and urban SEAs, is excluded, more people migrated to urban SEAs.

Origin SEA 8

Migration from the Eastern Hills (Ford, 1964), Origin SEA 8, is shown in Figure 3. Table VI contains the range of migrants for each class interval and the percentage of cases in each class.

TABLE IV

TOP 10% DESTINATION SEAs
FROM ORIGIN SEA 5

State	SEA	# of Migrants
Kentucky	4	1642
Kentucky	6	1618
Kentucky	A	1504
Ohio	K	1153
Kentucky	3	1079
Kentucky	E	1026
Indiana	D	1024
Indiana	5	828
Indiana	4	808
Kentucky	7	564
Tennessee	6	469
Michigan	F	461
Kentucky	8	422
Ohio	C	330
Georgia	B	272
Kentucky	9	268
Illinois	B	266
Tennessee	B	251
Kentucky	1	251
Tennessee	4	230

Letter SEAs indicate urban areas.
Number SEAs indicate rural areas.

TABLE V

RURAL AND URBAN DESTINATON SEAs
ORIGIN SEA 5

	Rural SEAs	Urban SEAs
Number	110	97
Total Migrants	11107	8660
Mean # of Migrants	100.97	89.27
Range of Migrants	1638	1500
Minimum	4	4
Maximum	1642	1504
% of Migrants	56.2	43.8

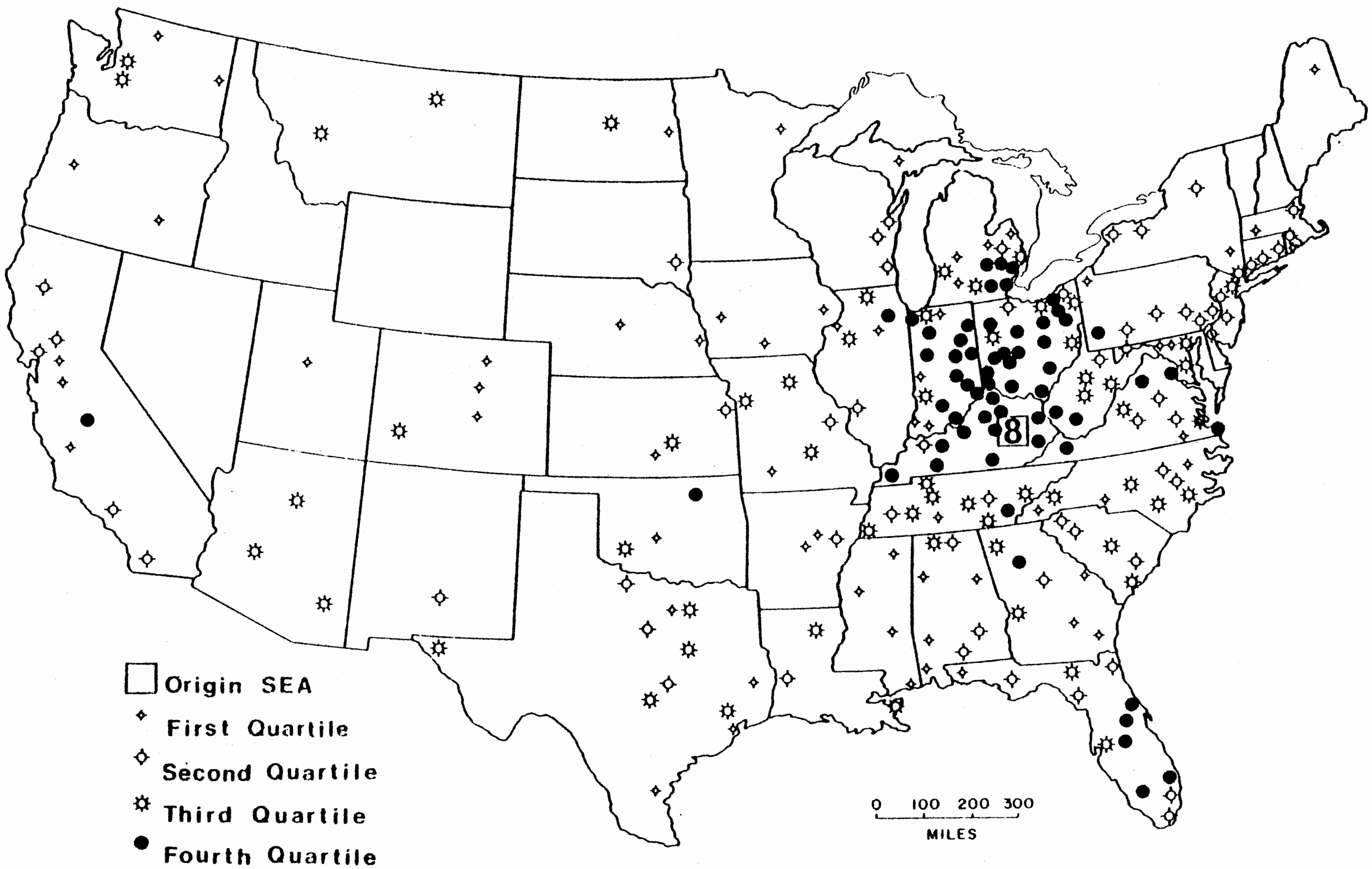


Figure 3. Migration from Origin SEA 8

TABLE VI

ORIGIN SEA 8 MAP CHARACTERISTICS

Class Limits	Actual Number of Migrants	% of Cases in Each Class
.01- .49	0-10	25.9%
.50-1.27	11-26	24.3%
1.28-3.30	27-67	25.1%
3.30	67	24.7%

Two hundred forty-three SEAs in 44 states received migrants from Origin SEA 8. The largest concentrations of migrants were in Kentucky, Ohio, Indiana, and Michigan with secondary concentrations in Florida, West Virginia, and Tennessee. The south, consisting of Virginia, North Carolina, South Carolina, and Georgia, was also a secondary migration region. Areas with moderate rates of inmigration from Origin SEA 8 included the northeast and southwest. Rate of migration to the northwest and the central northwest was slight.

Table VII, which contains the top 10% of the destination SEAs for Origin SEA 8 along with the actual number of migrants, is an indication that though the geographical range of destinations is wide, most of the migrants are concentrated in Kentucky, Ohio, Michigan, and Indiana. Seventy-one percent of the people who left Origin SEA 8 migrated to the 23 SEAs listed in Table VII; the remaining 29% were spread among 220 SEAs.

Table VIII shows the break-down of destination SEAs by rural and urban. The number of destinations and the number of migrants are almost evenly divided between the two types with rural SEAs receiving slightly more migrants. Removing migration to SEAs within Kentucky alters the percentages of people going to rural and urban SEAs and a definite trend to urban SEAs emerges.

Origin SEA 9

Migration from Origin SEA 9, the Eastern Coalfields (Ford, 1964), is mapped in Figure 4. The class limits, the range of actual migrants for each class and the percentage of cases in each class is shown in Table IX.

TABLE VII

TOP 10% DESTINATION SEAs
FROM ORIGIN SEA 8

State	SEA	# of Migrants
Kentucky	6	2955
Ohio	C	1640
Kentucky	E	1632
Kentucky	9	1529
Kentucky	C	1081
Ohio	3	1061
Ohio	K	1006
Kentucky	7	848
Ohio	D	793
Michigan	F	777
Kentucky	A	763
Ohio	B	738
Ohio	8	732
Indiana	D	651
Kentucky	B	625
Ohio	2	608
Kentucky	5	591
Ohio	4	585
Indiana	4	478
Ohio	7	389
Kentucky	3	349
Ohio	1	280
Ohio	N	271

Letter SEAs indicate urban areas.
Number SEAs indicate rural areas.

TABLE VIII

RURAL AND URBAN DESTINATION SEAs
ORIGIN SEA 8

	Rural SEAs	Urban SEAs
Number	117	126
Total Migrants	14728	14070
Mean # of Migrants	125.88	111.66
Range of Migrants	2952	1636
Minimum	3	4
Maximum	2955	1640
% of Migrants	51.1	48.9

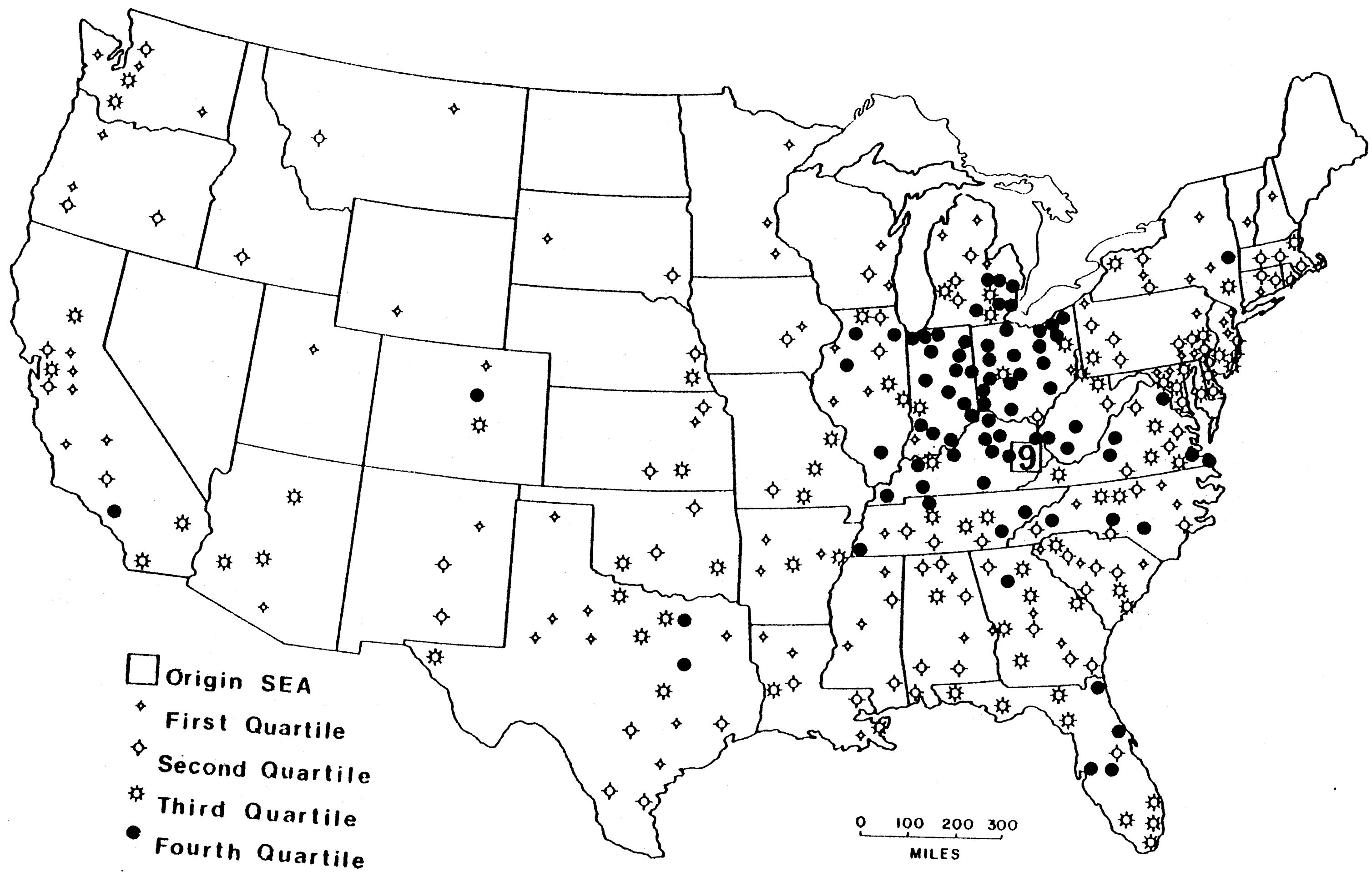


Figure 4. Migration from Origin SEA 9

TABLE IX

ORIGIN SEA 9 MAP CHARACTERISTICS

Class Limits	Actual Number of Migrants	% of Cases in Each Class
.01-.33	0-11	25.3%
.34-.94	12-32	25.0%
.95-2.65	33-90	25.0%
2.65	90	24.7%

Migrants from Origin SEA 9 went to 316 SEAs in 46 states and the District of Columbia. Recipient SEAs of high rates of inmigration were located within Kentucky and in Ohio, Illinois, Indiana, and Michigan. High rates of migration were also found in Tennessee and Florida. Secondary clusters of migrants were found in the south: Virginia, North Carolina, South Carolina, Georgia, and Alabama, and along the northeast coast. The southwest, including Texas, New Mexico, Arizona, and California, emerged as the third secondary region. Through the remainder of the country, migration was scattered.

Despite the emergence of several secondary regions and primary migration clusters, the major orientation of migration from Origin SEA 9 was midwestern: Ohio, Indiana, and Michigan, or within Kentucky. Table X, which shows the top 10% of the destination SEAs and the number of migrants to each helps clarify this point. Over 90% of the SEAs listed are in Kentucky, Ohio, Indiana, or Michigan and received 61% of the migrants from SEA 9.

Urban SEAs received a greater percentage of the migrants than did rural SEAs though more rural SEAs were destinations of migrants from Origin SEA 9 (Table XI). The difference between number of migrants to each type of SEA was more pronounced after removing within-state migration: 23,040 people migrated to urban SEAs compared to 16,227 people to rural SEAs.

Origin SEA C

Migration from Origin SEA C, the Ashland metropolitan area and the only urban Origin SEA in the study, is shown in Figure 5. Class intervals and corresponding number of migrants are presented in Table XII.

TABLE X

TOP 10% OF THE DESTINATION SEAs
FROM ORIGIN SEA 9

State	SEA	# of Migrants
Michigan	F	4229
Kentucky	8	2849
Kentucky	6	2603
Ohio	C	2430
Kentucky	E	2094
Ohio	K	1789
Kentucky	A	1477
Illinois	C	1312
Kentucky	3	1213
Ohio	3	1194
Ohio	B	1140
Indiana	D	1044
Tennessee	8	1002
Indiana	3	970
Kentucky	7	882
Kentucky	B	874
Ohio	2	772
Michigan	3	716
Ohio	1	617
Ohio	4	614
Indiana	8	577
Ohio	6	541
Ohio	D	523
Indiana	9	519
Indiana	C	517
Indiana	5	502
Indiana	4	496
Indiana	2	488
Ohio	N	441

TABLE XI

RURAL AND URBAN DESTINATION SEAs
ORIGIN SEA 9

	Rural SEAs	Urban SEAs
Number	167	149
Total Migrants	24712	27833
Mean # of Migrants	147.97	494.90
Range of Migrants	2845	4224
Minimum	4	5
Maximum	2849	4229
% of Migrants	47	53

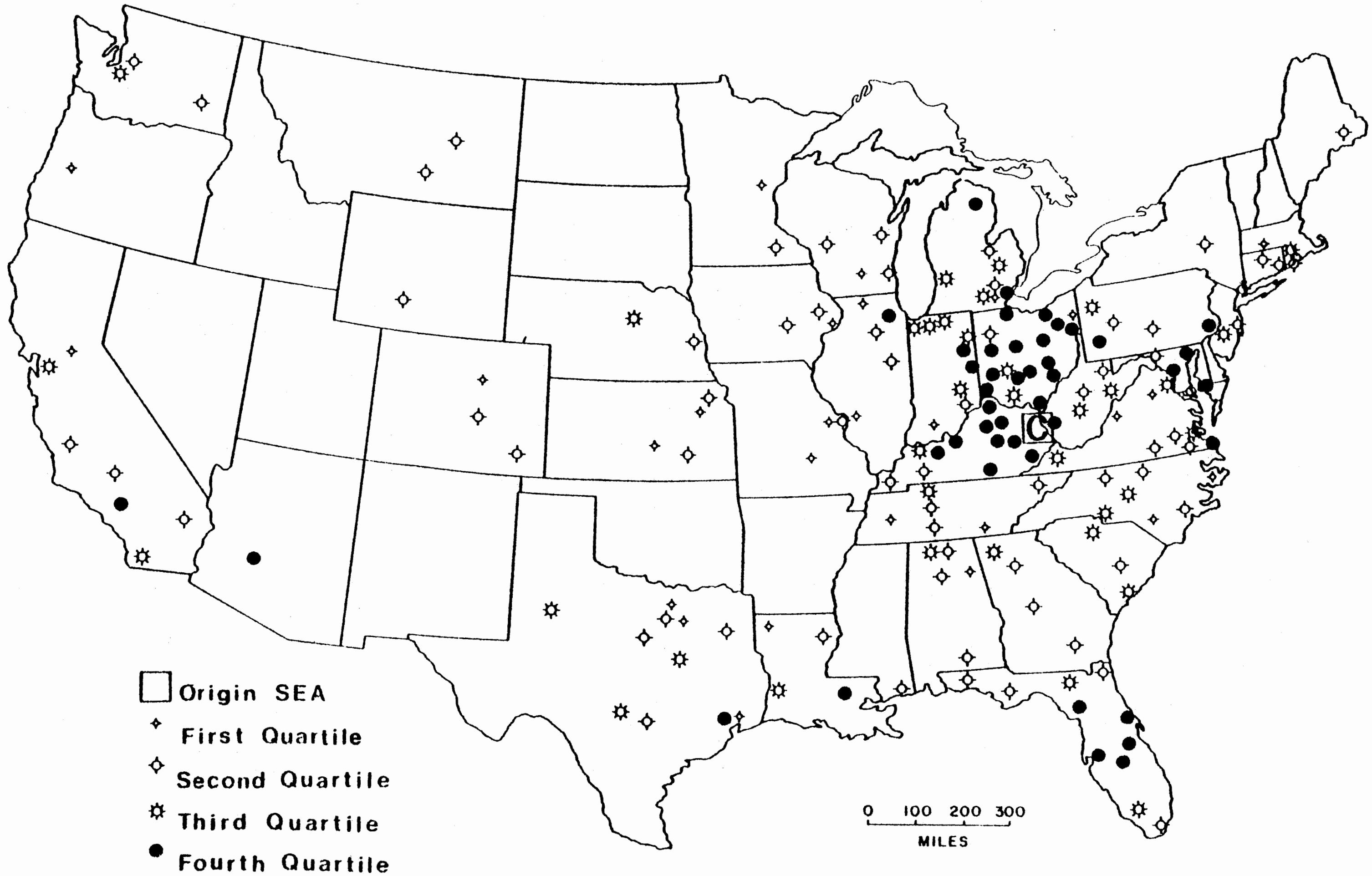


Figure 5. Migration from Origin SEA C

TABLE XII

ORIGIN SEA C MAP CHARACTERISTICS

Class Limits	Actual Number of Migrants	% of Cases in Each Class
.01-1.6	1- 6	25.7%
1.7-3.3	7-17	25.2%
3.4-7.5	18-39	24.0%
7.5	39	25.1%

The range of migrants from Origin SEA C was less than for any other Origin SEA; 9,521 people migrated to 175 SEAs in 38 states. Migration regions were fewer and located in closer geographical proximity to the origin than was the case with the other three Origin SEAs. High rates of inmigration occurred primarily in Kentucky, Ohio, and Indiana with secondary streams of migrants to Michigan and Florida. Small clusters of migrants were also located in the Maryland/Delaware area, Texas, and the south: Virginia, North Carolina, Georgia, and Alabama. The remainder of the migrants were scattered throughout the country though the central northwest and far northeastern states were recipients of few migrants.

Table XIII, showing the top 10% of the destination SEAs, illustrates the orientation toward migration within Kentucky and to Ohio. Fifty-three percent of the migrants went to 12 SEAs in Kentucky or Ohio with the remaining 47% divided among 163 SEAs.

Table XIV, showing the number of urban and rural destinations and the corresponding number of migrants, indicates that the number of migrants is divided almost evenly between the two types. When migration within Kentucky is removed, the difference increases and the orientation is toward urban areas; 3,514 migrants to urban SEAs as opposed to 1,994 to rural SEAs.

Comparisons of All Origin SEAs

When migration maps for all the Origin SEAs were viewed together, similarities in migration regions were discernible. In general, two primary migration regions existed. The first consisted of rural and urban SEAs within Kentucky. The second, with a definite midwestern

TABLE XIII

TOP 10% DESTINATION SEAs
FROM ORIGIN SEA C

State	SEA	# of Migrants
Kentucky	8	2057
Kentucky	A	605
Kentucky	E	529
Ohio	B	422
Ohio	L	397
Michigan	F	299
West Virginia	B	270
Kentucky	6	179
Kentucky	3	154
Kentucky	7	146
Ohio	K	129
Louisiana	C	120
Ohio	8	117
Kentucky	5	116
Ohio	4	115
Ohio	3	113
	Total	5768

TABLE XIV

RURAL AND URBAN DESTINATION SEAs
ORIGIN SEA C

	Rural SEAs	Urban SEAs
Number	91	84
Total Migrants	4789	4732
Mean # of Migrants	52.62	109.94
Range of Migrants	2053	604
Minimum	4	1
Maximum	2057	605
% of Migrants	50.3	49.7

orientation, included SEAs in Indiana, Ohio, and Michigan. Two secondary regions were also apparent, one was located in the southwestern states and the other consisted of SEAs in the southwestern, sunbelt states.

Though the same general trends of migration were observed for all the Origin SEAs, there were some differences in migration patterns both within and outside the primary and secondary regions. These differences indicated a degree of channelized migration similar to that found by Roseman (1971). The scope of this thesis does not permit a detailed analysis of the variations on a destination SEA by destination SEA basis but major differences are noted.

SEA 5, unlike the other Origin SEAs, had relatively few migrants going to Michigan. Only five of the 17 Michigan SEAs received migrants and only one of these, the Detroit area, received a substantial number. Additionally, SEA 5 had less of an orientation to Pennsylvania than the other Origin SEAs. Migration from SEA 5 was more channelized to the entire state of Tennessee, particularly the rural areas, and to the Ozark Plateau of Central Missouri than for the other Origin SEAs.

SEA 8 had a weaker inmigration stream to California than the other origin SEAs. Approximately the same number of California SEAs received migrants as from the other three Origin SEAs but the numbers were fewer. A slightly weaker stream was also observed to the Dallas-Ft. Worth to San Antonio area of Texas. SEA 8 had a highly channelized migration stream to urban SEAs in Michigan and a strong stream to rural and urban West Virginia SEAs. Additionally, SEA 8 was the only Origin SEA to send migrants to Missouri SEA 2, a rural farming area.

SEA 9 had more outmigrants, more destinations, and more migration streams than any of the Origin SEAs. Unlike the other Origin SEAs, SEA 9's midwestern stream extended heavily into Illinois. Additionally, SEA 9 had the strongest stream to Michigan. SEA 9 was the only Origin SEA to have a well defined stream to Washington state and was the only SEA to send migrants to the Ouachita Mountain area of Oklahoma. The only area to which SEA 9 had a relatively lighter stream than the other Origin SEAs was Tennesse.

SEA C had the most limited range of migration streams. Migration from SEA C was more highly concentrated in Kentucky, Indiana, and Ohio than for the other Origin SEAs though there was a strong stream to the Maryland-Delaware area. Relative to the other Origin SEAs, migration was slight to the southeast, southern Florida, and Tennessee.

Migration Models

Before calculating correlations and constructing models using multiple regression, it was necessary to normalize some of the variables. A requirement of linear regression is that the dependent variable, in this case MIG70, be normally distributed. To achieve normality in MIG70, a base 10 log transformation was done. A linear relationship between the dependent and independent variables is an assumption of regression. After performing a log transformation on MIG70, it was necessary to make a log transformation of MIG60 to reinstate the linear relationship between the two variables. Distance was also transformed using a base 10 log; the relationship between migration and distance decay is curvilinear and can be made linear by transforming both variables.

For inclusion in the correlation calculations and multiple regression, the variable names were abbreviated. A complete list of the variable abbreviations is contained in Tables I and II.

Correlations between all of the variables were calculated for each Origin SEA and for all the Origin SEAs combined. The results, located in Tables XXV-XXVIII, Appendix B, indicated a high degree of correlation between many of the independent variables. This necessitated the use of stepwise regression to construct migration models.

To determine which of the 16 variables were significant in explaining variation in outmigration from Appalachian Kentucky to destinations in the 48 contiguous state, i.e. pull factors, stepwise regression was performed for each of the Origin SEAs and for all of the Origin SEAs combined. Only variables significant at the .05 level were allowed to remain in the models of each of the Origin SEAs to optimize the amount of explained variation without including an inordinate number of variables.

A slightly different system was employed in determining which of the 16 variables to include in the migration model for all of the Origin SEAs combined. When sample size is large, it is possible to find almost any variable statistically significant though it may not be significant in a practical sense (Blalock, 1972). For the model of combined Origin SEAs, the sample size was 941. As a result, 10 of the 16 independent variables were stastically significant at the .05 level, though most were not significant in the practical sense of increasing the amount of explained variation. In keeping with the philosophy of creating a model to explain the optimum amount of variation with a minimum number of variables, a five variable limit was used rather than the significance level of .05 in determining which variables to include in the model.

Results from the stepwise regressions for each of the Origin SEAs and the Origin SEAs combined are reported in Tables XV, XVI, XVII, XVIII, and XIX. Included in these tables are the variables, listed in the order they entered the equation, the amount of explained variation (R^2), the increase in R^2 for each variable entered, the Sum of Squares (SS) error and the model F-values.

From the stepwise regression results, a multiple regression was performed for each Origin SEA and the combination of all of them. Results from the multiple regression analyses are also reported in Tables XV, XVI, XVII, XVIII, and XIX.

To determine if the migration models contained all of the factors contributing to variation in migration, residuals were calculated and mapped for each Origin SEA. From the multiple regression analyses, residual values (observed MIGL70 minus predicted migration) were calculated. Extreme residual values were mapped for each Origin SEA. Standard deviations from the mean were used as class intervals and only those values greater than one standard deviation above or below the mean were mapped. Figures 6, 7, 8, and 9 contain the residual maps for each Origin SEA.

To investigate the relationship between different models and migration, the RSQUARE procedure of the Statistical Analysis System (SAS) was used. This generated models composed of different independent variables and the amount of variation in the dependent variable explained by each. A limit of four variables in each model was imposed. The program was run for each of the Origin SEAs and all of the Origin SEAs combined. Results of the analysis are given in Tables XXIX-XXXIII, Appendix C.

TABLE XV

SEA 5 REGRESSION RESULTS

Stepwise Regression Result

Variable entered	R^2	Increase in R^2	SS Error	Model F-Value
Migl60	.52		35.36	222.96
Reg6	.56		32.57	130.46
Welf	.58	.02	30.67	96.10

Regression Model Results

Source	DF	SS	Mean Square	F-Value	R^2
Model	3	43.57	14.52	96.10	.58

Parameter	Estimate	F-value	PRJF-value
Intercept	1.18		
Migl60	.42	255.96	.0001
Reg6	.51	19.77	.0001
Welf	.01	12.58	.0005

TABLE XVI

SEA 8 REGRESSION RESULTS

Stepwise Regression Results

Variable entered	R^2	Increase in R^2	SS Error	Model F-value
Migl60	.58	.02	37.92	342.44
Distl	.62	.02	34.22	201.89
Reg6	.63	.01	33.11	141.17
Jobs	.64	.01	32.29	109.64
Reg3	.65	.01	31.61	90.24
Regl	.66	.01	30.91	77.47

Regression Model Results

Source	Df	SS	Mean Square	F-value	R-Square
Model	6	60.89	10.14	77.47	.66

Parameter	Estimate	F-value	PR F-value
Intercept	2.30		
Migl60	.38	411.32	.0001
Distl	-.49	28.22	.0001
Reg6	.25	8.45	.0040
Jobs	1.41E-06	6.28	.0129
Reg3	-.16	5.18	.0237
Regl	-.16	5.34	.0217

TABLE XVII

SEA 9 REGRESSION RESULTS

Stepwise Regression Results

Variable entered	R^2	Increase in R^2	SS Error	Model F-value
Migl60	.59		56.71	467.31
Distl	.62	.03	53.70	254.71
Regl	.64	.02	51.41	181.47
Reg3	.66	.02	47.70	152.24
Jobs	.67	.01	46.10	127.78

Regression Model Results

Source	DF	SS	Mean Square	F-value	R-Square
Model	5	141.12	19.00	129.78	.67

Parameter	Estimate	F-value	PR F-value
Intercept	2.49		
Migl60	.48	567.54	0.0001
Distl	-.59	20.21	0.0001
Regl	-.36	15.44	0.0001
Reg3	-.29	24.92	0.0001
Jobs	1.63E-06	10.78	0.0011

TABLE XVIII

SEA C REGRESSION RESULTS

Stepwise Regression Results

Variable entered	R^2	Increase at R^2	SS Error	Model F-value
Migl60	.39		26.35	112.80
Reg6	.44	.05	24.05	69.73
Distl	.47	.03	22.99	50.95
Plumb	.49	.02	22.17	40.94
Reg4	.50	.01	21.54	34.51

Regression Model Results

Source	Df	SS	Mean Square	F-value	R-square
Model	5	21.99	4.39	34.51	.50

Parameter	Estimate	F-value	PF F-value
Intercept	2.13		
Migl60	.28	134.80	.0001
Reg6	.49	18.13	.0001
Distl	-.42	8.27	.0046
Plumb	-.01	6.37	.0125
Reg4	.20	4.97	.0271

TABLE XIX

ALL ORIGIN SEAs REGRESSION RESULTS

Stepwise Regression Results

Variable entered	R^2	Increase in R^2	SS Error	Model F-value
Mig160	.55	.03	160.95	1170.94
Reg6	.58	.03	151.06	653.82
Dist1	.59	.01	145.47	464.18
Reg2	.60	.01	142.73	358.89
Jobs	.61	.01	141.25	291.78

Regression Model Results

Source	Df	SS	Mean Square	F-value	R-Square
Model	5	361.66	44.08	291.78	.61

Parameter	Estimate	F-value	PR F-value
Intercept	1.42		
Mig160	.42	1328.52	.0001
Reg6	.48	65.44	.0001
Dist1	-.22	37.03	.0001
Reg2	.14	18.07	.0001
Jobs	8.4E-07	9.81	.0018

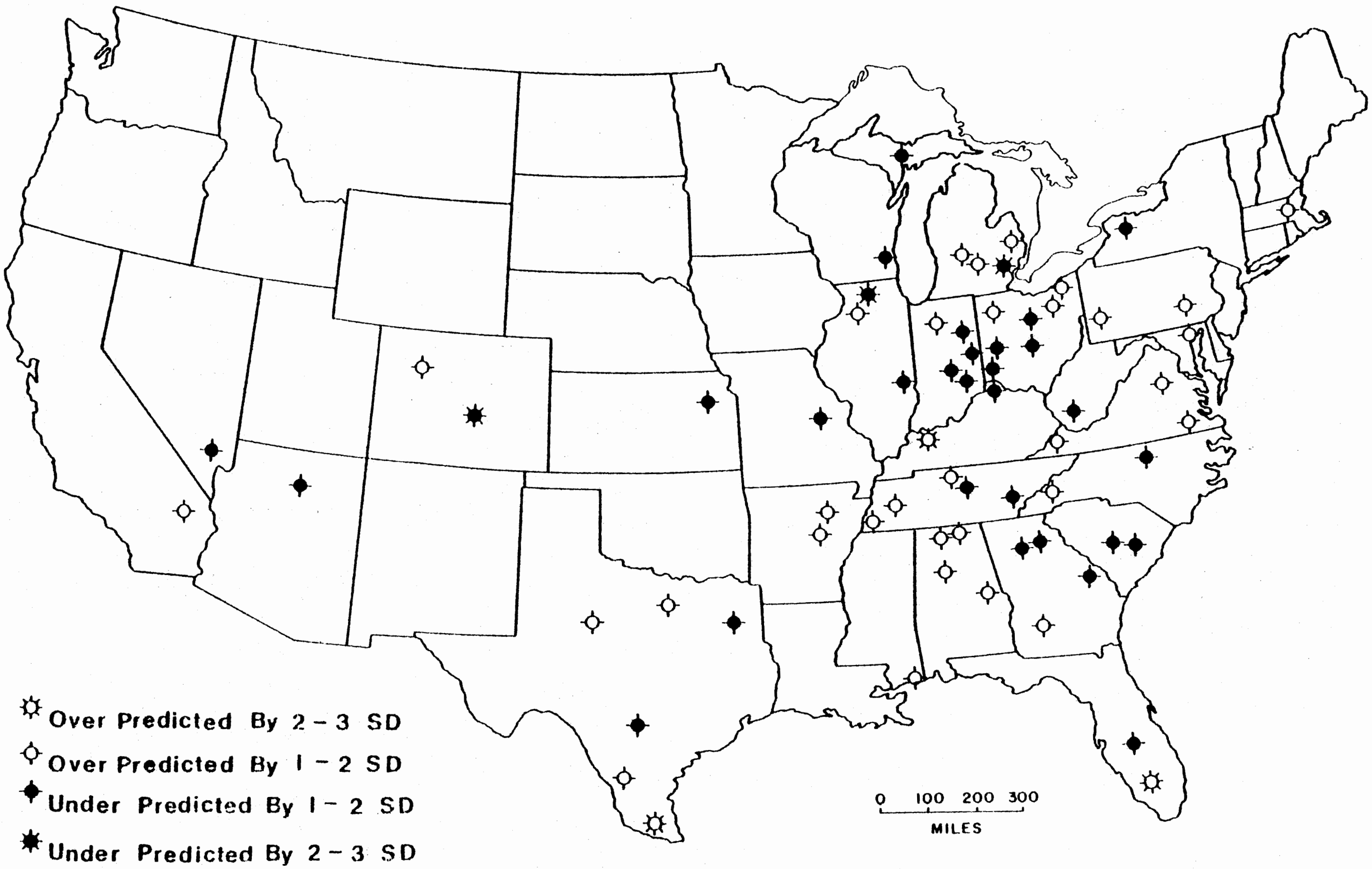


Figure 6. Residuals-Origin SEA 5

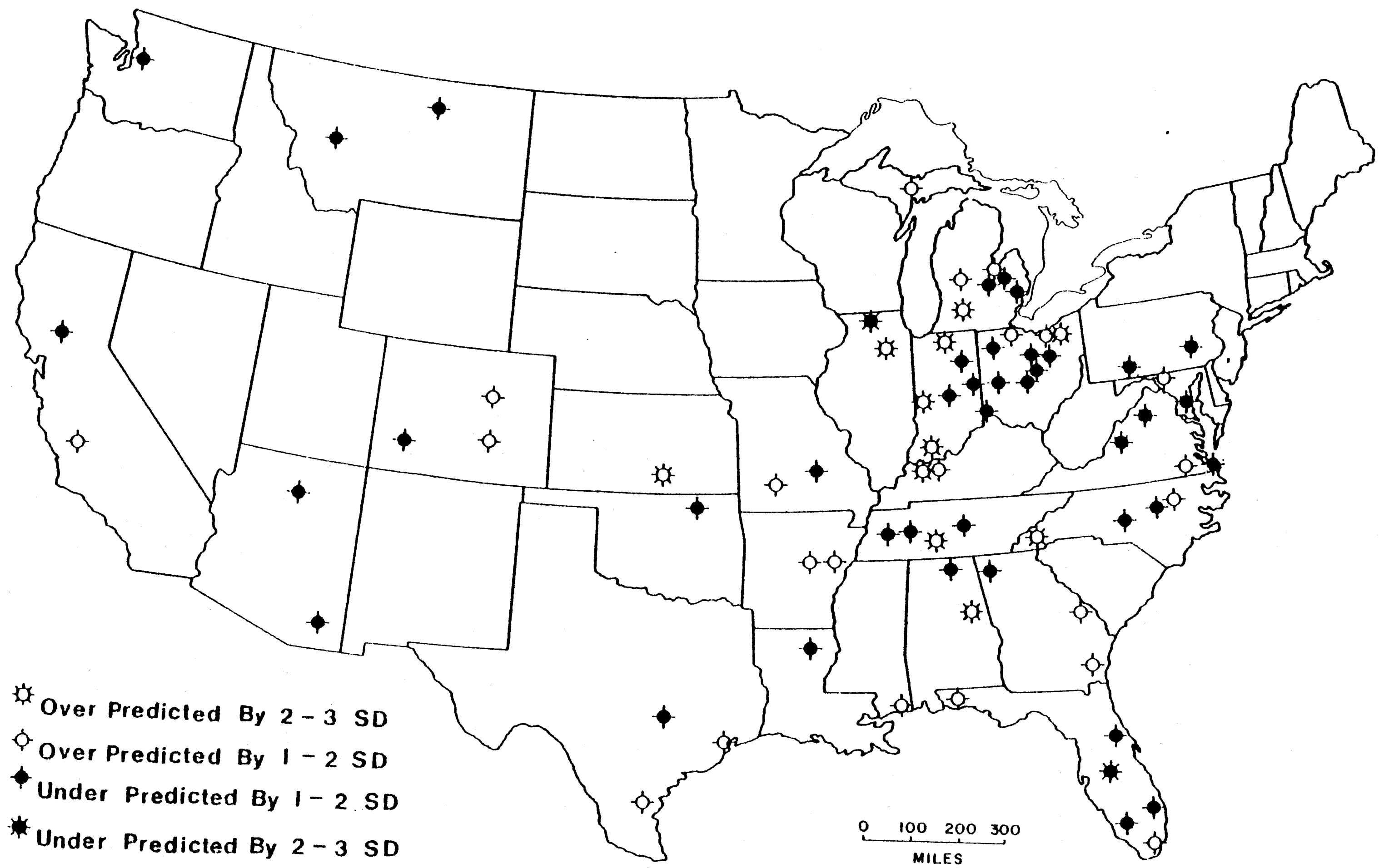


Figure 7. Residuals-Origin SEA 8

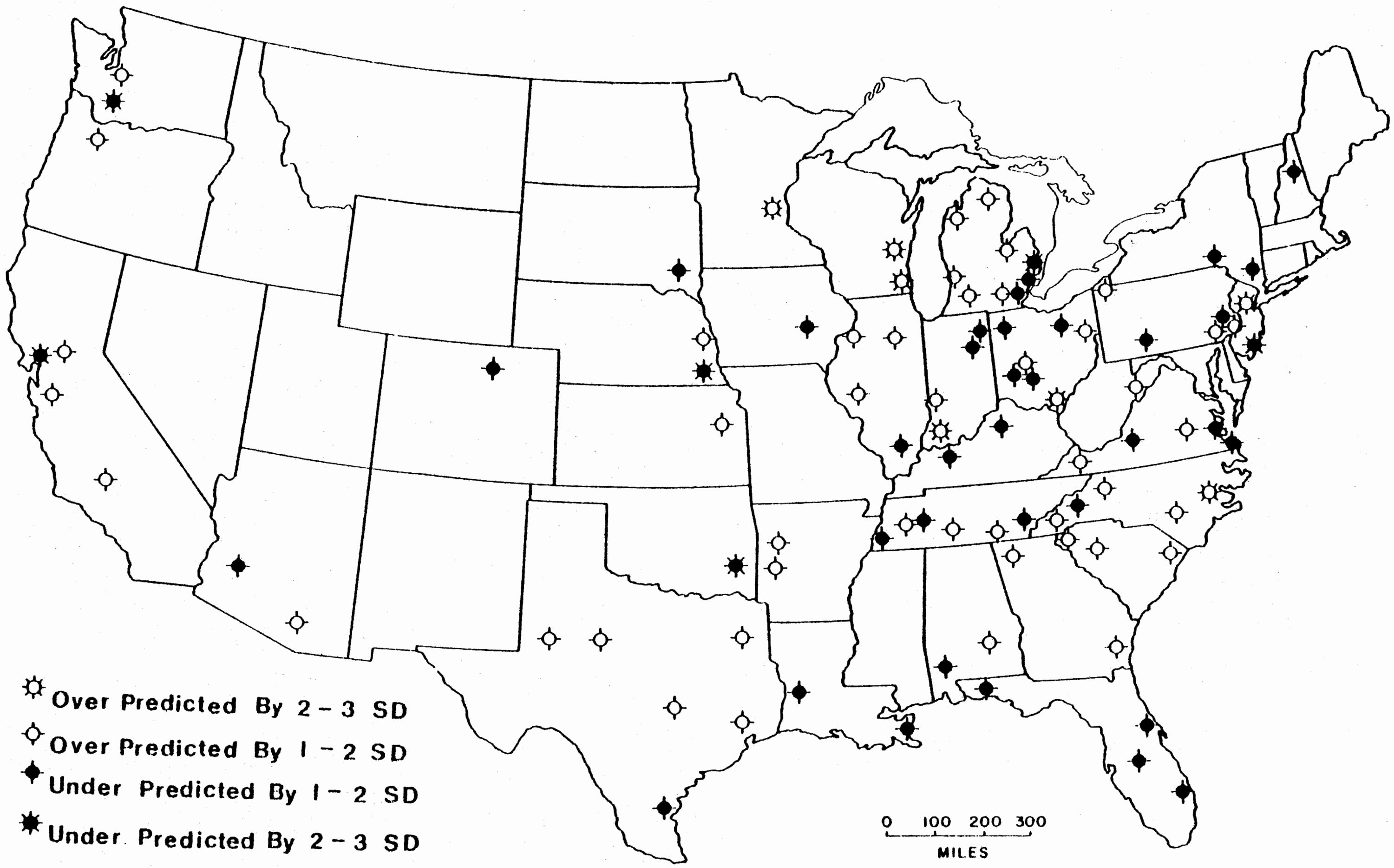


Figure 8. Residuals-Origin SEA 9

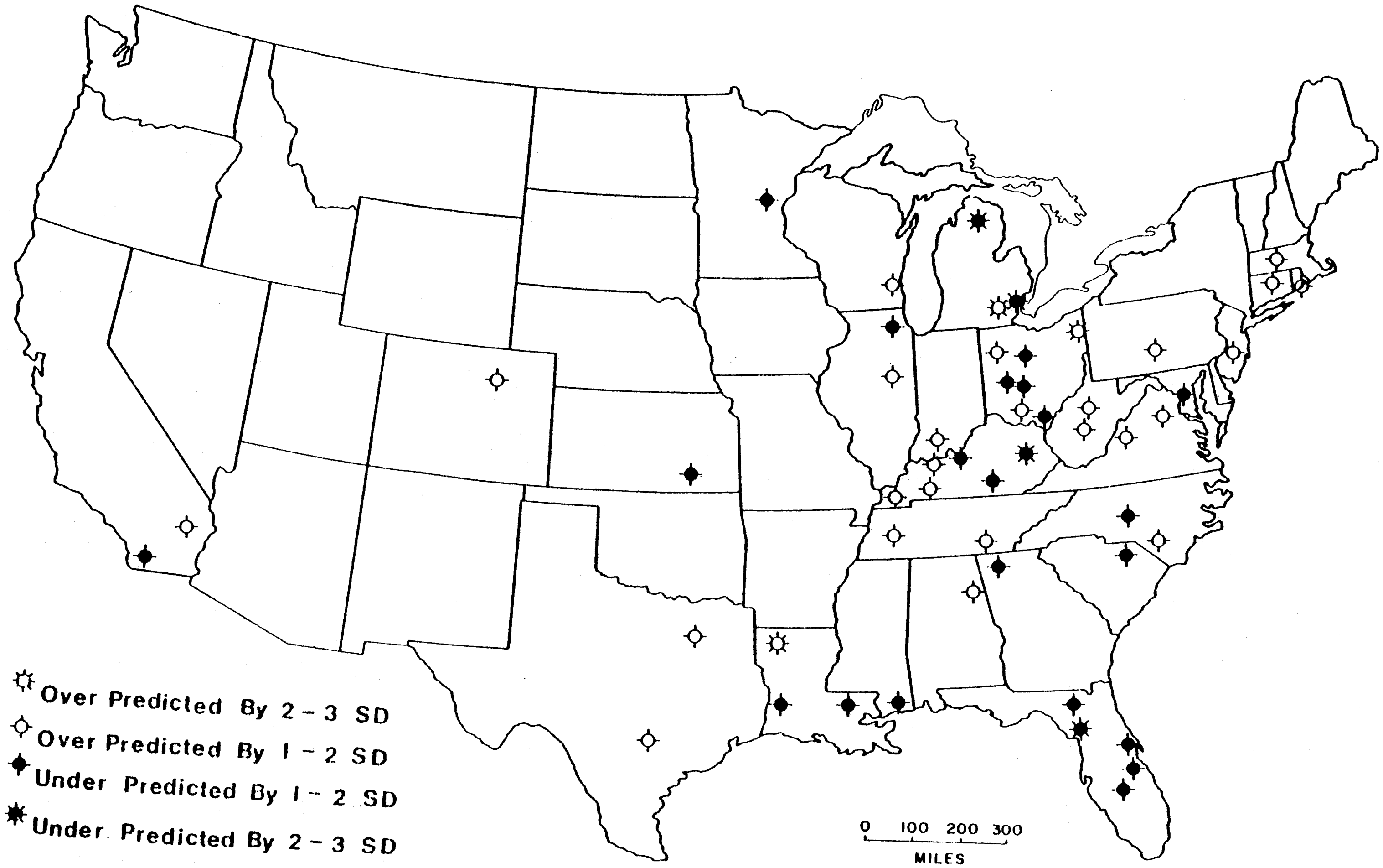


Figure 9. Residuals-Origin SEA C

The final step in migration model analysis was the construction of a model for all Origin SEAs combined which contained origin and destination characteristics, push and pull factors. Stepwise regression was used to determine which of the 27 variables were significant in explaining variation in migration. The five variable limit was again imposed because of the large sample size. Since none of the variables having origin characteristics were among the first five, the result is identical with the combined origin model in Table XIX.

Findings

Destination Characteristic Models

Origin SEA 5. As indicated in Table XV, only three variables were significant in explaining variation in MIGL70 from Origin SEA 5. The first of the three, MIGL60, explained 52% of the variation; the other two, REG6 and WELF explained only 6%. Table XV also shows that the relationship between MIGL70 and two of the independent variables, MIGL60 and REG6, is positive while the relationship between MIGL70 and WELF is negative.

Visual inspection of the residual map for the Origin SEA 5 model indicates that the residuals are not randomly distributed, as is expected if all the major factors explaining variation are included in the model. High positive residuals, indicating more migration than predicted, are clustered in Indiana and Illinois and in South Carolina and Georgia. High negative residuals, indicative of fewer actual migrants than predicted, are somewhat clustered in Tennessee, Alabama, and Arkansas with a smaller concentration in Michigan.

Most of the high positive residuals in Indiana and Illinois are for SEAs adjacent to large cities and under prediction by the model could be a function of the unit of analysis, rather than a missing factor. As SMSAs have grown, peripheral counties have become an integral, as well as a statistical, part of the urban area, especially as residential locations. SEA designations for counties have not been changed since the boundaries were drawn in the 1950's (Roseman, 1977) so counties included in SMSAs are not always included in corresponding urban SEAs. As a result, people migrating to cities for jobs or other urban amenities but choosing as residences places in adjacent counties are not always counted as inmigrants to the urban SEA. This could result in underprediction by the model. Under prediction for SEAs in and around Atlanta and Augusta, Georgia could be the result of the lack of inclusion of two factors in the model: military bases and place perceptions. Both areas contain military bases and Atlanta seems to be perceived as a newly emerging boom town. The only attribute readily apparent about the South Carolina area is it many lakes. No effort was made to account for recreational based pull factors and this might explain the under prediction.

Over prediction by the models is more difficult to explain but three possibilities exist. First, migrants could be going to urban areas but settling in surrounding counties in a dispersed enough manner to cause the model to under predict for the urban SEA but not over predict by more than one standard deviation for the surrounding rural SEAs. Second, it could be the result of the primary variable in the model, MIGL60, and the form of the data. No attempt was made to measure return migration. Therefore, it is possible that migrants went to the

SEAs with high negative residuals between 1955 and 1960 but returned to the Origin prior to 1965. This would have resulted in data reflecting contacts in destination SEAs with none existing in actuality. The third explanation pertains only to the south. During the 1960's, the south, particularly its cities, was characterized by racial strife and violence and the result might have been negative place perceptions working as adverse pull factors.

Origin SEA 8. Table XVI shows that six variables were significant in explaining variation in MIGL70 from Origin SEA 8. MIGL60 explained the majority of the variation, 58% of the total R^2 of 66%. The remaining five variables: DISTL, REG6, REG1, JOBS, and REG3, explained only an additional 6%. DISTL, REG3, and REG1 had a negative relationship with MIGL70; the other variables had a positive relationship.

The residual map of the model for Origin SEA 8 (Figure 7) indicates that the residuals are not randomly distributed. High positive residuals are clustered in Indiana and Ohio with a smaller cluster in Florida. High negative residuals are somewhat clustered in Michigan and northern Ohio, in Arkansas, Tennessee, and Alabama, and there is a small cluster in western Kentucky and southern Indiana.

Areas of high positive residuals for SEA 8 are similar to those for SEA 5. In Indiana and Ohio, they are adjacent to major metropolitan areas and the under prediction could be the result of urban SEAs not including all of the metropolitan counties. Under prediction for Florida might be a function of the perceived boom nature of the state. Though the model includes an employment opportunity variable, it contributes so little to the model, possibly because of the importance of previous rate, that the model might not accurately reflect the job situation in Florida. The same factor could also account for the under prediction for Cincinnati and Indianapolis.

High negative residuals in Michigan could be the result of the same explanations given for SEA 5: movement to the area but not to the center city or inadequate data which does not measure return migration. Over prediction by the model in the south could be the result of place perceptions creating adverse pull factors, similar to those hypothesized for the negative residual areas of SEA 5.

Origin SEA 9. Five variables were significant in explaining variation in MIGL70 from Origin SEA 9. MIGL60 contributed the most to explained variation, 59%. The other four variables: DISTL, REG1, REG3, and JOBS added only 8% to the explained variation, raising the total for the model to 67%. DISTL, REG1, and REG3 had a negative relationship with MIGL70; MIGL60 and JOBS had a positive relationship (Table XVII).

Visual inspection of the residual map of the migration model for Origin SEA 9 (Figure 8) indicates that the high positive residuals are more randomly distributed though there are small clusters in Florida and in Indiana and Illinois. The high negative residuals are clustered in the south: Tennessee, North Carolina, South Carolina, and Arkansas, and also in Michigan, Wisconsin, and Illinois. Additionally, there is a small cluster in the northeastern states.

Under prediction by the model for SEA 9 is probably the result of the same factors discussed in relationship to high positive residuals for SEAs 5 and 8. Florida is a fairly recent boom area so previous migration to the area is probably slight but the job situation, not represented by the model, might be attracting people to the area. For the high positive residuals in Indiana and Ohio, the same situation exists as in SEAs 5 and 8 with the areas adjacent to urban SEAs.

Under predictions for the south might be attributed to the place perceptions previously discussed. For the Chicago and Milwaukee/Madison area, the jobs for unskilled workers may have declined though the previous migration rate to the area was high.

Origin SEA C. Fifty percent of the variation in MIGL70 from Origin SEA C was explained by a five variable model composed of MIGL60, DISTL, REG6, PLUMB, and REG4. MIGL60 contributed the most to the explained variation, 39%; the remainder of the variables contributed only 11% of the explained variation. All of the variables except DISTL and PLUMB had a positive relationship with MIGL70 (Table XVIII).

High positive residuals, as shown on Figure 9, are not randomly distributed but clustered in Florida and in eastern Kentucky and Ohio. High negative residuals are clustered in West Virginia and Virginia and in southwestern Kentucky and southern Indiana.

Under prediction by the model for SEA C can probably be attributed to three factors. For eastern Kentucky, the high number of migrants above that predicted by the model probably reflects return migration. Under prediction for Florida is probably the result of factors previously discussed. For Toledo and Columbus, the situation probably exists where people move to the urban areas but settle in rural SEAs.

High negative residuals for the Charleston SEA and adjacent SEAs probably reflect a decline in the need for unskilled or semi-skilled labor relative to the demand in the previous census period. The over prediction in western Kentucky is puzzling because no factors seem applicable.

Origin SEAs Combined. When all four Origin SEAs were combined in the same regression model, the results were quite similar to those for the individual SEAs. The amount of variation in MIGL70 explained by the five variable model was 61%. MIGL60 explained 55% of the variation; DISTL, REG2, REG6, and JOBS combined explained only an additional 6% of the variation. As in the models for individual Origin SEAs, MIGL60, REG6, and JOBS had a positive relationship with MIGL70 and DISTL had a negative relationship.

The only different variable included in the model was REG2. When all the Origin SEAs were combined, REG2 became significant enough in explaining variation to be included in the model. As predicted, it had a positive relationship with MIGL70 (Table XIX).

RSQUARE. The results of the RSQUARE analyses, showing combinations of independent variables in one, two, three, and four variable models (Tables XXIX-XXXIII, Appendix C) indicate that MIGL60 is the most important variable in explaining variation in MIGL70 from all of the Origin SEAs and the Origin SEAs combined. In all cases, after MIGL60 was entered into the model, virtually any of the other variables could have been entered with the resulting models explaining approximately the same amount of variation. The results also indicated that the best four variable model explained relatively little more variation than the best two and three variable models.

Origin-Destination Characteristics Model

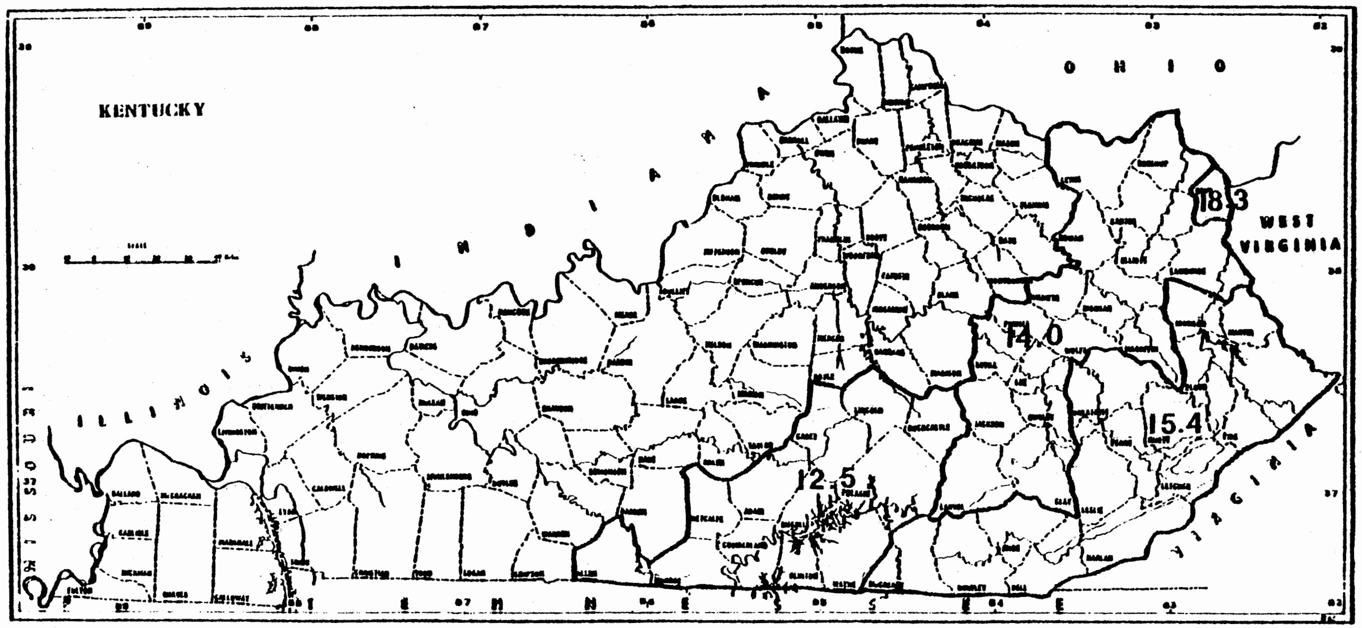
As previously indicated, the origin-destination characteristics model for the four Origin SEAs combined is the same as the Origin characteristics model. The same variables entered the model in the same order and explained 61% of the variation in MIGL70. The only origin characteristic variable to enter the stepwise regression was UNEMPO and explained only .3% of the variation. It entered the stepwise procedure as the ninth variable and therefore, was not included in the model.

Levels of Outmigration Within Appalachian Kentucky

Variations in outmigration within Appalachian Kentucky were analyzed with respect to the geographic location of the SEA and the economic and demographic characteristics of the area. Figure 10 shows the variation in levels of outmigration for the four SEAs located in Appalachian Kentucky. Table XXI contains selected economic and demographic characteristics of the SEAs.

As shown in Figure 10, the SEAs which lost the greatest percentages of their population during the 1965 to 1970 period were those located in the heart of the Appalachian Mountains, the eastern-most portions of of the state. The Ashland metropolitan area, SEA C, lost 18.3 of its population and the Eastern Coalfields, SEA 9, lost 15.4% of its population. SEAs located on the fringe of the Appalachian Mountains fared somewhat better but still lost sizeable portion of their population through outmigration. SEA 5, the South Central Highlands, lost 12.5% of its population and SEA 8, the Eastern Hills, lost 14% of its population.

The relationship between outmigration and economic development was much less distinct. SEA C had one of the highest levels of economic development in regard to income and unemployment but lost the greatest percentage of its population through outmigration. One factor which might have contributed to the high outmigration was change in jobs. Of



Numbers Indicate Outmigration Rate

Figure 10. Variations in Outmigration

TABLE XX

SOCIO-ECONOMIC CHARACTERISTICS

Origin SEA	% Pop Out 1965-1970	Total Pop Out 1965-1970	Total Pop Out 1965-1970	Income 1970	Change In Jobs 1965-70	Unemp Rate	Change In Coal Production 1965-1970	Change In in Coal Jobs 1965-70	Median Age
5	12.5	19767	23692	3795	3589	5.4	13	.1	32.3
8	14.0	28798	33001	3745	3122	8.1	-75	-.7	27.1
9	15.4	52545	69075	3628	9795	7.9	26259	-.6	28.2
C	18.3	9521	9131	7658	2537	3.9	-1	0	32.5

all the SEAs, C had the smallest increase in number of jobs. SEA 9, which had the second highest level of outmigration, was not the worst in terms of economic development because of a large increase in number of jobs but several factors contributed to a generally low level of economic health. SEA 9 had the lowest income of all the SEAs, the second highest unemployment rate, and one of the largest declines in coal mining employment, though coal production increased substantially. SEA 8, with the lowest overall economic development had the second lowest outmigration. It had the highest unemployment rate, the greatest decline in coal mining, the greatest decline in coal production, a small increase in jobs and the second lowest income. SEA 5, with the lowest outmigration, had the highest overall economic development; low unemployment and an increase in coal mining employment.

Variation in outmigration was somewhat related to age but there was not a perfect correlation. SEA C, with the greatest percentage of population lost through outmigration, had the oldest popultion of the four SEAs but SEA 9, with the second highest loss, had a younger population. SEA 5 had an older population and lost the smallest percentage of its population though outmigration.

If viewed as rank orderings, a perfect correlation exists between the SEAs which lost the most actual number of people between 1965 and 1970 and those which lost the most people between 1955 and 1960. SEA 9 lost the most people during both periods and SEA C lost the least. Caution should be exercised in interpreting this as an explanation for the variations in levels of outmigration because the size of the population of the four SEAs is quite varied but it does indicate a pattern.

Conclusions

In general, four migration regions existed for Appalachian Kentucky. SEAs in Kentucky and midwestern SEAs, predominately in Ohio and Indiana, formed primary destination regions. Secondary migration regions were located in the southeastern states and in the sunbelt, southwest. Each origin SEA exhibited slighty different patterns of migration within the regions indicating channelized flows of migrants.

Variations in patterns of migration to destination SEAs were explained primarily by previous migration to the SEA. Other variables significant in explaining variation were geographical, distance or region. Economic factors and QOL considerations, in general, were not found significant. Additionally, none of the origin characteristics variables were found useful.

Though all of the models explained over 50% of the variation in migration, other factors not identified in the models were responsible for some of the variation. Many migrants went to SEAs where migrants had previously gone but clusters of high positive and negative residuals indicated that new streams were forming. People were going to different areas of the country or to SEAs adjacent to urban SEAs.

Outmigration rate from Appalachian Kentucky SEAs ranged from 12.5% to 18.3% with the highest rates experienced by SEAs in the heart of the mountains. No distinct relationship was found between outmigration and economic development but change in jobs, particularly coal related employment, seemed to have some bearing on level of outmigration.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

Problem Review and Purpose

Outmigration has been a chronic problem of the Appalachian region for over six decades. At the turn of the century, outmigration exceeded inmigration in much of the region (Brown and Hillery, 1962) and by the depression era, the rate of outmigration had escalated (Caudill, 1962). After World War II, the rate escalated even more with the southern portion of the Appalachian region alone losing almost one-half million people between 1950 and 1960 (Brown and Hillery, 1962). Appalachian Kentucky has been particularly plagued by outmigration; almost one-half million people left eastern Kentucky between 1950 and 1980 (Dunlop and Whitt, 1981).

Outmigration, in many respects, is symptomatic of a myriad of problems facing Appalachian Kentucky. Job opportunities are lacking for the unskilled laborer because of the increasing mechanization of the coal industry (Gibbard, 1962) and the decline in the coal industry. Subsistence farming, the only type possible in much of the area because of the rugged terrain, has been made increasingly difficult as coal companies ravage the land (Caudill, 1962). The infra-structure, at its best marginal, has declined with the decline in the coal industry

Caudill, 1962). The productive portion of the population has been reduced as youths leave the region in search of a better life (Caudill, 1962). As a result, the tax base is dwindling and social services are over-burdened trying to meet the needs of the very old and the very young with a minimal amount of funds (ARC, 1971).

Attempts have been made by the federal government though Appalachian Regional Commission programs to bring Appalachia into the American mainstream. Many of the programs have been effective in the region as a whole but Appalachian Kentucky still exists on the fringes. Social services have been improved but the economy lacks diversity and a strong employment base (Dunlop and Whitt, 1981). Outmigration continues, despite government intervention.

The effectiveness of ARC programs is limited because a clear understanding of the patterns and processes of Appalachian Kentucky migration is lacking. Partial accountings of destinations of the migrants have been made but complete studies of where migrants went and what factors influenced their choice of destinations are lacking. Additionally, speculations have been made about the factors pushing people from Appalachian Kentucky but the inferences have been made based on limited variables and no definitive conclusions have been drawn.

The purpose of this thesis was to assess the patterns and processes related to Appalachian Kentucky migration. It was designed to answer three specific questions about migration: where the migrants went, what factors affected their choice of destination, and what factors affected the decision to leave.

Methodology Review

The first step in answering the questions was to identify attributes which might be potential push and pull factors. A review of the migration model literature indicated that on a whole, three types of factors were important: economic, quality of life, and previous migration rate, with different elements of the three acting as push and pull factors.

Inmigration models identified change in jobs, temperature, and previous inmigration rate as important pull factors. Outmigration models identified labor and non-labor sources of income, change in jobs, and previous outmigration rate as important push factors; no QOL factors were found important. Place-to-place models found income and unemployment important push factors and change in jobs, quality of life, and migrant stock important pull factors. Distance was found to direct the flow of migration.

After an assessment was made of the migration literature, it was determined that three methodologies were needed to answer the questions which would result in both an understanding of the patterns and processes of Appalachian Kentucky migration.

Mapping was used to determine where the migrants went. Maps were constucted for each Origin SEA showing the rate of migration to destination SEAs between 1965 and 1970. The maps were then used to delineate migration regions and assessments were made about patterns of migration.

Processes associated with migration were analyzed through the development and evaluation of place-to-place models. Variables included in the models were those utilized with some success in previous migration studies or representative of Appalachian Kentucky characteristics.

Two models were specified. The first contained only destination values and was used to identify pull factors. The second contained origin and destination values and was used to identify both push and pull factors.

Multiple stepwise regression was used to determine which variables were significant in explaining variations in migration from Appalachian Kentucky. Residual mapping and analysis was used to determine if the destination characteristic models had identified all the factors contributing to the variation in migration.

The final step in the analysis of migration processes was descriptive comparisons of the economic and demographic characteristics of the Origin SEAs relative to levels of outmigration. Characteristics considered were those identified in the literature as important push factors.

Findings

Patterns of Migration. From mapping migration from Appalachian Kentucky, it was evident that migration regions existed. Each Origin SEA had distinct primary and secondary migration regions, but the characteristics of the patterns were similar for all of the SEAs.

In general, two primary regions were delineated. The first was composed of SEAs within the state of Kentucky and included Appalachian as well as non-Appalachian ones. The second was a midwestern region containing core states of Ohio and Indiana and peripheral states of Michigan and Illinois, the inclusion of which depended upon the Origin SEA.

Two secondary regions were also delineated. Both were located in the south, one in the traditional south and one in the southwest sunbelt area. The traditional south region contained core states of Florida, North Carolina, South Carolina, Georgia, and Alabama; Tennessee and Virginia were also included in the region for some Origin SEAs. The southwest, extending from Texas through southern California, formed another secondary region though it was not as strong as the region in the traditional south.

In addition to the existence of migration regions, two other elements of the migration patterns were notable. First was the geographic diversity of the destinations. Though most of the migration was concentrated in the midwest, people from Appalachian Kentucky settled in almost all of the continental states. Second was the trend toward urban destinations. Initially, statistics indicated that migration was almost equally divided between rural and urban SEAs but when migration within Kentucky both to rural and urban SEAs was excluded, a distinct urban trend emerged.

Destination Characteristic Models. Result from the regression models for each Origin SEA and the Origin SEAs combined were quite similar. In all of the models, previous migration rate was the variable which explained the most variation in migration with other variables in the models contributing generally less 10% to the R^2. Other variables included in the models were also similar. Various regional variables and the distance variable were included in most models. Economic and QOL variables were rarely included in the models and when they were, they never explained more than 2% of the variation in MIGL70.

Overall, previous rate was found most significant in explaining variation. RSQUARE results indicated that after the inclusion of MIGL60, any combination of the remaining variables would explain approximately the same amount of variation and, in most cases, little more than MIGL60 explained by itself.

Maps of residuals from the regression analyses indicated that factors contributing to variation in migration had been omitted from the models. In all cases, there were clusters of high positive and negative residuals. High positive residuals, indicating under prediction by the model, were generally found in the SEAs adjacent to urban SEAs and were probably the result of people migrating to the urban areas but choosing a place of residence outside the urban SEA. High negative residuals were generally located in the south or large midwestern cities and could have been the result of negative place perceptions, which were not accounted for by the model variables, and by the failure of the model to account for return migration.

Origin-Destination Characteristic Model. The origin-destination characteristics model derived from the multiple regression was the same as the model for destination characteristics of all Origin SEAs combined. Origin as well as destination values were specified but none of the origin values entered into the model until the ninth variable and therefore, were not included in the final five variable model. Only one destination value, JOBD, entered the model; the remainder of the variables were either geographical or a measure of previous rate. As a result, the model was not useful in assessing push factors and only marginally useful in assessing the impact of economic pull factors.

Levels of Outmigration Within Appalachian Kentucky. Variation in outmigration within Appalachian Kentucky was found to be related to location of the SEA relative to the Appalachian Mountains. SEAs located in the heart of the Appalachian Mountains were found to have lost greater percentages of their population through outmigration than SEAs located on the fringe of the mountains.

The relationship between outmigration and economic development was less distinct. Some areas of Appalachian Kentucky with a relatively high level of economic development had high outmigration while other economically healthy areas did not. Poor economic conditions associated with the coal industry seemed to have some relationship with high levels of outmigration. Additionally, there seemed to be a slight relationship between outmigration and change in the number of jobs.

Conclusions

As indicated in the literature, distinct migration regions exist for Appalachian Kentucky with the emphasis on intra-state destinations or destinations in adjacent midwestern states. The importance of previous rate in explaining variation in migration, 1965-1970, suggests the existence of long term streams to these areas but during this period the trends were changing. The inability of the model to strongly predict migration and the clustered residuals indicate the emergence of new streams based on factors other than previous rate.

In many respects, the patterns of Appalachian migration are not radically different from those of other migrants. A trend toward urban destinations similar to that experienced by the rest of the nation during the 1960's is evident. A definite tie with industrial centers exists but a gradual shift from center city to suburbs is occurring. The existence of secondary migration streams in the southeast and southwest is similar to non-Appalachian trends.

The shift from midwestern industrial cities to the suburbs and to southeastern and southwestern cities may not reflect the preferences of the migrants but rather the trends of industry. The tax and labor organization structures of the south along with climate-based amenities have begun to attract industries. Increased space requirements and favorable governmental policies have also made suburban locations attractive industrial sites.

Development of models of analyzing variation in migration with regard to push and pull factors was less than satisfactory. Much of the responsibility for this rests with the research design but it indicates a problem inherent in previous research. The models used for this thesis were based on previously developed models and included only those variables found to be significant, but the results were different. Several variables found significant in previous models were also found significant in this research but contributed little to the explained variation. Results of migration models found in the literature rarely reported the importance of the variables in explaining variations in migration. As a result, the importance of economic and quality of life factors in the migration decision may be overrated.

Despite the problems with the models, this research did substantiate the findings of Greenwood (1969), Miller (1973), and Kleiner and McWilliams (1977) with regard to the importance of previous rate. Both outmigration and the choice of destination are related to previous rate, indicating the importance of information systems and potential support groups in the migration process.

When the results of the analysis are considered it is apparent that migration, at least at this scale, is not very statistically predictable.

Unique pairs of origins and destinations exist which might better be explored with some other methods. Survey data would provide a more accurate assessment of individual motivations but problems are also inherent with survey methodologies. Appalachian migrants would first need to be identified, a somewhat difficult task in large cities. An alternate method would be studies conducted in small Appalachian communities consisting of migration life histories accompanied by questionnaires. This would provide a means both of identifying migrants and assessing individual motivations. These results could then be used to develop theoretical constructs on which to base model development.

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APPENDIXES

APPENDIX A

MIGRATION MODELS

TABLE XXI

IMMIGRATION MODELS

Author	Glantz, 1973	Cebula, 1975
Level of Analysis	S.M.S.A., Center City, Suburbs	States
Number of Observations	164	82
Dependent Variable	Proportion of poor migrating to each area.	Net migration to state.
Independent Variables	* Employment potential * Growth in industry * Welfare payments per recipient * Proportion poor residing in area Population Racial Mix	* Average monthly welfare payments Mean # days 32°F or less Mean Daily proportion of sunlight * Physicians per 1000 people * Pollution
	$\bar{X}$ r^2 = .37	$\bar{X}$ r^2 = .43

TABLE XXI (Continued)

Author	Nauratil & Doyle, 1977	Kleiner & McWilliams	Cebula, 1980
Level of Analysis	82 labor markets	States & Washington, D.C.	S.M.S.A.
Number of Observations	Not given	102	36
Dependent Variable	Immigration rate	Immigration rate	Net immigration rate
Independent Variables family	* Unemployment rate * Employment growth rate per capita income Average education * % married % unemployed % military * Average age * Average education Average temperature Urbanness Modal distance traveled Population Migrant stock	Rate of natural increase of labor force * Change in employment per capita income % change in unemployment rate * A.F.D.C. * Mean January temperature * Previous immigration rate rate Population	* Average median income * Average unemployment rate * Average cost of living *Annual 65°F days
	$\bar{X}$ r^2 = .50	$\bar{X}$ r^2 = .81	r^2 = .48

*Variable significant or consistently significant when several regressions were run.

TABLE XXII

OUTMIGRATION MODELS

Author	Miller, 1973	Petto and Bender	Kleiner & McWilliams, 1977
Level of Analysis	States	Ozark counties	States
Number of Observations	49	Not given	102
Dependent Variable	Outmigration rate	Net outmigration rate	Outmigration rate
Independent Variables	* Median family income * Employment growth rate * % population with some * Mean January temperature * Immigration rate Proportion of population living outside state of birth Population	* Per capita income Change in farm size Change in employment * Change in manufacturing employment % pop. rural-farm % farmers working off farm Distance to nearest city	Rate of natural increase in labor force Change in employment Per capita income % change in unemployment rate * A.F.D.C. * Mean January temperature * Previous immigration rate
	* Population		
	$r^2 = .88$	$\bar{X}$ $r^2 = .46$	

*Variable significant or consistently significant when several regressions were run.

TABLE XXIII

PLACE-TO-PLACE MODELS

Author	Greenwood, 1969	Petto and Bender, 1974
Level of Analysis	State to State	From Ozark SEAs to States
Number of Observations	2256 less 0 observations	720
Dependent Variable	Migration rate from state i to state j	Migration from SEA i to state j
Independent Variables	Male median income state j/ male median income state i * % unemployment state i % unemployment state j * Median school years state i * Median school years state j * % population urban state j/ % population urban state i * Mean yearly temperature state j/ mean yearly temperature state * Distance * Migrant stock	* Mean family income SEA i * Average non-farm wages state j * % unemployment SEA i % unemployment state j * Change in non-agricultural employment state j * Median school years SEA i Urbanness state j * Miles moved * Migrant stock * Population SEA i
	$r^2 = .72$	$r^2 = .79$

*Variable significant or consistently significant when several regressions were run.

TABLE XXIV

APPALACHIAN MIGRATION MODELS

Author	Clark & Ballard, 1980	Clark and Ballard, 1980	Graham, 1982
Level of Analysis	Outmigration from Central Appalachia	Place-to-place from Central Appalachia	SEA
Number of Observations	Not given	Not given	Not given
Dependent Variable	Number of migrants from 6 industry groups	Number of migrants	Outmigration from Appalachian SEAs
Independent Variables	* Change in jobs unemployment rate * Wage rate	* Change in employment * Mean annual temperature * Gravity (Pop/Distance)	Socio-demographic * Infra-structure * Economic develop-ment
	$\bar{X}\ r^2 = .65$	$\bar{X}\ r^2 = .80$	

*Variable significant or consistently significant when several regressions were run.

APPENDIX B

CORRELATION MATRICES

TABLE XXV

CORRELATION MATRIX - SEA 5

	MIGL70	MIGL60	DISTL	MEDINC	UNEMP	WELF	JOBS	MEDHOME	PLUMB
MIGL70	1.000	0.721	-0.469	0.018	-0.120	-0.275	0.093	-0.034	0.110
MIGL60	0.721	1.000	-0.476	0.108	-0.160	-0.144	0.170	0.067	0.018
DISTL	-0.469	-0.476	1.000	0.056	0.306	0.340	0.194	0.236	-0.333
MEDINC	0.018	0.108	0.056	1.000	-0.227	0.422	0.326	0.728	-0.710
UNEMP	-0.120	-0.160	0.306	-0.227	1.000	0.325	-0.028	-0.119	0.191
WELF	-0.275	-0.144	0.340	0.422	0.325	1.000	0.215	0.488	-0.398
JOBS	0.093	0.170	0.194	0.326	-0.028	0.215	1.000	0.445	-0.256
MEDHOME	-0.034	0.067	0.236	0.728	-0.119	0.488	0.445	1.000	-0.633
PLUMB	0.110	0.018	-0.333	-0.710	0.191	-0.398	-0.256	-0.633	1.000
URBAN	-0.039	0.035	0.266	0.554	-0.158	0.174	0.369	0.620	-0.710
TEMP	-0.030	-0.068	0.199	-0.424	-0.174	-0.599	0.093	-0.270	0.238
REG1	-0.233	-0.185	0.110	0.225	0.028	0.453	0.174	0.267	-0.138
REG2	0.156	0.250	-0.305	0.379	-0.067	0.165	-0.079	0.092	-0.215
REG3	-0.006	0.012	-0.255	-0.317	-0.316	-0.491	-0.065	-0.168	0.341
REG4	-0.154	-0.179	0.529	-0.202	0.223	-0.050	0.121	-0.114	-0.028
REG5	-0.170	-0.305	0.361	0.055	0.193	0.190	-0.069	0.089	-0.205
REG6	0.473	0.400	-0.401	-0.136	0.076	-0.118	-0.074	-0.116	0.232

TABLE XXV (Continued)

	REG3	REG4	REG5	REG6	URBAN	TEMP	REG1	REG2
MIGL70	-0.006	-0.154	-0.170	0.473	-0.039	-0.030	-0.233	0.156
MIGL60	0.012	-0.179	-0.305	0.400	0.035	-0.068	-0.185	0.250
DISTL	-0.255	0.529	0.361	-0.401	0.266	0.199	0.110	-0.305
MEDINC	-0.317	-0.202	0.055	-0.136	0.554	-0.424	0.225	0.379
UNEMP	-0.316	0.223	0.193	0.076	-0.158	-0.174	0.028	-0.067
WELF	-0.491	-0.050	0.190	-0.118	0.174	-0.599	0.453	0.165
JOBS	-0.065	0.121	-0.069	-0.074	0.369	0.093	0.174	-0.079
MEDHOME	-0.168	-0.114	0.089	-0.116	0.620	-0.270	0.267	0.092
PLUMB	0.341	-0.028	-0.205	0.232	-0.710	0.238	-0.138	-0.215
URBAN	-0.167	0.134	0.098	-0.101	1.000	0.010	0.046	0.007
TEMP	0.506	0.444	-0.230	-0.155	0.010	1.000	-0.258	-0.491
REG1	-0.210	-0.171	-0.106	-0.089	0.046	-0.258	1.000	0.212
REG2	-0.375	-0.306	-0.190	-0.159	0.007	-0.491	-0.212	1.000
REG3	1.000	-0.302	-0.187	-0.157	-0.167	0.506	-0.210	-0.375
REG4	-0.302	1.000	-0.153	-0.128	0.134	0.444	-0.171	-0.306
REG5	-0.187	-0.153	1.000	-0.079	0.098	-0.230	-0.106	-0.190
REG6	-0.157	-0.128	-0.079	1.000	-0.101	-0.155	-0.089	-0.159

TABLE XXVI

CORRELATION MATRIX - SEA 8

	MIGL70	MIGL60	DISTL	MEDINC	UNEMP	WELF	JOBS	MEDHOME	PLUMB
MIGL70	1.000	0.766	-0.555	0.193	-0.044	-0.136	0.145	0.028	0.056
MIGL60	0.766	1.000	-0.497	0.165	-0.012	-0.172	0.153	0.068	-0.001
DISTL	-0.555	-0.497	1.000	-0.071	0.282	0.271	0.162	0.179	0.349
MEDINC	0.193	0.165	-0.071	1.000	-0.116	0.149	0.169	0.348	-0.395
UNEMP	-0.044	-0.012	0.282	-0.116	1.000	0.308	-0.072	-0.106	0.102
WELF	-0.136	-0.172	0.271	0.149	0.308	1.000	0.155	0.470	-0.400
JOBS	0.145	0.153	0.162	0.169	-0.072	0.155	1.000	0.432	-0.246
MEDHOME	0.028	0.068	0.179	0.348	-0.106	0.470	0.432	1.000	-0.627
PLUMB	0.056	-0.001	-0.349	-0.395	0.102	-0.400	-0.246	-0.627	1.000
URBAN	-0.033	0.081	0.220	0.359	-0.109	0.167	0.364	0.655	-0.705
TEMP	-0.081	0.002	0.125	-0.191	-0.281	-0.610	0.130	-0.143	0.179
REG1	-0.139	-0.151	-0.029	0.071	-0.080	0.342	0.082	0.289	-0.108
REG2	0.330	0.356	-0.353	0.329	0.023	0.191	-0.023	0.079	-0.230
REG3	-0.146	-0.111	-0.120	-0.232	-0.313	-0.515	-0.063	-0.197	0.384
REG4	-0.149	-0.110	0.498	-0.092	0.200	-0.017	0.141	-0.025	-0.107
REG5	-0.230	-0.295	0.437	-0.046	0.266	0.199	-0.075	-0.028	-0.158
REG6	0.401	0.327	-0.381	-.100	0.028	-0.142	-0.071	-0.143	0.249

TABLE XXVI (Continued)

	REG3	REG4	REG5	REG6	URBAN	TEMP	REG1	REG2
MIGL70	-0.146	-0.149	-0.230	0.401	-0.033	-0.081	-0.139	0.330
MIGL60	-0.111	-0.110	-0.295	0.327	0.081	0.002	-0.151	0.356
DISTL	-0.120	0.498	0.437	-0.381	0.220	0.125	-0.029	-0.353
MEDINC	-0.232	-0.092	-0.046	-0.100	0.359	-0.191	0.071	0.329
UNEMP	-0.313	0.200	0.266	0.028	-0.109	-0.281	-0.808	0.231
WELF	-0.515	-0.017	0.199	-0.142	0.167	-.610	0.342	0.191
JOBS	-0.635	0.141	-0.075	-0.071	0.364	0.130	0.082	-0.023
MEDHOME	-0.197	-0.025	-0.028	-0.143	0.655	-0.143	0.289	0.079
PLUMB	0.384	-0.107	-0.158	0.249	-0.705	0.179	-0.108	-0.230
URBAN	-0.150	0.179	-0.040	-0.103	1.000	0.099	0.036	0.062
TEMP	0.576	0.379	-0.363	-0.098	0.099	1.000	-0.191	-0.417
REG1	-0.257	-0.168	-0.144	-0.099	0.036	-0.191	1.000	-0.257
REG2	-0.380	-0.248	-0.213	-0.146	0.062	-0.417	-0.257	1.000
REG3	1.000	-0.248	-0.213	-0.146	-0.150	0.576	-0.257	-0.380
REG4	-0.248	1.000	-0.139	-0.095	0.179	0.379	-0.168	-0.248
REG5	-0.213	-0.139	1.000	-0.082	-0.040	-0.363	-0.144	-0.213
REG6	-0.146	-0.095	-0.082	1.000	-0.103	-0.098	-0.099	-0.146

TABLE XXVII

CORRELATION MATRIX - SEA 9

	MIGL70	MIGL60	DISTL	MEDINC	UNEMP	WELF	JOBS	MEDHOME	PLUMB
MIGL70	1.000	0.773	-0.479	0.121	-0.052	-0.171	0.184	0.059	0.016
MIGL60	0.773	1.000	-0.452	0.201	-0.046	-0.125	0.201	0.154	-0.031
DISTL	-0.479	-0.452	1.000	0.079	0.315	0.297	0.150	0.209	-0.427
MEDINC	0.121	0.201	0.079	1.000	-0.101	0.485	0.339	0.740	-0.697
UNEMP	-0.052	-0.046	0.351	-0.101	1.000	0.306	-0.036	-0.048	0.001
WELF	-0.171	-0.125	0.297	0.485	0.306	1.000	0.189	0.493	-0.447
JOBS	0.184	0.201	0.150	0.339	-0.036	0.189	1.000	0.463	-0.252
MEDHOME	0.059	0.154	0.209	0.740	-0.048	0.493	0.463	1.000	-0.616
PLUMB	0.016	-0.031	-0.427	-0.697	0.001	-0.447	-0.252	-0.616	1.000
URBAN	0.084	0.162	0.245	0.548	-0.024	0.180	0.386	0.625	-0.684
TEMP	-0.070	-0.046	0.068	-0.411	-0.220	-0.614	0.417	-0.250	0.279
REG1	-0.206	-0.120	-0.025	0.257	-0.107	0.435	0.106	0.314	-0.186
REG2	0.377	0.335	-0.255	0.351	0.678	0.176	-0.025	0.077	-0.215
REG3	-0.012	0.045	-0.343	-0.343	-0.340	-0.512	-0.081	-0.212	0.443
REG4	-0.209	-0.251	0.537	-0.208	0.218	-0.089	0.066	-0.113	-0.059
REG5	-0.216	-0.256	0.433	0.042	0.251	0.154	-0.024	0.020	-0.182
REG6	0.353	0.283	-0.320	-0.138	0.031	-0.129	-0.059	-0.109	0.212

TABLE XXVII (Continued)

	REG3	REG4	REG5	REG6	URBAN	TEMP	REG1	REG2
MIGL70	-0.012	-0.209	-0.216	0.353	0.084	-0.070	-0.206	0.377
MIGL60	0.045	-0.251	-0.256	0.283	0.162	-0.046	-0.120	0.335
DISTL	-0.343	0.537	0.433	-0.320	0.241	0.068	-0.025	-0.255
MEDINC	-0.343	-0.208	0.042	-0.138	0.548	-0.411	0.257	0.351
UNEMP	-0.340	0.218	0.251	0.031	-0.024	-0.220	-0.107	0.067
WELF	-0.512	-0.089	0.154	-0.129	0.180	-0.614	0.435	0.176
JOBS	-0.081	0.066	-0.024	-0.059	0.386	0.417	0.106	-0.025
MEDHOME	-0.212	-0.113	0.020	-0.109	0.625	-0.250	0.314	0.077
PLUMB	0.443	-0.059	-0.182	0.212	-0.684	0.279	-0.186	-0.215
URBAN	-0.162	0.114	0.009	-0.071	1.000	0.034	0.053	0.045
TEMP	0.527	0.430	-0.342	-0.094	0.034	1.000	-0.273	-0.411
REG1	-0.286	-0.217	-0.154	-0.971	0.053	-0.273	1.000	-0.257
REG2	-0.331	-0.254	-0.180	-0.113	0.045	-0.411	-0.257	1.000
REG3	1.000	-0.283	-0.201	-0.126	-0.162	0.527	-0.286	-0.335
REG4	-0.283	1.000	-0.153	-0.096	0.114	0.430	-0.217	-0.254
REG5	-0.201	-0.153	1.000	-0.068	0.009	-0.342	-0.154	-0.180
REG6	-0.126	-0.096	-0.068	1.000	-0.071	-0.094	-0.097	-0.113

TABLE XXVIII

CORRELATION MATRIX - SEA C

	MIGL70	MIGL60	DISTL	MEDINC	UNEMP	WELF	JOBS	MEDHOME	PLUMB
MIGL70	1.000	0.628	-0.479	0.085	0.075	-0.149	0.138	0.050	0.068
MIGL60	0.628	1.000	-0.481	0.067	0.025	-0.197	0.267	0.131	0.082
DISTL	-0.479	-0.481	1.000	-0.024	0.091	0.194	0.194	0.176	-0.375
MEDINC	0.085	0.067	-0.024	1.000	-0.203	0.359	0.327	0.712	-0.696
UNEMP	0.075	0.025	0.091	-0.203	1.000	0.315	-0.035	-0.087	0.181
WELF	-0.149	-0.197	0.194	0.359	0.315	1.000	0.160	0.435	-0.364
JOBS	0.138	0.267	0.194	0.327	-0.035	0.160	1.000	0.444	-0.261
MEDHOME	0.050	0.131	0.176	0.712	-0.087	0.435	0.444	1.000	-0.651
PLUMB	0.068	0.082	-0.375	-0.696	0.181	-0.364	-0.261	-0.651	1.000
URBAN	0.053	0.141	0.253	0.624	-0.134	0.144	0.378	0.721	-0.738
TEMP	0.003	0.135	0.199	-0.292	-0.273	-0.618	0.141	-0.177	0.115
REG1	-0.028	0.052	-0.124	0.070	0.037	0.268	0.055	0.167	-0.038
REG2	0.163	0.108	-0.365	0.449	0.066	0.233	-0.014	0.160	-0.247
REG3	0.123	0.013	-0.028	-0.249	0.368	-0.482	-0.067	-0.190	0.278
REG4	-0.110	-0.200	0.498	-0.115	0.134	-0.034	0.193	0.018	-0.132
REG5	-0.231	-0.255	0.412	-0.044	0.138	0.211	-0.080	-0.007	-0.158
REG6	0.412	0.307	-0.329	-0.246	0.115	-0.170	-0.083	-0.199	0.385

TABLE XXVIII (Continued)

	REG3	REG4	REG5	REG6	URBAN	TEMP	REG1	REG2
MIGL70	-0.123	-0.110	-0.231	0.412	0.053	0.003	-0.028	0.163
MIGL60	0.137	-0.200	-0.255	0.307	0.141	0.135	0.052	0.108
DISTL	-0.028	0.498	0.412	-0.329	0.253	0.199	-0.124	-0.365
MEDINC	-0.249	-0.115	-0.044	-0.246	0.624	-0.292	0.070	0.449
UNEMP	-0.368	0.134	0.138	0.115	-0.134	-0.273	0.037	0.066
WELF	-0.482	-0.034	0.211	-0.170	0.144	-0.618	0.268	0.233
JOBS	-0.067	0.193	-0.084	-0.083	0.378	0.141	0.055	-0.014
MEDHOME	-0.190	0.018	-0.007	-0.199	0.721	-0.177	0.167	0.160
PLUMB	0.278	-0.132	-0.158	0.385	-0.738	0.115	-0.038	-0.247
URBAN	-0.093	0.193	-0.005	-0.172	1.000	0.086	-0.043	0.081
TEMP	0.575	0.427	-0.336	-0.098	0.086	1.000	-0.183	-0.446
REG1	-0.243	-0.158	-0.150	-0.110	-0.043	-0.183	1.000	-0.250
REG2	-0.367	-0.239	-0.227	-0.166	0.081	-0.446	-0.250	1.000
REG3	1.000	-0.232	-0.220	-0.162	-0.093	0.575	-0.243	-0.367
REG4	-0.232	1.000	-0.143	-0.105	0.193	0.427	-0.158	0.239
REG5	-0.220	-0.143	1.000	-0.100	-0.005	-0.336	-0.150	-0.227
REG6	-0.162	-0.105	-0.100	1.000	-0.172	-0.098	-0.110	-0.166

APPENDIX C

RSQUARE RESULTS

TABLE XXIX

RSOUARE - SEA 5

Number in Model	R-SQUARE	Variables in Model
1	0.00004	REG3
1	0.00035	MEDINC
1	0.00090	TEMP
1	0.00121	MEDHOME
1	0.00152	URBAN
1	0.00877	JOBS
1	0.01227	PLUMB
1	0.01455	UNEMP
1	0.02382	REG4
1	0.02438	REG2
1	0.02912	REG5
1	0.05463	REG1
1	0.07597	WELF
1	0.21999	DISTL
1	0.22382	REG6
1	0.52097	MIGL60
2	0.31678	DISTL REG6
2	0.52100	MIGL60 UNEMP
2	0.52122	MIGL60 REG3
2	0.52134	MIGL60 TEMP
2	0.52161	MIGL60 REG2
2	0.52163	MIGL60 REG4
2	0.52187	MIGL60 JOBS
2	0.52375	MIGL60 REG5
2	0.52460	MIGL60 MEDINC
2	0.52518	MIGL60 URBAN
2	0.52801	MIGL60 MEDHOME
2	0.53052	MIGL60 PLUMB
2	0.53133	MIGL60 REG1
2	0.54127	MIGL60 DISTL
2	0.55092	MIGL60 WELF
2	0.56121	MIGL60 REG6
3	0.56121	MIGL60 JOBS REG6
3	0.56138	MIGL60 REG4 REG6
3	0.56162	MIGL60 REG3 REG6
3	0.56165	MIGL60 MEDINC REG6
3	0.56245	MIGL60 REG2 REG6
3	0.56253	MIGL60 UNEMP REG6
3	0.56279	MIGL60 URBAN REG6
3	0.56305	MIGL60 REG5 REG6
3	0.56335	MIGL60 WELF TEMP
3	0.56349	MIGL60 TEMP REG6
3	0.56370	MIGL60 PLUMB REG6
3	0.56401	MIGL60 MEDHOME REG6
3	0.56455	MIGL60 WELF REG3
3	0.56993	MIGL60 DISTL REG6
3	0.57090	MIGL60 REG1 REG6
3	0.56681	MIGL60 WELF REG6
4	0.57511	MIGL60 DISTL REG5 REG6
4	0.57726	MIGL60 DISTL WELF REG3
4	0.57920	MIGL60 DISTL REG1 REG6
4	0.58695	MIGL60 WELF URBAN REG6
4	0.58703	MIGL60 WELF PLUMB REG6
4	0.58708	MIGL60 UNEMO WELF REG6
4	0.58750	MIGL60 WELF REG4 REG6
4	0.58780	MIGL60 WELF REG1 REG6
4	0.58781	MIGL60 WELF MEDHOME REG6
4	0.58852	MIGL60 WELF JOBS REG6
4	0.58899	MIGL60 DISTL WELF REG6
4	0.58988	MIGL60 MEDINC WELF REG6
4	0.59151	MIGL60 WELF REG2 REG6
4	0.59160	MIGL60 WELF REG5 REG6
4	0.59165	MIGL60 WELF TEMP REG6
4	0.59212	MIGL60 WELF REG3 REG6

TABLE XXX

RSQUARE - SEA 8

Number in Model	R-SQUARE	Variables in Model
1	0.00080	MEDHOME
1	0.00114	URBAN
1	0.00198	UNEMP
1	0.00315	PLUMB
1	0.00657	TEMP
1	0.01871	WELF
1	0.01933	REG1
1	0.02118	JOBS
1	0.02143	REG3
1	0.02234	REG4
1	0.03740	MEDINC
1	0.05333	REG5
1	0.10936	REG2
1	0.16093	REG6
1	0.30815	DISTL
1	0.58693	MIGL60
2	0.36512	DISTL JOBS
2	0.58695	MIGL60 WELF
2	0.58695	MIGL60 REG5
2	0.58747	MIGL60 REG1
2	0.58750	MIGL60 MEDHOME
2	0.58775	MIGL60 JOBS
2	0.58817	MIGL60 UNEMP
2	0.59011	MIGL60 PLUMB
2	0.59070	MIGL60 REG2
2	0.59071	MIGL60 REG3
2	0.59121	MIGL60 REG4
2	0.59151	MIGL60 MEDINC
2	0.59383	MIGL60 TEMP
2	0.59633	MIGL60 URBAN
2	0.61229	MIGL60 REG6
2	0.62720	MIGL60 DISTL
3	0.62138	MIGL60 MEDINC REG6
3	0.62532	MIGL60 REG2 REG6
3	0.62753	MIGL60 DISTL REG2
3	0.62790	MIGL60 DISTL MEDHOME
3	0.62791	MIGL60 DISTL PLUMB
3	0.62811	MIGL60 DISTL UNEMP
3	0.62864	MIGL60 DISTL URBAN
3	0.62881	MIGL60 DISTL WELF
3	0.62914	MIGL60 DISTL REG4
3	0.62953	MIGL60 DISTL REG1
3	0.63015	MIGL60 DISTL TEMP
3	0.63210	MIGL60 DISTL REG5
3	0.63213	MIGL60 DISTL MEDINC
3	0.63491	MIGL60 DISTL JOBS
3	0.63815	MIGL60 DISTL REG3
3	0.63925	MIGL60 DISTL REG6
4	0.64044	MIGL60 DISTL REG4 REG6
4	0.64049	MIGL60 DISTL MEDINC REG3
4	0.64061	MIGL60 DISTL REG3 REG5
4	0.64074	MIGL60 DISTL REG1 REG6
4	0.64083	MIGL60 DISTL MEDHOME REG6
4	0.64121	MIGL60 DISTL WELF REG6
4	0.64144	MIGL60 DISTL TEMP REG6
4	0.64146	MIGL60 DISTL PLUMB REG6
4	0.64189	MIGL60 DISTL JOBS REG5
4	0.64252	MIGL60 DISTL REG5 REG6
4	0.64342	MIGL60 DISTL REG2 REG6
4	0.64543	MIGL60 DISTL REG1 REG3
4	0.64605	MIGL60 DISTL JOBS REG3
4	0.64667	MIGL60 DISTL REG3 REG6
4	0.64735	MIGL60 DISTL MEDINC REG6
4	0.64822	MIGL60 DISTL JOBS REG6

TABLE XXXI

RSQUARE - SEA 9

Number in Model	R-SQUARE	Variables in Model
1	0.00016	REG3
1	0.00025	PLUMB
1	0.00277	UNEMP
1	0.00348	MEDHOME
1	0.00498	TEMP
1	0.00718	URBAN
1	0.01488	MEDINC
1	0.02947	WELF
1	0.03412	JOBS
1	0.04246	REG1
1	0.04402	REG4
1	0.04691	REG5
1	0.12501	REG6
1	0.14282	REG2
1	0.23034	DISTL
1	0.59810	MIGL60
2	0.30207	REG2 REG6
2	0.59836	MIGL60 REG4
2	0.59838	MIGL60 UNEMP
2	0.59847	MIGL60 REG5
2	0.59896	MIGL60 JOBS
2	0.59931	MIGL60 TEMP
2	0.59931	MIGL60 MEDINC
2	0.59973	MIGL60 PLUMB
2	0.59979	MIGL60 URBAN
2	0.60045	MIGL60 REG3
2	0.60190	MIGL60 MEDHOME
2	0.60377	MIGL60 WELF
2	0.61105	MIGL60 REG1
2	0.61384	MIGL60 REG2
2	0.61764	MIGL60 REG6
2	0.61941	MIGL60 DISTL
3	0.62013	MIGL60 DISTL TEMP
3	0.62076	MIGL60 DISTL PLUMB
3	0.62078	MIGL60 DISTL WELF
3	0.62081	MIGL60 DISTL REG5
3	0.62105	MIGL60 DISTL UNEMP
3	0.62142	MIGL60 DISTL REG2
3	0.62146	MIGL60 DISTL REG6
3	0.62348	MIGL60 DISTL REG4
3	0.62464	MIGL60 DISTL JOBS
3	0.62541	MIGL60 WELF REG2
3	0.62861	MIGL60 REG1 REG6
3	0.63113	MIGL60 DISTL REG2
3	0.63125	MIGL60 DISTL REG3
3	0.63145	MIGL60 DISTL REG6
3	0.63568	MIGL60 DISTL REG1
3	0.64393	MIGL60 REG2 REG6
4	0.64394	MIGL60 REG2 REG5 REG6
4	0.64424	MIGL60 URBAN REG2 REG6
4	0.64434	MIGL60 REG2 REG4 REG6
4	0.64470	MIGL60 DISTL JOBS REG1
4	0.64529	MIGL60 PLUMB REG2 REG6
4	0.64535	MIGL60 MEDHOME REG2 REG6
4	0.64543	MIGL60 DISTL REG1 REG6
4	0.64552	MIGL60 UNEMP REG2 REG6
4	0.64589	MIGL60 REG2 REG3 REG6
4	0.64663	MIGL60 MEDINC REG2 REG6
4	0.64716	MIGL60 TEMP REG2 REG6
4	0.64824	MIGL60 REG1 REG2 REG6
4	0.64877	MIGL60 JOBS REG2 REG6
4	0.65187	MIGL60 DISTL REG2 REG6
4	0.65383	MIGL60 WELF REG2 REG6
4	0.66194	MIGL60 DISTL REG1 REG3

TABLE XXXII

RSQUARE - SEA C

Number in Model	R-SQUARE	Variables in Model
1	0.00001	TEMP
1	0.00081	REG1
1	0.00252	MEDHOME
1	0.00283	URBAN
1	0.00467	PLUMB
1	0.00564	UNEMP
1	0.00727	MEDINC
1	0.01229	REG4
1	0.01531	REG3
1	0.01911	JOBS
1	0.02244	WELF
1	0.02667	REG2
1	0.05338	REG5
1	0.16986	REG6
1	0.22981	DISTL
1	0.39468	MIGL60
2	0.30240	DISTL REG6
2	0.39492	MIGL60 REG4
2	0.39495	MIGL60 PLUMB
2	0.39538	MIGL60 WELF
2	0.39562	MIGL60 JOBS
2	0.39574	MIGL60 MEDHOME
2	0.39598	MIGL60 URBAN
2	0.39651	MIGL60 MEDINC
2	0.39821	MIGL60 UNEMP
2	0.39851	MIGL60 REG1
2	0.40005	MIGL60 REG5
2	0.40158	MIGL60 TEMP
2	0.40380	MIGL60 REG2
2	0.41221	MIGL60 REG3
2	0.43546	MIGL60 DISTL
2	0.44776	MIGL60 REG6
3	0.44776	MIGL60 WELF REG6
3	0.44788	MIGL60 JOBS REG6
3	0.44806	MIGL60 URBAN REG6
3	0.44845	MIGL60 REG4 REG6
3	0.44848	MIGL60 MEDHOME REG6
3	0.44874	MIGL60 REG1 REG6
3	0.44888	MIGL60 UNEMP REG6
3	0.45019	MIGL60 TEMP REG6
3	0.45093	MIGL60 DISTL REG4
3	0.45235	MIGL60 REG5 REG6
3	0.45363	MIGL60 PLUMB REG6
3	0.45436	MIGL60 DISTL REG3
3	0.45651	MIGL60 REG3 REG6
3	0.46035	MIGL60 MEDINC REG6
3	0.46954	MIGL60 REG2 REG6
3	0.47196	MIGL60 DISTL REG6
4	0.47189	MIGL60 PLUMB REG2 REG6
4	0.47199	MIGL60 DISTL TEMP REG6
4	0.47219	MIGL60 DISTL REG5 REG6
4	0.47221	MIGL60 DISTL WELF REG6
4	0.47272	MIGL60 MEDINC REG2 REG6
4	0.47357	MIGL60 REG2 REG4 REG6
4	0.47498	MIGL60 DISTL REG1 REG6
4	0.47522	MIGL60 DISTL UNEMP REG6
4	0.47618	MIGL60 DISTL MEDHOME REG6
4	0.47707	MIGL60 DISTL JOBS REG6
4	0.47746	MIGL60 DISTL URBAN REG6
4	0.48008	MIGL60 DISTL REG2 REG6
4	0.48273	MIGL60 DISTL MEDINC REG6
4	0.48278	MIGL60 DISTL REG3 REG6
4	0.48463	MIGL60 DISTL REG4 REG6
4	0.49062	MIGL60 DISTL PLUMB REG6

TABLE XXXIII

RSQUARE - ALL ORIGIN SEAS

Number in Model	R-SQUARE	Variables in Model
1	0.00027	URBAN
1	0.00078	MEDHOME
1	0.00187	UNEMP
1	0.00275	PLUMB
1	0.00278	TEMP
1	0.00370	REG3
1	0.01494	MEDINC
1	0.01875	JOBS
1	0.02345	REG1
1	0.02601	REG4
1	0.02916	WELF
1	0.04430	REG5
1	0.07264	REG2
1	0.14657	REG6
1	0.22407	DISTL
1	0.55496	MIGL60
2	0.27641	DISTL REG6
2	0.55498	MIGL60 JOBS
2	0.55503	MIGL60 UNEMP
2	0.55506	MIGL60 REG5
2	0.55535	MIGL60 MEDINC
2	0.55591	MIGL60 REG4
2	0.55729	MIGL60 MEDHOME
2	0.55732	MIGL60 TEMP
2	0.55732	MIGL60 PLUMB
2	0.55790	MIGL60 URBAN
2	0.55799	MIGL60 REG3
2	0.55971	MIGL60 WELF
2	0.56114	MIGL60 REG2
2	0.56232	MIGL60 REG1
2	0.58167	MIGL60 DISTL
2	0.58230	MIGL60 REG6
3	0.58299	MIGL60 JOBS REG6
3	0.58318	MIGL60 DISTL UNEMP
3	0.58321	MIGL60 TEMP REG6
3	0.58323	MIGL60 REG3 REG6
3	0.58326	MIGL60 URBAN REG6
3	0.58340	MIGL60 DISTL REG2
3	0.58402	MIGL60 DISTL REG5
3	0.58438	MIGL60 DISTL JOBS
3	0.58486	MIGL60 MEDINC REG6
3	0.58501	MIGL60 WELF REG6
3	0.58504	MIGL60 DISTL REG4
3	0.58768	MIGL60 REG1 REG6
3	0.59069	MIGL60 DISTL REG3
3	0.59098	MIGL60 DISTL REG1
3	0.59713	MIGL60 REG2 REG6
3	0.59777	MIGL60 DISTL REG6
4	0.59803	MIGL60 URBAN REG2 REG6
4	0.59812	MIGL60 DISTL UNEMP REG6
4	0.59831	MIGL60 TEMP REG2 REG6
4	0.59837	MIGL60 DISTL WELF REG6
4	0.59883	MIGL60 JOBS REG2 REG6
4	0.59899	MIGL60 REG1 REG2 REG6
4	0.59907	MIGL60 DISTL REG5 REG6
4	0.59984	MIGL60 DISTL PLUMB REG6
4	0.59998	MIGL60 DISTL REG4 REG6
4	0.60049	MIGL60 DISTL MEDINC REG6
4	0.60140	MIGL60 DISTL JOBS REG6
4	0.60243	MIGL60 DISTL REG3 REG6
4	0.60352	MIGL60 WELF REG2 REG6
4	0.60492	MIGL60 DISTL REG1 REG6
4	0.60532	MIGL60 DISTL REG2 REG6
4	0.60712	MIGL60 DISTL REG1 REG3

VITA

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