A COMPARATIVE STUDY OF MIGRATION: DEPRESSED AND NON-DEPRESSED REGIONS

By

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This study examines differences in migration behavior between depressed and non-depressed regions. The analysis is motivated by the literature which reported a lower propensity of mobility for the people from depressed regions, and by the failure of migration to ensure that income converges between regions over time.

The study uses individual data from the youth cohort of the National Longitudinal Survey (NLS) and develops a synthesis model of migration. The central premise of the models is a systematic differentiation between the people of depressed and non-depressed region to location specific and non-location specific human capital, location preference, contextual factors and overall behavior.

The analysis is carried out by separately estimating the decision to migrate and destination choice. A discrete hazard model that is cast in a binary logistic form is used for the decision to migrate and a conditional logit model is employed for the destination choice.

The study finds that there are behavioral differences for only two variables, own race and level of urbanization, out of five hypothesized variables. The former measures locational preference while the latter represents contextual factors. In the destination choice, difference is observed in terms of the specific variables of location specific and non-location specific human capitals. In both models however, the differences to specific variables do not translate to overall behavioral differences.

Out-migration rate may also be lower for depressed regions because the levels of their independent variables slow migration. It is shown that this is indeed the case and the predicted probability of out-migration from the depressed regions is found to be lower.

The failure to find overall differences, despite differences to some variables, implies that behavioral differences do not underlie the lower propensity of mobility from depressed regions. Levels of migration determinants on the other hand are more likely to be associated with the differential migration rates. The implication of the study for regional convergence is that lack of regional convergence is not due to migration failure but due to other regional phenomena irrespective of migration.

To My Mother

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CHAPTER I

INTRODUCTION

1.1 Introduction and Statement of the Problem.

The economic space is marked by substantial and persistent differences in regional economic and non-economic conditions. The greatest difference is between depressed, backward or lagging regions on one hand and non-depressed or prosperous regions on the other hand.

In terms of economic conditions, depressed regions have lower average real income that could possibly be increasing less fast or even declining. The rate of unemployment will be higher than that prevailing elsewhere. Labor force participation will be low and income in kind may be higher. Socio-demographic conditions such as fertility, mortality, health care would also be unfavorable in these regions as opposed to economically healthy regions (Graham, 1987).

The interest of a regional planner in such different regional economies arises from their implications for regional welfare and national policy. At an individual level, inferior economic opportunity is hurtful in so far as one is unable to move to the rich pasture or is so attached to home from where one is reluctant to move (Brown and Burrows, 1977). At a national level, inequality of regional real income is a concern on the ground that welfare would be greater if the same total income was more evenly distributed.[1]

[1] This statement assumes that interpersonal comparison of income is meaningful and there is a diminishing marginal utility of income.

Further, inter-regional income differences, could be viewed as symptoms of a misallocation of productive resources, if labor, ceteris paribus, earns less in one region than another. In this instance there is a presumption that output could be raised if some workers would move to the high paying region (Brown and Burrows, 1977). A similar analysis is true for returns to capital.

A continuing puzzle in this context is why such regional differences should persist over long periods of time and how can it be redressed. Researchers have identified two powerful forces that might be expected to redress the regional contrasts.

These are the movement of capital and labor. The role of capital is less studied because of the difficulty in tracing the regional movements of private and public capital (Costa et al. 1987). Labor movement, the process of inter-regional migration, has however been intensively studied (Richardson, 1973; Armstrong and Taylor, 1978; Olvey, 1972).

Conventionally, it is viewed as an important allocation mechanism for integrating over time and space the demand and supply of labor. From this perspective migration is viewed as part of a process whereby workers adjust to differences among regional labor markets. Labor migrates, with the highest flows expected from high unemployment, low wage areas towards employment growth and high wage areas (Congdon, 1988; Kahley, 1991).

Much of this discussion has focused on the importance of two contributing sets of factors. The first known as "pull" factors focussed on the characteristics of the destinations which attract people. The other set, known as "push" factors focus on the characteristics of the origin which repel people. The most important finding, due to Lowry (1966), was that these sets of factors act asymmetrically.

Lowry's (1966) asymmetric finding was out-migration rate was independent of economic conditions while in-migration was responsive to economic variables. Some of the subsequent studies corroborate his finding (Morrison, 1973) while others (Miller, 1973; Olvey, 1972; DaVanzo,1978) asserted that push factors, namely the economic conditions of the origin region affect out-migration. Still others identified the need to look for intervening factors such as different range of income (Fedar, 1982) or the population pool of potential out-and in-migrants (Plane, Rogerson and Rosen, 1984). But as has already been noted these studies do not explain persistent regional inequality. They share the central conclusion that regional convergence will be achieved, and depressed or backward regions will achieve parity as market forces redress regional imbalances. There are however substantial regional differences which have not been eliminated and depressed regions continue to be depressed.[2]

Indeed there is substantial evidence against the traditional theory of mobility. In his study of 40 non-depressed and 13 depressed labor market areas in the continental United States, Gallaway (1961) noted that while the theoretical expectation is for depressed regions to show a higher out-migration than non-depressed regions, his data showed that the mean percentage of out-migrants from non- depressed areas was 3.47 while the mean percentage from depressed areas was 2.90. Lack of knowledge, age barriers, lack of job opportunity elsewhere due to tight labor markets were the factors thought to account for low mobility from depressed regions.

Lansing and Mueller (1967) found no differences in out-migration rates from development areas and non-development areas, and conjectured that lack of information or poor information flows is the main cause of low mobility.

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[2]To explain this researchers have developed a set of so called polarization models (Hirschman, 1958, Myrdal,1957, Kaldor, 1970) which refer to cumulative processes of regional growth and stress that a pattern of increasing divergence between rich and poor regions is the norm.

Parr (1966) mentions that in spite of a desirability of migration from depressed areas, there is a pronounced reluctance on the part of the people to move.[3] A similar finding was that of Cordey Heyes and Gleave (1974) who found that in England growing areas have high gross out-migration per capita and very high gross in-migration per capita, while declining areas have low gross out-migration per capita and minimal gross in migration per capita.

The relationship is unexpected in a disequilibrium setting, because one would expect attractive areas to attract people and retain them as well, while less desirable or declining areas would be expected to show the reverse (Mueser and White, 1989).

Several explanations were put forward to account for such paradoxes. Growing areas attract more migrants, and thus contain a population more prone to move (Morrison, 1971). Forming attachments to localities is believed to take time, thus those who are new arrivals, having less time to develop attachments, tend to depart quickly, implying a positive association between in and out migration. Return migration is also believed to account for the positive association in that areas with high out migration tend to have higher return migrants thus producing positive association (Vanderkamp, 1971). Mueser and White (1989) for their part argue that the dynamics of population change account for the observed association.

In summary, first, contrary to the convergence theory, depressed regions continue to be depressed; and contrary to the notion of the equilibrating role of migration, depressed regions continue to have relatively low mobility. Second, the reason for the low and high mobility from declining and prosperous regions respectively has generally been explained in terms of regional decomposition and dynamic effects, information

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[3] In a study made on deindustrializing region, Haurin and Haurin (1990) reported a higher net migration from Midwest of deindustrialized region. While the result seems contrary to the above two studies, net migration however tells only a relative story of out-migration.

flows and age barriers. All these explanations share one central feature: they are based on aggregate considerations. Aggregate studies do not allow the examination of personal influences and personally relevant economic and non-economic opportunities. Hence they shed little light on the complexity of migration decision and by implication on differential rates of regional migration. They can not be related to the observed realities of persistent regional inequality.

But there is another possibility. It is, at least, intuitively plausible that differences in migration rates are due to systematic differences in the characteristics of individuals in developed and non-developed areas; and in particular, in the way they make their migration decisions.[4] There is indeed some evidence of this in the literature.

Lansing and Mueller (1967) noted that extreme pressures often have a different impact on behavior, quantitatively and qualitatively, from mild pressure. Large and conspicuous economic differentials may induce people to make changes while small ones may not be of sufficient interest to overcome the fixed cost of relocating. Similarly Mueller (1982) hinted that those outside the mainstream of economic activity may behave differently with regard to the migration decision.

In this regard the low wage and high unemployment in declining regions may not be due to excess labor or poor location of industry, as commonly thought, but due to individual skill endowments or individual attitudes to work. Declining regions might contain individuals who show higher emotional attachment to their locality than those individuals in non-depressed regions. Another alternative is that personally relevant development-related contextual conditions which are an amalgam of economic, social and infrastructural conditions might be responsible for the different nature of migration of the

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[4]Differences in the systematic influences of migration determinants do not only explain differential migration rate but also become an underlying reason why labor movement fails to redress regional inequality.

depressed and non-depressed regions. These alternative conjectures imply that migration determinants could be region-specific and dependent on regional contextual and regional individual characteristics.

If any of these features that encourage and discourage migration are at work in depressed and prosperous regions, then previous studies have not appropriately addressed them, and these might reduce the significance or actually change the direction of, migration determinants conventionally found.

In order to settle this, we need to focus directly on the question of the individual determinants of migration, with the objective of identifying whether these determinants have the same force on inhabitants of depressed and non-depressed areas.[5] In this context, as noted by Clark (1983), the relevant question is, does the migration process appear to be the same for growing and declining areas? The answer to such question should be sought from a comparative analysis of the individual migration decision.

The focus on individual decision making has another implication. As will be seen in the literature review, development related contextual factors are found to be important in accounting for migration differentials in third world setting. The contextual paradigm implies that if the development parameters are held constant, the migration decisions of people from depressed region will be similar to those of people in non-depressed regions. But from the view point of individual decision-making, it seems likely that even if development variables are held constant personal variables may help explain differential rates of migration. Thus the use of personal variables will explain migration differential that can not be explained by development contextual variables.

[5]Some studies have focussed on individual determinant of migration (Mueller, 1982, DaVanzo, 1976). These studies however stop short of investigating whether the individual determinants have the same force in growing and declining regions

1.2 Research Objective and justification.

The overall objective of this study is to investigate whether changes in the magnitude and direction of the determinants of inter-regional migration between depressed and non-depressed region can be explained by differences in individual rules governing the decision to migrate. Factors that are expected to have direct bearings on different individual rules in the two kinds of regions are those pertaining to production capacity of individuals, the idea of an individual preference (Leven, 1989) and personally relevant development context. Thus, the specific objectives of the study are:

1. To examine the role of personal variables pertaining to production capacity, locational preferences and personally relevant contextual factors in accounting for (a) gross migration probabilities in depressed and non-depressed regions; and (b) destination choice of migrants from depressed and non-depressed regions.

2. To examine whether these forces differ in their effect in depressed regions and non-depressed regions, i.e., to examine if there is specific behavioral differences for these factors.

3. To examine whether overall individual rules of migration decision and destination choice differ in the two kinds of regions; i.e., to examine whether there is a general behavioral difference between individuals in the two regions.

To accomplish the research objectives a disaggregated multi regional migration model will be estimated. The model explicitly includes variables measuring production capacity of individuals, locational preference and contextual factors that form the basis for differences in the individual decision rule. The rational for the focus on these factors is outlined in the conceptual framework, developed in chapter III. The framework provides the motivation for testable hypotheses.

The results of this study will be useful in explaining whether behavioral differences underlie the differential migration propensity in depressed and non-depressed regions. The findings will also contribute to state and federal policies of economic development. Specifically, the findings will suggest whether a completely differentiated migration policy is needed in the depressed and non-depressed region or whether we may need to focus only on specific details in making migration policies in depressed and non-depressed region.

1.3 **Format.**

Chapter II reviews the findings of research on migration. The review encompasses studies on the various general migration models and those studies explicitly made from depressed regions. The conclusion of the latter part of the literature is that none of the studies address whether people show behavioral differences from a disaggregate perspective.

Chapter III presents the conceptual framework for the study. In this section, the potential migrant is viewed as a utility maximizing agent, whose utility depends, among other things, on individual endowment of capital, location preference and development context. Seven testable hypotheses are generated.

Chapter IV focusses on the data and method used in the study. The data section deals with the nature of National Longitudinal Survey (NLS) data, the main source of data in the study. Also discussed in this section is the operation-alization of the data and the specification of variables used in the study. The method section discusses the statistical methodologies used in the study. These are the discrete hazard rate that is cast in binary logistic form and a conditional logit model.

Chapter V discusses the problem of identifying depressed and non-depressed areas and provides an overview of the migration patterns in NLSY data. We develop an operational method of regional identification based on levels and changes in per capita income and employment. The annual rates and the regional patterns of migration from depressed and non-depressed region are presented in absolute numbers and percentages.

Chapter VI presents the empirical results from a binary logistic and conditional logit models. Chapter VII summarizes the findings of the study and discusses policy implications and directions for future research.

CHAPTER II

REVIEW OF THE LITERATURE

2.1 Introduction

The review of the literature in this chapter is organized along two main lines. The first part is a review of the technical literature used in general migration studies. In this part the most important models of migration will be reviewed. The objective is to learn about migration modeling and to appreciate the different approaches of migration studies. This part is subdivided into three parts. Section 2.2 reviews the aggregate studies of migration, section 2.3 reviews the micro studies of migration and section 2.4 reviews the development-related contextual studies of migration. A summary and analysis of the approaches is given at the end of each section. The second part of the literature deals with those studies pertaining to migration from depressed regions. The objective of this part of the literature is to learn the extent of modeling and approaches used to study migration from depressed regions. This part of the literature will throw light on the shortcomings of these studies, if any, and provide a rationale for the present study.

2.2 Aggregate Studies of Migration

Aggregate studies of migration are concerned with the size and direction of migration flows. Emphasis is given to the locational characteristics that affect migration. The aggregate studies are mostly based on one of two alternative theories (Mueller, 1982).

The first is the gravity model formulation and the second is the neoclassical theory of labor migration.

An early formulation of the gravity model is by Zipf (1946). Zipf (1946) stated that the number of persons that move between any two communities whose respective sizes are P1 and P2 and separated by distance D, will be proportional to the ratio (P1.P2)/D. In order to show its empirical applicability P was measured by the population of cities. The ratio (P1.P2)/D was computed for 29 pairs of cities in the U.S and the values were plotted against the number of passengers and aggregate fares for highway traffic, railway traffic and air traffic. The separate plots of the number of passengers and the aggregate fares against the ratio of (P1.P2)/D for highway traffic showed a linear relationship.

The railway traffic also showed the anticipated linear relation, but its slope was greater than expected. The airway data also showed a close relationship. Zipf's model, by focussing on distance, neglects the directionality of the flow of migration. Stouffer (1960) elaborated a model of intervening opportunity in which the directional flow of migration was specified. The idea is that the number of people going a given distance S from a point is not a function of distance, but rather a function of the spatial distribution of opportunities. Under this formulation it is postulated that the number of people going S distance from a point is directly proportional to the number of opportunities on the perimeter of a circle with radius S and inversely proportional to the number of opportunities on or within that circle. The distribution of opportunities as it affects the direction of migration is also considered in the model. Opportunities in a given city is defined as total number of migrants to that city from all other cities of 100,000 or over (Stouffer, 1960).

The model presented was,

$$Y = k(X_m)/(X_b)^a , \tag{1}$$

where Y is gross inter city migration,

X_b is a measure of intervening opportunity,

X_m is a product of total out-migration from origin (m_i) and all in-migrants to a given destination from all other places(m_j) i.e., $X_m = m_i m_j$,

K is a constant.

Empirical prediction on the basis of intervening opportunity was found to explain migration in some direction and not in others. The concept of "competing migrant" was introduced to account for all directional flows. The number of competing migrants, X_c, is defined as the total number of persons leaving cities as close or closer to Y than the migrants in X (Stouffer,1960). The above model was modified to

$$Y = K(X_m)/(X_b X_c)^b . \tag{2}$$

Most studies which have focussed on structural and spatial aspects of migration have used Zipf's formulation or Stoufer's formulation. The latter however seems better supported by empirical findings. For example Miller (1972) tested the role of distance as impediment and as an intervening opportunity. He hypothesized that the distance as an impediment hypothesis predicts that migration rates should decline with state area while the intervening opportunity hypothesis predicts that migration should decline with population. His result supported the intervening hypothesis of distance. Similarly Waycki (1975) compared the intervening opportunities-competing migrants model and the distance model and found the former to be superior in explaining geographic mobility.

The economic analysis of migration was based on the early works of Hicks on wages and labor allocation. Within this framework, demand and supply are mediated by fluctuations in wages and wages respond to any excess of demand or supply (Molho, 1986). On this basis Hicks concluded that differences in wages are the main cause of migration. This view was extended to implying that migration by responding to wage differentials or job vacancies is an important mechanism that eliminates regional disparities in per capita income (Mueller, 1982).

The assumptions of this classical model are typical of general classical theory. Workers are assumed to maximize their utility; their knowledge of employment and wage opportunity is assumed to be prefect: labor is assumed to be plentiful and homogeneous; regions are equally attractive except for wage differences; and it is assumed that there are no significant social or economic costs to the labor adjustment process (Clark and Ballard, 1980).

Lowry (1966) synthesized the above two views of migration by incorporating gravity and economic variables in his study of migration flows from 1955-60 census data. He postulated that the observed directional flows between each pair of place is related to measures of economic opportunity at origin and destination as well as to the size of places and intervening distance (Lowry, 1966). Unemployment and wage rates are used to measure economic opportunity. Non-agricultural labor force of origin and destination and airline distance are used to measure the size of and distance between places respectively. The model formulated was

$$M_{i\text{-}j} = K \left[\frac{U_i \, . \, W_j . \, L_i L_j}{U_j \, . \, W_i . \, D_{ij}} \right], \qquad (3)$$

where M_{i-j} is number of migrants from place i to place j,

L_i, L_j are number of persons in the non-agricultural labor force at i and j respectively,

U_i, U_j are unemployment as a percentage of the civilian non-agricultural labor force at i and j respectively,

W_i, W_j are hourly manufacturing wage in dollars at i and j respectively,

D_{ij} is airline distance from i to j in miles.

In the above model people migrate from areas of low wage to high wage, from areas of surplus labor to those with labor shortage. An equilibrium is reached when the wage rate and unemployment rate of the origin and destination are equal. The random element of migration thereof depends on the size of places and the distance between them.

The model was applied to migratory streams of SMSAs using data from 1955-60. The result showed that only the unemployment rate at destination is statistically significant. The model was revised, and the non-agricultural labor force was partitioned into civilian and military components. The revised model showed that migration from place i to j is encouraged by high wages at j and it is discouraged by high unemployment rate at j and by greater intervening distance. Origin unemployment and wage rate, contrary to general expectations, were found to be insignificant. The civilian and military labor force both at origin and destination encouraged migration. From this, it was concluded that the volume of out-migration from SMSA is unrelated to labor market condition in that SMSA, but that the choice of destination reflects a knowledge of and interest in that labor market.

The implication is that in-migration and out-migration can be analyzed separately. Out-migration is related only to the size and mobility of population while in-migration is related to labor market conditions, distance and population size.

Lowry's result, known as asymmetric hypothesis in the literature, raised interest and many researchers employed similar methodology to test the validity of the result. The results however turned out to be mixed. Morrison (1973), strengthening the asymmetry result indicated that people do not necessarily come from the correct origin although they tend to go to the correct destination. Miller (1973) after testing the asymmetry result maintained that out-migration is affected by wages and unemployment rate once differences in the propensity to migrate are controlled. The variables used to measure propensities to migrate are out of state birth, education level and population size. Olvey (1972) developed a simultaneous equation system to explain employment and labor force growth. His result, contrary to Lowry's finding, showed a significant relationship between out-migration and local labor condition as measured by employment growth and wage levels. DaVanzo (1978) analyzed the effect of unemployment on migration by testing numerous hypotheses. Her main conclusion was that local economic conditions (measured by the origin unemployment rate) do affect out-migration, but only within the subset of people most seriously affected by them--the unemployed.

The implication was that policies meant to induce the unemployed to move amount to no more than a costly duplication of private market forces already working in the right direction (DaVanzo, 1978). Feder (1982) showed that the relation between average income at the origin and the rate of migration is not necessarily a monotonic one. He believed that the relationship will be positive for low average income and negative for high average incomes. He concluded that if observations are drawn from different ranges of average income, it is quite possible to get results showing no effect of income

Plane, Rogerson and Rosen (1984) reflecting on the Lowry hypothesis showed that the difference in the size of the respective population pool of potential out- and in migrants is a contributing factor to the lesser sensitivity of out-migration than in migration to economic conditions.

Schachter and Althaus (1989), who estimated in and out-migration function for states of the U.S, found that higher income is associated with higher in-migration and lower out-migration. The in-migration function was however found to be much more elastic with respect to income than the out-migration one. This was interpreted as implying that persons already in a state are much less influenced by income in their migration decisions than in-migrants because they might have accumulated human capital which is specific to the state and formed personal relationships which impose psychic costs of moving. Unemployment was found to be significant and positive in in-migration and significant and positive in out-migration indicating high rates of unemployment attract migrants. This is, perhaps it is the leisure component of unemployment that attracts migrants.

In a more recent paper Haurin and Haurin (1991) showed that economic restructuring or change of economic base increases the probability of inter regional out-migration. This study was couched in terms of human capital where differentials instead of push and pull variables were emphasized.

A similar issue that resulted in a puzzling finding is the positive association between rates of in and out-migration across locations. The finding of Cordey Heyes and Gleave (1974) shows that growing areas have high gross out-migration per capita and very high gross in migration rates, while declining areas have low gross out-migration per capita and minimal gross in migration per capita. The relationship is unexpected, because one would hope to see attractive areas attract people and retain them as well, while less desirable or declining areas would be expected to show the reverse (Mueser and White, 1989).

Several explanations were put forward to account for such paradoxes. Areas that attract more migrants are believed to grow containing population more prone to move (Morrision, 1971). Forming attachments to localities is believed to take time, thus new arrivals, having less time to develop attachments, are more likely to depart, leading to a positive association between in and out-migration. Return migration is also believed to account for the positive association in that areas with high out-migration tend to have higher return migrants thus producing positive association (Vanderkamp, 1971). Mueser and White (1989) in their part argue for the dynamics of population change to account for the observed association. Recently, an equilibrium framework was put forward to explain the positive association of in-migration and out-migration. Schachter and Althaus (1989) showed that a change in amenity changes the rate of in-migration and out-migration which in turn causes earnings to rise or fall inducing further in-migration or out-migration. The direction of the change depends on the initial nature of the amenity change which guides the direction of earnings change. Sufficiently high increase (decrease) of earnings establishes a new equilibrium.

Summary and Analysis of Aggregate Studies

The aggregate studies based on the gravity formulation do not have strong micro economic behavioral foundations. Physical distance and intervening opportunities are used as major explanatory factors. The use of physical distance not only makes an erroneous assumption of a linear cost-distance relationship but also neglects other distance namely economic or social distances which may be more relevant for migration decisions. The gravity model also makes a heroic assumption of uniform population and homogeneous tastes and needs. The intervening opportunity model by capturing social distance, has proved to be superior to the physical distance modeling. The concept however, as admitted by Stouffer, can not effectively explain the migration behavior of individuals.

Neoclassical theory has focussed on the long run equilibrium of regional labor markets. Migration is viewed as a labor market adjustment. The empirical results of the neoclassical model have been mixed. While some studies have accepted Lowry's no-push or "asymmetric" assertion, others have rejected it. The findings of Cordey and Hayes call into question the validity of the neoclassical hypothesis of regional equilibrium.

The common feature of all aggregate models however is that they do not pay attention to the motives behind the individual migration decision or the decision making process. By focussing on aggregated flows, on an areal basis, they fail to explain why some people do not move despite finding themselves in economically disadvantaged areas or small areas. In addition, they take a stance with convergence theory and view migration as being efficient in redressing regional inequality. Though the various debate surrounds whether origin or destination factors or whether one or another factor is important in explaining migration, the underlying theme was that the efficiency of migration goes towards mediating regional differences in income and opportunities. Regional inequality however has persisted and the movement of labor fails to follow the "efficient" path. One possible avenue to explain persistent regional equality is to depart from "efficient migration view " and from aggregate studies and investigate the real reasons why people make such an economic decisions and whether such decisions appear to be the same for different regional economies.

This is better served by micro models which focus on the individual decision making process. We now turn to such models of migration.

2.3 Micro Studies of Migration

2.3.1 The Human Capital Model

The human capital approach was initially suggested by Sjaastad (1962). According to this approach migration is modeled as an investment in human capital. The basis of decision for a potential migrant is the anticipated future stream of earnings. The individual migrates if the present value of net benefits in the destination location is greater than the present value of net benefits in the current location.

In the earliest and basic model of human capital of Sjaastad (1962), the benefits of migration are represented by the present discounted value of the differences in lifetime earnings at the destination and origin. The costs are typically borne immediately and include the actual cost of moving as well as psychological costs. The individual decision to migrate from region i to region j is based on the following calculation.

$$NB_{ij}=\int_{t0}^{T} e^{-r(t-t0)}\,(W_{jt}-W_{IT})\,dt-C_{ij} \tag{4}$$

where NB_{ij} is net benefit of moving from region i to region j,

W_{it} is earnings in origin i during period t,

W_{jt} is earnings in destination region j during period t,

r is discount rate,

C_{ij} is costs (both actual and psychological) of moving from i to j,

to is current time period,

T is end of individuals working life,

t is time,

e is exponential function.

The human capital model can also be derived from a utility maximization problem where the potential migrant evaluates the utility obtained from living in a particular region.[1] The individual who maximizes utility subject to a budget constraint in each region decides to move if he or she finds the difference between the maximum utility associated with moving to a new region is greater than staying. The individual decision to choose to live in a particular region j can be written in terms of the indirect utility function as

$$V(P_j, W_j, O_{Yj}, A_{ij}) > V(P_i, W_i, O_{Yi}, A_{ij}), \quad \text{for all } i \neq j \qquad (5)$$

where P_j is vector of price of goods in region j,

W_j is individual's wage in region j,

O_{Yj} is individual's non-wage income in region j,

A_{ij} is vector of other variables (climate, availability of public good, employment opportunities etc) characterizing region j.

The indirect utility formulation corresponds to the original human capital model if time is added. Hence the difference between wages, prices and other variables between regions determines the migration of the individual.

The early human capital model which uses only discounted income could then be generalized as (Milne, 1990)

$$M_{ij} = f_{ij}(X_i, X_j, C_{ij}), \qquad (6)$$

where X_i is a vector of variables in origin region i which influence the decision to migrate,

[1] See Mueller (1982) for this kind of model.

X_j is a vector of variables in the destination region j influencing the decision to migrate,

C_{ij} is the costs of migrating from region i to region j,

f_{ij} is a functional form (linear or log linear).

The above formulation allows for the possibility that many variables can influence the flow of migrants between two regions. Thus the human capital model includes a whole variety of economic, social and environmental factors that affect migration decision as opposed to the early model based on wage differences alone (Molho, 1986).

The model also attaches significance to individual attributes. Empirical research has specified various factors that affect migration within a human capital framework. A good review is found in Greenwood (1975). These variables can be seen to represent personal characteristics, benefits of migration and costs of migration.

Personal Characteristics

Age, level of education, race are some of the personal characteristics that influence migration decision. A prediction of the human capital model is that labor force migration decreases with age. This is because the rate of return for older people, due to shorter life span, is lower than younger people. Older people do also show strong family ties and greater job security than younger ones, hence discouraging migration of older people through higher costs (Gallaway, 1969).

Education is expected to positively influence migration through its effect on increasing job opportunity and employment information (Greenwood, 1975). Education also increases awareness of other localities and reduces cultural and personal ties to families and localities. The differential influence of race on migration is also noted: that while whites are more responsive to job opportunities, non-whites are responsive to income differentials (Greenwood, 1975).

Benefit Variables

Income is the most common variable representing benefits. Income is usually measured by the average wage in the region. The early human capital model doesn't include the possibility of being unemployed after a person has moved. Theoretically such uncertainty is accounted for by expected utility maximization approach. In this approach the weights forming the expected utility would be the probability of being employed and the probability of being unemployed in the destination region versus the expected utility based on these probabilities in the origin region (Milne, 1990). Alternatively the unemployment rate(or employment) is included as separate explanatory variable. Vacancies and job turnover are suggested as better measures of labor market conditions (Fields, 1976).

Other sets of variables that measure benefits are those that affect quality of life. Amenities, both physical (climate, scenery) and cultural are considered important determinants of migration (Graves, 1980).[2] Population density as proxy for crowding, congestion or pollution are included as quality of life indicator. Cebula (1979) incorporated amenity differentials as well as income differentials as a measure of benefit in the human capital model. Government policies such as taxes and expenditures are also suggested as measures of benefits (Boadway and Flatters, 1982).

Costs

The costs of migration are represented by direct moving costs and indirect costs. Sjaastad (1962) discusses three types of costs namely monetary cost, psychic cost and opportunity cost. Transportation costs and costs of accommodations are monetary cost. Opportunity cost is the cost of foregone earnings while psychic costs are costs associated with leaving relatives and friends.

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[2] These are the main factors behind the model that treats migration as a response to increased demand for non traded goods.

interactions with age and schooling. The results were highly significant and consistent with the human capital model of migration. Two racial differences between black and white migrants were found. These are that the predicted level of out-migration for blacks is greater than that for whites and secondly blacks are observed to be less responsive to income gain but have higher schooling effect on income-age and income-schooling interactions.

The human capital model has been extended to account for some observed realities lacking in the original model. The first extension of the model was in recognizing migration as a family investment instead of individual investment (DaVanzo, 1976). The family is assumed to move together as a unit. Hence the relevant benefits and costs are those pertaining to the family and the family or household is the appropriate unit of study. Specifically the family is hypothesized to move if the net return to the family- the sum of returns to the various member of the family less family costs, is positive; and to choose that location where the net present value is largest (DaVanzo, 1976). In a family consideration the family's decision will be the same as that of the husbands in case where the wife doesn't work or never plans to. In families where the wife works or may in the future, the potential change in her earnings affect the family's decision.

The other extension of the human capital model is in accounting for subsequent migration (onward or return migration). The standard human capital model views migration as a one-period movement whereas in fact people could be involved in multi-period movements.

Yezer and Thurstone (1976) explain sequential migration (particularly reverse or return migration) by experiences of individuals with optimistic wage expectations. Some of the optimistic individuals will not get their high wage at the destination and as they engage in intensive job search, they will learn the actual wage distribution and revise their wage expectations. Such revised wage expectations may make return migration attractive. Individuals with alternative destinations may also choose to move onward.

DaVanzo and Morrison (1981) used the concept of location specific capital and imperfect information to explain repeat migration. Location specific capital is defined as a factor that ties a person to a particular place. These factors may include concrete assets or other features such as job seniority, personal knowledge of the area, community ties, close friendship etc. Return migrants are hypothesized to be those with higher location specific capital. Similarly, imperfect information which necessities prompt corrective action is also seen to cause sequential migration. Under this postulate, what differentiates onward migrants from return migrants is the degree of success at the destination. Return migrants are those discouraged at the destination who want to maintain their old equilibrium. Onward migrants are successful migrants at the destination who decide to seek a new place in case they decide not to stay in the destination.

2.3.2 Residential Satisfaction and Locational Preference

The residential satisfaction model is elaborated by Speare (1974) following the concept of environmental stress by Wolpert (1965) and the concept of satisfying criteria by Simon (1957).

According to Speare (1974) individuals are viewed as tied to a particular location by bonds to other individuals, attachment to a particular housing unit, attachment to a job, to a neighborhood-based organization or other bonds. The bonds and residence attributes are simplified in the minds of the individuals as being satisfactory or unsatisfactory (Landele and Guest, 1985).

The theory predicts that those individuals who evaluate their current residence as satisfactory will not move while the dissatisfied individuals will consider moving.

Residential satisfaction is assumed to depend on characteristics and aspirations of the household, the characteristics of the location and the social bonds between household members and other people. Hence factors such as age, income and duration of residence have only indirect effects on moving, through their influence on residential satisfaction. Residential satisfaction is then considered as an intervening variable in the movement decision.

Speare (1974) argues that the residential satisfaction model is a complement to the benefit cost model of human capital, because the model stresses that once the person is dissatisfied with the current location he weighs the costs and benefits on the basis of which he makes his further decision. A tolerance or threshold level is also assumed to exist for dissatisfaction beyond which a person considers a move.

The model was empirically tested on a sample of 700 residents in the state of Rhode Island. Two interviews with a one year interval were conducted. The original interview asked individuals about their satisfaction with various aspects of housing and geographical location and intentions or plans to move within the next year. The subsequent interview ascertained whether the individuals have moved or not. Hence two mobility variables, intention to move and actual mobility, and a satisfaction variable were directly observed. In addition to this, background variables such as age, education, income, location, home ownership, duration of residence, crowding ratio, friends and relatives were also collected. The background variables were examined if they had more relation to the satisfaction index than to mobility indicators.

A zero order correlation between background variables, satisfaction index and mobility showed that residential satisfaction is more correlated with mobility than with thebackground variables. Mobility and background variables showed a lower correlation. A path analysis showed that residential satisfaction acted as an intervening variable in predicting wish to move and from the background variables only home ownership showed a direct effect on the wish to move. As for actual mobility, home ownership and duration of residence showed a direct effect while residential satisfaction did not perform as well as in the previous model. This suggested other intervening variables such as extent of search and cost of moving may be important intervening variables in the actual movement.

Landele and Guest (1985) undertook similar analysis in the Seattle metropolitan area. The dependent variables were again the desire to move and actual mobility. The explanatory variables included community and home satisfaction, individual characteristics of age, number of children, education, income and change in household size. Attachment to home and local communities was also measured by housing tenure, length of residence, proportion of friends and relatives in the community. A logit regression was estimated and it was found that satisfaction and structural variables work independently to influence thoughts to move. The actual mobility model showed that the community attachment variables act directly and independently of other variables. The intention to move is found to be a good predictor of actual mobility while satisfaction variables have little effect.

A similar but slightly different attitudinal study of migration looks at the locational preference and migration destination of individuals. Surveys of residential preferences have reported that some combination of rural environment and access to metro cities are frequently desired attributes (Heaton, et al. 1979; Fugitt and Zuiches, 1975). The preferred size and proximity of a place in relation to migration was studied by Dejong (1977). It was found that movers preferred size of place is the size similar to their origin.

2.3.3 The Demand for Non-Traded Goods

This model differs from the above model in that the main reason for migration lies in non-pecuniary benefits. Along with money income, people move seeking better climates, public services, educational facilities etc. One set of goods which is of particular relevance are "location specific" goods, and different packages of them cannot be purchased in the local market. It is only a physical move which allows different levels of consumption (White, 1977). Thus migration takes place as a result of changes in demand for locationally fixed amenities (Graves, 1980).

This model has been used effectively to explain inconsistencies seen in-income and employment-differential explanations of migration. The faster growth of non-metropolitan counties relative to metropolitan counties and the unexpected sign of income variables in migration models are thought to give empirical support to the model (Graves, 1980).

The root of the model is urban economic theory in which market rents and wages are expected to adjust so as to leave utility constant over space. Differences in wages and rents are compensating differentials between regions endowed with different levels of amenities.[3]

Graves and Linneman (1979) constructed a model in which they showed that the demand for amenities causes migration. Their model is framed as follows.

A household which maximizes life time utility has a utility function in year i given as

$$U_i = U(x_i, A_i, L_i, B_i) \qquad (7)$$

[3] The strand of literature that deals with amenity valuation is based on the principle of compensating differential. According to this literature amenities are capitalized in wages and rents and hence hedonic wage and rent equation could be used to derive the value of amenities.

where X_i and A_i are traded and non-traded goods consumed in the ith year. The latter is purchased by residing in the area. L_i is the amount of leisure consumed in year i, B_i is a vector of taste and or consumption efficiency shifter for year i. The cost of migration is given by

$$\pi_{im} = \pi_{im}(p_m, w_i, B_i) \tag{8}$$

where p_m is the monetary cost of moving, w_i is the family's value of time. The budget constraint is assumed to have a combined money and time component

$$S = (w_i L_i, p_{ix} Xi, p_{ia} Ai) R_i + \Sigma \pi_{im} M_i R_i = \Sigma T_i w_i R_i + \Sigma V_i R_i \tag{9}$$

where S is the family's life time expected full income, T_i is the total amount of time available to the family in year i, w_i is the household expected wage rate in the ith year, R_i is the family's discount factor and p_i is the price index for year i, V_i is non-labor income, p_{ix} and p_{ia} are the expected prices of market and amenity goods respectively.

Maximizing (7) subject to (9) gives the first order conditions from which the demand equation for amenities could be derived for given values of exogenous variables

$$A_{id} = f((\{w_i R_i\}, \{p_i x R_i\}, \{p_{ia} R_i\}, \{T_i\}, \{V_i R_i\}, \{B_i\}, n) \tag{10}$$

In equilibrium, quantity demanded equals to quantity supplied, i.e.,

$$A_{id} = A_{is}. \tag{11}$$

Since the household chooses a location that exactly satisfies its demand, migration occurs as a result of a change in the quantity demanded by the household or quantity supplied of the non-traded good at current location. The family's derived demand for migration in year i is then

$$M_i = h(\{dlnA_{id}\}, \{dlnA_{is}\}, \{\pi imR_i\} \qquad (12)$$

The quantity demanded of non-traded goods changes as a result of 1) household life cycle 2) unexpected changes in factors internal to family such as death, divorce etc 3) unexpected changes in exogenous factors external to the family. Similarly, changes in supply also lead to migration.

The main conclusion of this model is that in an equilibrium world, migration takes place as a result of changes in demand for location specific amenities. As with ordinary goods, changed demands result largely from changed relative prices and changed incomes with age and race being important shifters (Graves, 1980).

It is important to note that Grave's work cannot be used to examine the direct relationship between amenities and migration. Rather, migration is related to those factors which change the demand for amenities.

Evans (1990) criticized the assertion that changes in income leading to changes in demand will lead to migration as implausible. His main argument was that Graves model is only a transfer from urban economics model of residential segregation and if applied at regional level it would mean that rich people live in one corner of the country while poor people live in another. Since in fact poor people and rich people live in the same region the model is implausible.

While Evans statement is only one reaction to Grave's proposition, researchers have been puzzled by the continuous migration in the face of spatial equilibrium assumption and particularly by wages still being a significant predictor of migration (Alonso, 1988). Recently attempts have been made to explain migration as a disequilibrium phenomenon and yet recognize the compensating differential suggested by the equilibrium models.

Greenwood et al. (1991)[4] computed the equilibrium expected income of different places to see if there is any deviation from equilibrium assumptions. The starting point is the assumption that an area's rate of population growth due to internal migration is a function of economic opportunity and amenity differentials. The following model (13) was estimated from which equilibrium values were determined.

$$\ln[NLF_{a,t-1}+ECM_{a,t-1}]=\ln\alpha+\beta\ln RY_{a,t}+e_{ut} \tag{13}$$

α states the amenity effects of an area, RY is the relative expected income estimated as the relative wage bill divided by the natural labor force (NLF). An equilibrium value of RY is computed for each area. The equilibrium is the value that just offsets the impact of the estimated individual effect for each area 'a' of that value which generates no net migration. To get the equilibrium value, it was assumed that in equilibrium the measure of net economic migration for an area 'a' takes on the value of unity. Thus an equilibrium value of RY less than unity implies attractive areas: individuals are willing to accept lower earnings or pay higher local prices or both to consume the area characteristics. Areas with $RY>1$ have less attractive characteristics and therefore individuals require a premium in earnings or lower local prices or both to be in equilibrium.

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[4] Though this work does not neatly fit into the classification we adopted in this section, we have chosen to include it in the text to keep the flow of the idea.

The result showed that most areas in west and south have more attractive characteristics than northeast and midwest. Greenwood et al. (1991) compared their work with Blomquist et al. (1988) who attempted to value amenities under the assumption of equilibrium. They took as a measure of regional disequilibrium the difference between the state's actual relative real after-tax earnings in 1980 (RY) and its corresponding point-estimate equilibrium value (RY*). They found that regional equilibrium does not hold for a number of states. From this, they concluded that understatements and overstatements result when amenity valuations are made under the assumptions of equilibrium. The authors computed a disequilibrium value for each state and they concluded that out-migration or in-migration is needed to adjust wages and rents so that the expected income will be driven to its equilibrium value.

2.3.4 The Random Utility Theory

A more recent model of migration is based on discrete choice analysis which involves the application of random utility theory (Mueller,1982; Molho, 1986; Mair and Weiss, 1990). The essence of random utility theory is that the utility function is partitioned into two components, one of which reflects the behavior of representative individual and the other of which is a random variable reflecting unobserved individual idiosyncrasies and situational factors which cause them to deviate in their behavior from the representative individual. The random utility model is specified as

$$U_{kim} = V_{kn} + e_{kn} , \qquad (14)$$

where U_{kim} is the expected utility of individual k living in i as a result of moving to (or staying in),

V_{kn} is the non-random element of this utility, reflecting the preference of representative individuals,

e_{kn} is a random variable reflecting differences in preferences due to individual idiosyncrasies.

Generally the non-random element of the model is composed of factors that affect utility (goods and amenities) or (prices and income). Using the random utility concept, the migration decision could be formalized in terms of probabilities.

Two improvements of the discrete choice random utility model over the previous models are first, its recognition of heterogeneity across individuals which helps explain the complexity of migration behavior. The earlier models, the neoclassical and human capital, predict unidirectional moves for any identifiable homogeneous population group, while the fact is that not all individuals move in the same direction even if subjected to identical observable factors. This component of behavior is captured by stochastic component of individual's utility function which reflects the unobserved factors specific to each individual (Molho, 1986). The other contribution is allowing for the behavioral constraints, that is, in a migration decision, regions cannot be chosen in continuous quantities. A migrant cannot combine a quarter of Region A and three quarters of Region B. The option is rather to choose either Region A or Region B.

Summary and Analysis of Micro Studies

The micro models of migration focus on individual decision making processes. They suggest the importance of including personal characteristics, measures of benefits and costs in migration decision. Empirical applications have found evidence for their validity, and particularly for the human capital model.

Location specific capital and imperfect information have been new additions to the human capital model to account for the different behavior of migration particularly onward and return migration. The human capital model is very flexible in that it can be formulated in a utility maximizing framework. Hence the original income differential model of Sjaastad could be extended to utility differentials between regions. The utility maximizing approach provides a framework that facilitates the inclusion of the subjective or attitudinal factors of migration such as regional attachments and satisfaction.

The residential preference and satisfaction studies indicate the importance of including attitudinal variables. Demand for non-traded goods is found to influence migration. Attempts to view migration in both equilibrium and disequilibrium frameworks seem to be promising in explaining the persistence of the significance of wage, though wages are known to be compensating differentials and hence should have no influence in equilibrium. Lastly we have seen that individual heterogeneity can be accommodated if the human capital model is formulated in a random utility framework.

While the various micro models give us a framework to approach individual migration decision making, the studies stop short of suggesting whether these individual decision making frameworks show regional variation and whether inhabitants occupying different regions would show inherently different migration behavior. While answering this in the affirmative would suggest behavioral differences in migration decision, a negative answer implies a similarity in behavior. An affirmative answer would contribute towards explaining the lower mobility rates exhibited in the depressed regions and by implication the persistent regional inequality.

2.4 Development Related Contextual Studies

The previous two groups of models have focussed on the aggregate vs individual levels of analysis. The aggregate studies have focussed on locational characteristics mainly related to size and labor market indicators to explain aggregate flows. The micro studies in explaining the decision making process have emphasized the personal characteristics that directly and indirectly affect the migration decision. In both models little is said about the context in which the migration decision is made. Thus context, particularly as related to stages of development, is emphasized in a strand of literature that focuses on the developing world.

The relevance of the literature emerges from its emphasis on the expectation of areal variation in the explanatory factors depending on development milieu. The literature asserts that various factors influencing migration shift in importance according to locales of socio- economic development. Thus measures of development have to be incorporated in migration models and their direct and interactive effects studied. The perspective is summarized as

> Economic growth involves structural changes in society which in turn alter the role of specific migration factors; and since development varies in character from place to place as well as through time differences in migration processes are to be expected (Brown and Jones, 1985, p.327).

The effects of development related contextual factors are outlined by Findley (1987) as being additive, intervening and interactive. Additive contextual factors uniformly raise the probabilities of migration for all persons or families in the community. In the intervening effect the context has a compositional effect; i.e., increasing the number of individuals or families with characteristics associated with greater probability of experiencing the event. The presence of a school that increases the number of literate migrants is cited as an example of this. In the interacting case, the context changes the pattern of relation between the individual and the event (migration). For example, accessibility might change the relation between socioeconomic status and migration when ceteris paribus lower class families have a higher probability of migration in more accessible location than in more isolated ones (Findley, 1987).

There have been many attempts to see the validity of the perspective across different third world settings. Brown and Jones (1985) used aggregate data for Costa Rica and estimated a single model with spatially varying parameters.

The central hypothesis of the paper is that the role of independent variables should vary spatially in accordance with core and periphery patterns and further, standard relationships should typify core areas whereas others, possibly opposite ones, may hold in peripheral locales. Two models, one for out-migration and the second for relocation, were used. The determinants of out-migration were origin-based factors namely wage, percent urban jobs and population pressure, measured as total population divided by the number of persons employed in the primary, secondary and tertiary sectors.

The results for out-migration showed that the influence of population pressure was strongly positive for economic core and adjacent areas but negative for remote regions of the country. This was interpreted as implying that employment opportunity is important in regions where the market dominates but less so where traditional economic elements dominate. In other words, the inverse relationship between migration and population pressure in the periphery is taken as a signal for the market economy to encourage migration and for the non-market economy to discourage migration. One reason for this is thought to be the inability of the poor to finance migration. Percent urban jobs shows a similar pattern over space to that of population pressure.

The relocation model was estimated for destination characteristics including population, wage, percent urban jobs, population pressure and a distance variable. Spatial variation in distance was reported. That is, distance acts as a deterrent in all centers but less so in Caribbean coastal areas and in the Golf region which received significant stimulus from development. Destination population was found to have greater leverage on migration to regions that have received economic stimuli. Percent urban jobs at the destination was found to discourage migration to remote centers that are declining but encouraged migration to economically ascendant areas. Population pressure at the destination led to peripheral areas while destination job was found to give incentive to migrate to the core region. The conclusion of the authors was that the standard model is operative for core areas while for others, the models of migration should be augmented by variables more indicative of the operant process.

The above study is an aggregate one, in that it takes only aggregate areal variables. However, individual attributes, mainly pertaining to demographic characteristics, were included in Brown and Goetz (1987), a similar study. The areal variables reflecting levels of development were compressed using principal components analysis. This resulted in two components, STRUCTURE representing the traditional and contemporary continuum in space and PRESSURE representing economic pressure and economically dependent population in regions. Individual variables namely age, education and gender were collected and used as independent variables in addition to indicators of level of development.

The analysis was carried out for the whole sample and for two sub-samples. The two sub-samples were districts with urban centers of 20000 or greater population and districts in which no urban center exceeds 20000. For the total sample it was found that the likelihood of out-migration is greater for females, varies inversely with age and varies directly with educational attainment, traditionalness and population pressure. The coefficients indicate that the traditional-contemporary context is the most important determinant of out-migration followed by educational attainment, age, gender and population pressure in that order. The subsamples indicate variation in the importance of different variables. The importance of structure or traditional-contemporary differential is less for rural centers as opposed to urban center samples. Population pressure also showed a shift in sign in that in districts with urban centers greater than 20000 people, higher population pressure leads to higher out-migration. The education variable was found to be most important for districts with no urban centers and second in importance for those with high urban centers. Gender is important for rural districts but is of less importance for others.

Billsborrow et al (1987) analyzed the extent to which origin area or contextual factors reflecting certain aspects of structural conditions in areas of origin affect out-migration tendencies in Ecuador. The potential migrant's decision was specified as a function of variables at three levels: the individual level, the household level, the area/ contextual level. The variables were age, education and marital status at the individual level. Land owned by the farm household and adults in household at the household level. Distance to Quito (major destination area), agricultural labor absorptive capacity, size of urban labor market (urban employment) and indicator of amenity level at the areal level.

Findings related to contextual factors are such that the effect of distance to Quito is negative and significant for sons while it was insignificant for daughters implying that the attraction of daughters to Quito is not deterred by distance. Rural labor absorption capacity appears a factor retaining sons especially from small farms. Daughters however showed a positive association of migration and labor absorption capacity implying that off-farm agricultural labor is not considered socially desirable. While urban employment showed a mixed sign for the different sex-land holding groups, the amenity variable of no electricity shows a positive relationship to the migration decision. The interaction effect showed a strong negative relationship between distance and propensity to migrate for smaller farms and a small positive association for large farms.

Findley (1987) examined out-migration in the Ilocos Norte region of northern Philippines. The dependent variable is the proportion of family members who migrate. "Family level" and "community level" variables were used as explanatory concepts in the study. The variables for family level were family class, farm status, family human capital, family size and migration experience. For the community level, the variables were community socioeconomic development, physical facilities, community agricultural commercialization, accessibility and community migration history.

The findings of the contextual effects revealed that commercial agriculture showed a positive coefficient implying more family migration when the agriculture sector is commercialized. Out-migration was inversely related to community development and there was no independent effect of physical facilities on migration. The community variables which have significant interactive effects were community access and community migration history. The community migration history affects the class migration relation i.e., in communities with small number of families with previous migration experience, the upper and lower class families are more likely to migrate than the middle class, while in communities with large number of families with migration experience, the lower and upper class adopt lower migration than middle class. Community accessibility affects the development-migration relationship i.e., the inverse relationship between socioeconomic development and out-migration was weaker in more accessible locales. Finally it was also found that the positive relationship between commercialization of agriculture and migration is strongest in communities with high level of social and economic infrastructure.

Summary and Analysis of Development Related Contextual Studies

There are two observations that could be made from the contextual studies. First, indicators of level of development of a region have significant influences in migration. The empirical literature showed that the extent of population pressure, the level of agricultural development, the level of commercialization and the economic structure of the economy are significant factors in migration studies. Second, conventional socio-demographic factors such as age, education assume different roles in different contexts. The context modifies the roles of these factors by influencing the character of the individual and by providing framework that facilitate or discourage their normal operations. The contextual studies however do not explicitly claim that the behavior of individuals is different, rather they focus on how some factors shift importance as a

Standard state per capita income was used to measure income, job opportunity was measured by total employment by states, distance was measured by statute miles from population center of ith state to leading state of jth population, population density is total population per square mile. Appalachian-ness was measured by taking the percentage of jth state's 1960 population living in an Appalachian region.

The results showed that the relation between migration and the independent variables is as posited by economic theory. Migration from Appalachia was found to be sensitive to the income level of the destination. Job opportunity was found to be statistically significant and other variables such as preference to Appalachia and population density work in the expected direction. The model was estimated for migrants from non-Appalachian parts of Appalachian states.

The overall conclusion was that there is no difference in migration behavior of Appalachians from that of non-Appalachians. The result however, can be doubted because the model neglects important influences on migrant's decisions such as demographic characteristics, amenities etc. To the extent that amenities may be correlated with income, it may be suspected that the resulting coefficients could be biased. Furthermore, as confessed by the author, the variables included in the model are not proper indicators. Total employment was used to measure job opportunity. Total employment however measures the demand for labor instead of being a measure of the relationship between demand and supply as implied by job opportunity. Per capita money income was used as a measure of income. This measure excludes non-monetary income such as the value of hunting, fishing or gardening which may influence the migrant's decision. The importance of non-money income for residents in low income regions as a factor in migration decision is noted by Russel and Winger (1972), who indicated that the income-migration relationship will be distorted if non-money income is not included in the model. They observed that when money income is used as a predictor variable, we should find actual migration to be less in the lagging regions than the predicted amount based on estimates using data from regions with both high and low incomes.

The study by Lansing and Mueller (1967) was a descriptive comparison between areas designated as redevelopment areas and non-redevelopment areas. The out-migration rates for the two areas were found to have no significant difference. The conclusion reached was that neither low income nor high unemployment in a depressed region will be a significant stimulus to out-migration. The disinterest in moving or inertia in a redevelopment area is ascribed to a lack of labor information in depressed regions. Push factors are thus thought to play little role in influencing decisions in depressed regions.

Clark and Ballard (1980) took a different stand and emphasized push factors to explain migration from depressed regions of Appalachia, noting that "the conceptual approach emphasizes disenchantment with originating region rather than the pull of the destination". Their objective was to model both out-migration and destination choice. Three variables, namely, employment opportunity, unemployment rate and wages were used as explanatory variables of migration from depressed region. Employment opportunity was measured as the employment in the current period minus that for the previous period for each industry i in each region. Unemployment rate was measured relative to an external labor market (the national rate) to be indicative of short run changes in labor market activity. The wage is the wage of industry i in region r relative to the nation.

The authors found that while employment opportunity and wages are the most consistent and effective determinants of out-migration, unemployment was found to be insignificant and a relatively poor determinant of out-migration from depressed areas.

The results are in contrast to those of Lansing and Mueller (1967) who claim that push factors are insignificant for depressed regions.

The destination choice model used destination variables such as employment, climate, and gravity model representation. The variables performed well except for some fluctuation seen in the employment variable. Clark and Ballard (1980) concluded that migrants from Appalachia are attracted to states with high relative employment growth, large population and good climate. In this respect the result is similar to that of Gallaway et al.(1971).

Ballard and Clark (1981) studied the short-run in-migration to four rapidly growing states of the U.S: Arizona, Colorado, Florida and Texas in two analytical stages. First they determined the volume of in-migrants as a function of attraction variables and then analyzed the origins of the in-migrants. The independent variables for the in-migration model were employment growth in region r relative to the nation, labor turnover to represent workers who leave their place of employment, a population proportioned regional share of national migration as an indicator of random migration to a region and a "discomfort index" constructed as a product of national unemployment rate and the inflation rate.

The results indicate that employment opportunity is a strong and positive pull to the four states. The turnover parameter was significant for two states. The national migration flows was also found out to be significant. The authors interpreted the latter as implying that much of migration decision is affected by general rather than specific factors. The discomfort index is found out to have a negative sign for three of the four states.

The independent variables for the model of origin is a gravity index, employment growth of region i relative to the nation, an index of economic welfare relative to the nation which is constructed by using wage rates, disposable per capita income and unemployment rates. A climate dummy was also used. The result of the study was that the gravity parameter was highly significant for all states. The economic welfare index was usually statistically insignificant and positive. This finding was taken as contrary to the neoclassical theory of specific directionality in labor movement. The climatic variable showed that migrants are selective in their climatic preferences exhibiting different kinds of movement: from cold to cold, from warm to warm and from cold to warm. Another finding from the study was the temporal variation of the parameters. For example the size of the gravity parameter varies markedly over time and between the four states. This evidence was suggestive of the contention that migration is very adaptive in the short run.

The above studies made in the late 60's and early 80's were based on depressed, fast growing and development regions, and shared several characteristics. First, the central focus of the studies was to view migration as a labor market adjustment mechanism. However, the inadequacy of the view of migration as merely a labor market adjustment in explaining migration from different regions (Brown and Goetz, 1987; Brown and Jones, 1985) and migration of different socioeconomic groups (Glantz, 1974; Clark, 1983) has recently been emphasized in the literature. Second, all the studies are concerned with aggregate variables such as average income, average employment etc. The question however remains whether individual migration behavior conforms to the findings of aggregate studies (Robinson and Tomes, 1982). Third, except for Gallaway (1971), scant attention is given to statistical modeling of the way the determinants of migration from depressed region differ from or resemble that of migration from non-depressed regions.

To the knowledge of the writer, migration studies based on the framework of depressed regions seem to have fallen off in the literature; rather, the lion's share of areal studies in U.S have taken a perspective of metropolitan and non-metropolitan population movements. Such studies have been initiated by the reversal of the population movement favoring non-metropolitan areas observed during the mid 1970's. A number of authors (Alonso, 1978; Beale, 1977; Berry and Dahmann, 1977; Sternlies and Huges, 1977; McCarthy and Morrison, 1977) have documented such phenomena. Recent literature on the issue (Cochrane and Vining, 1988; Berry 1988; Champion, 1988; Frey, 1988; Mera, 1988) has documented a return to the metropolis. These studies, while useful in describing the overall trend of population movement, do not adequately capture the complexities of population movement. Regions, states and substates that are at different levels of development could be classified as metropolitan vs. non-metropolitan, hence hiding the real migration behavior of people. Miller (1990) recently questioned the meaning of using the metropolitan area as a study unit.

An exception is a dissertation by Graham (1987). The focus of the study is the recognition of different sub-regions within a depressed region of Appalachia. Three sub-regions, namely the resource sub-regions, the industrial sub-region and the agricultural sub-region are recognized within Appalachia and the migration patterns to and from these regions was studied. Specifically the magnitude of migration, the determinants of out-migration and return migration, the number and volume of channelized stream of migration and distance profiles of channelized streams were the objects of the study. Determinants of out-migration were studied by employing aggregate explanatory variables such as median age, median school years, percentage employed in mining, percentage employed in manufacturing, percentage employed in agriculture, percentage unemployed, sex ratio, average weighted distance of channelized stream, per capita income and infrastructural development.

The result showed that only average weighed distance was significant for the resource region, only infrastructural development was significant for the industrial region and only percentage of employment in agriculture and the sex ratio were significant for the agricultural region. The modest R^2 and few significant variables however cast doubt on the study in which one may suspect that the aggregate variables are not sufficient indicators of what is going on in the depressed regions of the study. This study resembles the studies made in the late 60's and early 80's in its emphasis on aggregate variables, and being concerned only with one depressed region in isolation.

Summary and Analysis

The migration studies from the depressed regions belong to the aggregate studies attempting to explain migration flows. The conclusion of most researchers (Gallaway, 1971) is that the migration behavior from depressed regions is not different from those in non-depressed regions. Two approaches to migration, the micro approach and the contextual approach, however lead us to doubt such conclusion. First, the human capital model points out that individual heterogeneity can be recognized by considering individual level data. Aggregate studies do not pick up such differences and may result in misleading inferences being made. Second, the contextual factors which are not included in the above studies may help discern differences between the two groups. The next chapter describes a conceptual framework that helps make a comparative analysis of the migration determinants between the depressed and non-depressed regions.

CHAPTER III

CONCEPTUAL ANALYSIS OF MIGRATION DETERMINANTS: THE DEPRESSED AND THE NON-DEPRESSED REGIONS

3.1 Introduction

This chapter develops a conceptual framework for the study. The objective is to aid in forming testable hypotheses. The questions to be analyzed are: (1) How do personal variables pertaining to production capacity, locational preferences and personally relevant contextual factors account for gross migration probabilities and destination choice of migrants from depressed and non-depressed regions? (2) How do the determinants of depressed regions compare with those of non-depressed regions?

We begin with a discussion of a wider utility maximizing framework of human capital. This explicit utility maximizing framework allows a better understanding of factors that determine the migration determinants than what has been used to study migration from depressed regions (see literature review section). The random utility framework of discrete choice is followed as the form of the model[1] and we incorporate an extension to a dynamic setting to fit the problem at hand.[2] The empirical specification of the model contains the appropriate independent variables that help distinguish migration decisions in depressed and non-depressed regions. The research hypotheses are presented at the end of this chapter.

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[1] These kinds of models are used by Mueller (1982), Falaris (1987), Huges and McCormick (1989), Evers (1989), Mair and Weiss (1990), Liew (1990).

[2] Such an extension is discussed in Bailey (1989).

3.2 **The Model**[3]

The essence of the model is that the potential migrant evaluates the economic and amenity alternatives open to her (him) in light of her (his) preferences and selects the alternative for which her (his) life time utility is maximized.

The n-th (potential) migrant ranks the j-th alternative according to the utility function

$$U_{nj} = U_n(b_j, A_j)^4, \tag{16}$$

where A_j is the amenity attribute,[5]

b_j is the commodity bundle.

She (he) maximizes U_{nj} subject to her (his) budget constraint to yield an indirect utility (V_{nj}) at alternative j,

$$V_{nj} = V_n(Y_j, p_j, A_j). \tag{17}$$

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[3]This section draws largely from the works of Mueller (1982)

[4]Note that we started from a simplified preference function directly. There is however a preceding assumption that leads to this simplified utility function in intertemporal setting. Assume that there are q commodities and T future periods then let b_{jqt} be the quantity of commodity q consumed in period t at alternative j. This commodity bundle at alternative j is $(b_{j11},\dots,b_{jq1}, b_{j12},\dots,b_{jq2}, b_{j1T},\dots,b_{jqT})$. Let the associated prices be p_{jqt}. The dimensionality of this commodity bundle can be reduced by using the composite commodity theorem (Henderson and Quandt, 1980). We assume rate of inflation, discount factor and relative prices of commodities to be constant. Then a commodity bundle at j can be represented by a scaler consumption level, b_j. Similarly the group of discounted prices can be represented by p_j.

[5]We assume that the migrant views A_j to be constant over time.

The indirect utility depends on the real present discounted value of lifetime income net of migration costs, on amenity attributes and prices. The problem of the migrant is to choose an alternative for which (17) is maximized. For example the ith alternative is chosen if

$$V_n(Y_i,p_i,A_i) > V_n(Y_j,p_j,A_j) \quad j \neq i \tag{18}$$

The probability of a tie is assumed to be zero.

In order to account for differences in the individual choice of alternatives, two factors, namely differences in personal income and in taste are, stressed. The taste differences among individuals are due to unobservable relocation costs[6] which are related to observable attributes of potential migrants. These observed personal attributes include employment tenure, job turnover, race, age, length of residency. A person with longest tenure will have the greatest taste for the origin alternative. A potential migrant with high job turnover is more likely to be efficient in his job search than one with low turnover.[7] Hence a potential migrant with high job turnover has low relocation cost. The longer the length of residency the higher will be the separation cost, as this involves breaking a well-established style of life. Relocation cost is lower for young people as they can easily adapt to new situations and have higher rates of return due to longer span of life (Shaw, 1975). These observed personal attributes for individual n are represented

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[6]The relocation cost are unobservable to the analyst but are known to the decision maker.

[7] This may be due to learning by doing as the migrant with high job turnover accumulates experience in his search process.

by $S_{nj} = (S_{nj1} \ldots\ldots S_{njm})$.[8] Unobserved personal attributes such as nurture, experience and attitude towards tradition also influence tastes. These are denoted by G_{nj}. The observed and unobserved personal attributes affect the potential migrant's ranking of alternatives.

The personal income differences could be related to the level of wage earning capacity of individuals. The capacity of earning a wage varies depending on individual's level and kind of skill, training and ability. Inidividual's characteristics has to match job characteristics to earn income. Different alternatives provide jobs with different requirements and possess different stocks and composition of labor force. Hence the relative income of individuals vary over alternatives. As a result different alternatives provide different migratory choices for different individuals. The potential migrant's relevant wage at alternative is that associated with her (his) job type or industry of employment (Mueller, 1982).[9] Let y_{nj} be the income measure for the n-th potential migrant at j.

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[8]The reason S_{nj} has the subscript j is because personal attributes are considered to be specific to individual and to an alternative. Notice that some personal attributes such as age may not be alternative specific, but others such as location preference, location-specific capital etc are alternative specific. We chose to have the subscript to keep the notation consistent.

[9]Note that the discussion on personal income differences focusses on the level of return the potential migrant receives for his level and kind of job. It doesn't accommodate for whether the potential migrant has more or less number of alternatives from where he (she) can draw income. The presence of more or less number of alternatives is relevant because the migration decision of the potential migrant may involve trade-offs with other sets of factors that could compensate for income gain or loss. Thus the more the number of alternatives to draw income from, the more the chances are to involve in trade-offs with other factors and the more the chances to get satisfaction out of the migration decision. One way to incorporate this is to explicitly identify whether a person has easily transferable human capital to many locations or his human capital ties him to one or few regions. This has to be incorporated in empirical assessment of the model. See below for more discussion on this.

With regard to alternatives, there are those attributes which are observed and those which are unobserved. Both the observed and unobserved attributes affect the migrant's decision. The observed attributes include amenity factors and labor market characteristics of alternative j and are denoted by A_{nj}. The unobserved attributes of alternative j are denoted by $T_{nj.}$

From the foregoing, the nth potential migrant's utility at the j-th alternative is expressed as

$$U_{nj}=U_n(S_{nj},X_{nj},G_{nj},T_{nj}), \tag{19}$$

where $X_{nj}=(A_{nj},y_{nj})$ is a vector of observable economic and amenity attributes at j-th alternative to the n-th potential migrant. In such augmented utility the migrant's problem is to choose the single alternative which we will also refer to as a region that maximizes (19). Hence i is chosen over j if

$$U_{ni} > U_{nj}. \tag{20}$$

In the above equation we have stressed that there are observed and unobserved factors that influence migration. The unobservable factors (G_{nj} and T_{nj}) though known to the decision maker, are unknown to the analyst. Without loss of generality, we can combine the unknowns into a single random variable e_{nj}. We can formally partition the utility function into two additive components,

$$U^*_{nj}(S_{nj}, X_{nj}) + e_{nj}. \tag{21}$$

The first part (U*) is a deterministic part and the second part is a stochastic part. The implication is that the unknown factors contributing to utility give rise to stochastic behavior from the view of the observer (Maier and Fisher, 1985). The model is called a random utility model.

From the point of view of the analyst, the random element means that only the probability of observing an event (decision) can be discussed. The probability that individual n will choose region i in preference to the remaining I-1 alternative regions is

$$P_{ni} = \text{Prob}(U_{ni} > U_{nj}),\ \ j = 1.....I,\ j \neq i, \quad (22)$$
$$= \text{Prob}(U^*_{ni} + e_{ni} > U^*_{nj} + e_{nj}\ \ j = 1......I,\ \ j \neq i,$$
$$= \text{Prob}(U^*_{ni} - U^*_{nj} > e_{nj} - e_{ni}\ \ j = 1.......I,\ \ j \neq i.$$

An empirically tractable model is derived by assuming a specific joint distribution of the e_{ni} and e_{nj} . For example, assuming all e_{ni} and e_{nj} to be identically independently distributed (I.I.d) as type-one-extreme value yields the multinomial logit model,

$$P_{in} = \exp(V_{in}) / \sum \exp(V_{jn}) \quad (23)$$

The multinomial model satisfies the property of independence from irrelevant alternatives (IIA). The IIA states that the ratio of the choice probabilities for any two of the j alternatives depends only on the characteristics of those two alternatives. Thus introducing additional alternatives to the choice set does not influence the relative probabilities (odds) of choosing any two alternatives.

The IIA assumption has two advantages. First, parameter estimates based upon a sample using a subset of all alternatives determined by systematic or random selection are asymptotically those from a sample using all alternatives. Second, choice probabilities for alternatives not in the alternative set can be forecast using the estimated model (Mueller, 1982). The IIA assumption however is restrictive particularly when alternatives are close substitutes. A formulation that relaxes the IIA assumption leads to the generalized extreme value (GEV) models and the multinomial probit (MNB) models (Maier and Fisher, 1985).

A special case of GEV models is a nested logit model which views migration as a two stage decision process (Falaris, 1987, Liew, 1990). A decision to migrate first and secondly, conditional on the first decision, a decision where to migrate. Such models are formulated as departure and destination choice models (Liew, 1990). Hence they allow one to investigate the different determinants that enter the different decision stages.

The random utility theory can be extended by considering the dynamics of causal processes (Bailey, 1989b). An individual n will remain in place i and not relocate to j as long as the discounted present value of utility from that place (i) is greater than that of the alternative (j) at time t, i.e.,

$$U_{nit} > U_{njt} \qquad (24)$$

Migration will occur in response to temporal changes in net benefits. Again, we may distinguish influences unobservable at time t by the analyst, and represent them by the random variable e_{nit}. If now U^*_{nit} is the observable component of utility, this leads to the familiar random utility framework with stochastic errors.

$$U^*_{nit}+e_{nit} > U^*_{njt}+e_{njt} \qquad (25)$$

$$U^*_{nit}-U^*_{njt} > e_{njt}+e_{nit}.$$

Assuming e_{nit} and e_{njt} to be i.i.d and with no temporal autocorrelation, the above will result in migration probabilities which depend on the difference between U_{nit} and U_{njt}. Hence

$$P(j\backslash i,t) = f(t,X^*_t), \tag{26}$$

where i is an origin and j is a destination and X^*_t is a vector of variables measuring differences in utility between regions i and j for a particular individual, at elapsed time t.

In the following empirical specification of the model, we suggest three concepts thought to be relevant to differentiate migration in depressed and non-depressed regions. These concepts would allow for the possibility of behavioral differences between people of depressed and non-depressed regions that may account for the relatively low rates of migration of people from depressed regions (see the introduction). We hypothesize that these differentiating concepts, are individual endowment of skill, location preferences and development context. We now briefly discuss each, and indicate how they might explain the migration decision.

Individual Endowment of Skill

Many present-day depressed regions are the results of shifts in the demand for resources or the exhaustion of resources (Perloff, 1963). The inhabitants of these regions have grown up acquiring skills relevant for their regions' production, for example in the mining sector or in old manufacturing sectors such as textiles which may be concentrated in the region. Such skills are of limited value outside their regions. As a result, the skills are non-transferable or transferable only to locations which have passed through the same resource use stages. The impact on behavior is to limit the opportunity sets of alternatives. That is, the greater the proportion of income derived from location-specific skills, the fewer the alternatives that provide income to the potential migrant and hence the lower the probability of migration.

The model presented above does not differentiate between sources of income and hence it is only the effect of the level of aggregate income on migration that can be measured. The impact of sources of income from various skill types is underplayed. It could for example be that income derived from location specific skill irrespective of its magnitude will tend to lower mobility whereas income derived from easily transferable skill will be expected to have an effect as posited in the general model above.

In order to include this in the model we assume, following DaVanzo and Morrison (1981) and Dierx (1988), that individuals possess different proportions of location specific and non-location specific human capital. Wage income is derived by selling the location specific and non-location specific capital. Hence wage income (W) is a function of the quantity of the location specific and non-location specific capital of an individual,

$$W = f(K,M), \tag{27}$$

where K is the quantity of location specific capital,

M is the quantity of non-location specific capital.

For people in depressed regions the hypothesis suggests that, a higher proportion of income will typically be derived from K which means that the highest utility is reached at their present location; whereas for people in non-depressed regions a higher proportion of income will come from M which means that the most utility may be reached from other locations.

The nature of the capital types could also be different in the two regions, as elements contributing to the make-up of the location specific and non-location specific capital will be inherently different or show varying quality in the two regions. For example, the effect of job tenure, a contributing factor for location specific capital, may be less pronounced in highly competing regions as compared to less competitive regions. Similarly the influence of education, a contributing factor for non-location specific capital, will be different in the two regions as better and higher quality education would be expected in non-depressed regions.[10]

Location Preference

People care about places they live in and they derive satisfaction from their current locations (Leven, 1989). The theory of residential satisfaction predicts that satisfied individuals do not consider moving. Thus leaving a place entails a loss of satisfaction or utility and affects the decision to migrate. For example a test made by Dunn (1979) showed that individual valuation of communities is a major determinant of migration.

The source of utility derived from a place however is far from clear and may include subjective elements related to intangible community characteristics or psychological phenomena. An important factor may be the presence of persons with a similar life-style. For some, friends and relatives may represent similar life style, for others, religious or racial conditions may be important considerations. For example, in Dunn (1979) the locations of friends and relatives are assumed to capture the benefit or cost of living near or far from relatives and friends. Regional attachments and social bonds

[10]It is plausible to think that the same level of education will exhibit different qualities in depressed and non-depressed regions as educational resources and facilities will be different in the two regions.

thus decrease the intention or actual mobility and have to be controlled for in studies investigating differences among aggregates of people.

People in depressed regions are relatively less exposed to foreign elements and new ideas as there is less in- and out-migration to and from the region. Consequently a stronger regional attachments would be expected in depressed regions than non-depressed regions.

Development Related Contextual Factors

A recent addition to the literature of migration is the development paradigm of migration. This recognizes that the explanatory variables of migration vary according to the socio-demographic development milieu known collectively as the development context (Brown and Goetz, 1987).

The effects of these contextual variables are outlined by Findley (1987) as being additive, intervening and interactive. These effects raise the probability of migration for all people, inculcate the character that makes individual susceptible to migration, and change the relation between socioeconomic factors and migration respectively (see the literature review for further discussion).

The development context includes the infrastructure and the state of technological advancement, the extent of population pressure, and the structure of the economy. The implication is that these variables affect the opportunity set and the information level of a potential migrant, and also determine the livability of a place. Thus individuals of the same personal characteristics in different regions will make different migration decisions.

Declining and non-declining regions clearly differ in the context they provide to their inhabitants, and as a result such variables would be important distinguishing factors. The peripheral nature of the economy in the depressed regions will make modern elements play less role in their people's lives and decisions. In contrast, modern elements of the economy will play a greater role in the life and decision of people in non-depressed regions.

From the foregoing discussion, the original model of (19) describing the utility of an individual when augmented by the variables suggested as important in their temporal setting is now

$$U_n(S_{njt}, X_{njt}, G_{njt}, T_{njt}, C_{njt}), \qquad (28)$$

where S_{njt} are personal characteristics including location preference variables for location j in time t,

X_{njt} are a function of income and amenity variables for location j in time t,

C_{njt} are development related contextual factors for location j in time t,

G_{njt} are unobserved personal characteristics for location j in time t,

T_{njt} are unobserved alternative attributes for location j in time t.

3.3 Testable Hypotheses

The major objective of this dissertation is to make a comparative study of migration determinants by utility maximizing agents in depressed and non-depressed regions. Thus the hypotheses to be formed pertain to the overall migration behavior of the people in the two regions and to the key variables that help discern behavioral differences between the two groups of people. With regard to the key variables it was earlier conjectured that different forces are at work in depressed and non-depressed regions. These forces are related to a) location specific and non-location specific human capital b) location preference c) contextual development factors d) individual attributes. The model structure developed here will allow us to discover whether the empirical determinants of migration do in fact exhibit different influences hence showing variation from common expectations. We now list the testable hypotheses and the expected signs and direction of migration influences in the two regions.

Hypothesis One: Location Specific Capital(K)

Location specific capital (K) is utility increasing at the origin, that is it enhances the utility of not moving. It will thus have a negative sign for out-migration. The responsiveness of people in depressed regions to changes in location specific capital will be significantly different from people in non-depressed region.

Hypothesis Two: Non-Location Specific Capital

Higher levels of non-location specific capital facilitates geographic movement. It will thus have a positive sign for out-migration. The responsiveness of people in depressed regions to changes in non-location specific capital will be significantly different from people in non-depressed regions.

Hypothesis Three: Location Preference

Location preference variables are utility increasing at the origin and thus they are expected to show negative signs for out-migration. The responsiveness of people in the depressed region to location preference variables will be significantly different from people in non-depressed regions.

Hypothesis Four: Contextual Factors

The contextual factors (development indices) will influence out-migration in both depressed and non-depressed regions but their influences will be different in the two settings.[11]

[11] It is not easy to hypothesize on the signs of development related contextual factors. It depends on the nature of the context that is measured. The specific sign is given in chapter six where we have restated the hypothesis in specific terms related to the variables used to measure the different concepts.

Hypothesis Five: General Migration Probability Behavior

People in the depressed region and non-depressed region are expected to show different migration behavior. Thus the general migration model of the depressed region will be significantly different from that of the non-depressed region.

Hypothesis Six: Destination Choice

Hypotheses one and two differentiated the migration decisions of people in depressed and non-depressed regions in terms of their skill composition. A derivative hypothesis regarding destination choice could be formulated, that these differentiating variables will also be important in the destination choice of those deciding to migrate. Thus it is hypothesized that the responsiveness to location specific and non-location specific capital in the destination choice will be significantly different in the two regions.

Hypothesis Seven: General Destination Choice Behavior

The destination choice behavior of the people in depressed regions will be significantly different from that of the non-depressed regions.

CHAPTER IV

DATA AND METHODOLOGY

4.1 Data

The empirical test of this study is to be conducted on the data from the youth cohort of the National Longitudinal Survey (NLS). The National Longitudinal Survey (NLS) began in the mid 1960 for the purpose of conducting longitudinal studies of the labor market experience of four groups of population in the U.S: men 45 to 59 years of age, women 30 to 44 years of age, young men and women 14 to 24 years of age (Center for Human Resource Research) (CHRR, 1991). The data was gathered by the Center for Human Resource Research at the Ohio State University.

The study generated widespread interest and in 1977 a fifth cohort of young men and women was added. This cohort of young men and women, hereafter called NLSY, contained people aged 14-21 on January 1st, 1979 with over representation of blacks, Hispanics and economically disadvantaged whites. It is this cohort of youth which forms the basis of this study.

The target population of NLSY consisted of eight groups: Hispanic males; Hispanic females; Black males; Black females; poor White males; poor White females; Military males and Military females. These target groups were selected by undertaking three independent probability samples: 1) A cross sectional sample designed to represent the non-institutionalized segment of the American young people aged 14-21 as of Jan. 1, 1979, 2) A supplemental sample designed to over represent civilian Hispanic, black and economically disadvantaged non-Hispanic and non-black and 3) a military sample

(CHRR, 1991). A total of 12686 respondents were interviewed and the distribution of the respondents by sample type, sex and race is shown in Table 1.

Table 1. Distribution of NLSY Respondent Interviewed in 1979 by Sample Type, Race and Sex

	cross sectional sample		supplemental sample		military sample	
	male	female	male	female	male	female
white	2439	2477	-	-	609	342
poor white	-	-	742	901	-	-
black	346	405	1105	1067	162	89
hispanic	218	226	729	751	53	25

Source -CHRR, 1991, p.29

The civilian sample was drawn "through a multi-stage stratified area probability sample of dwelling units and group quarter units" (CHRR, 1991, p.27). Individuals on active military duty were sampled in two stages which included selection of military units in the first stage and persons of age 14-21 in the second stage. The procedure of sample selection is given in CHRR, 1991.

The sample which consisted of 12686 individuals in the base year (1979) was followed and reinterviewed annually during the 1979-1984 period. In 1985, interviewing of the full military sample ceased and the total NLSY sample size dropped to 11607, of which 11406 were the original civilian respondents and the remaining 201 being military respondents. A retention rate of 90% or more is reported for the years through 1979-1989. The longitudinal nature of the NLSY data permits the study of temporal causal relation of variables in migration as opposed to cross-sectional studies.

The categories of variables collected in NLSY are 1) labor market experience 2) human capital and other socioeconomic variables 3) environmental variables and 4) geocode variables. The latter is available as a supplemental file, after signing an agreement of confidentiality. By including the county and state of residence at birth, age 14 and at each interview date the geocode file facilitates the study of geographic mobility.

A legitimate concern regarding the NLSY data and in particular in relation to its relevance to this study is whether the NLSY data shows geographic bias or not. It was earlier stated that the objective of the NLSY study was to over represent Blacks, Hispanics and economically disadvantaged whites. Hence it may follow that the geographic distribution depicts such stated objective. Bailey (1989a) computed a location quotient by dividing the ratio of the number of individuals in the sample in a state to the total sample size by the ratio of the number of 15-19 years old resident in the state in 1980 to the total number of 15-19 year old in the country in 1980. While different states show variation in their location quotient, there has not been found any regional bias in the National Longitudinal Survey. Regions which experienced growth between 1979-81 and regions which experienced decline each have member states with above average sample size (Bailey, 1989a). It is the lack of obvious spatial bias in the distribution of sample respondents which makes the data suitable for the objective of the present study.

4.1.1 Operationalization of the Data

A number of issues regarding sample delimitation, measurement interval and aggregation of data have to be decided before using the NLSY data for this study. While the NLSY data contain both civilian and military personnel, in this study it is only the civilian population which are studied. The reason for deleting the military is because the choices of the military are mostly institutionally constrained and hence do not fully reflect the relationship hypothesized in the previous chapter. Further, the civilian population is limited to those who are 18 years old and above in 1979. The reason for this is that it is this group which is believed to make an independent migration decision as opposed to those who are below 18 years of age.

Migration Measure, Length of Period and Geographic Unit

Migratory choices are taken to be changes in the location of residence. In individual data, the migration measure is 1 if the respondent migrates and 0 otherwise. The length of the period covered in migration research has an important implication. If the length of the period is long, say five years, the importance of multiple moves is masked. A person who migrated more than once in five years would be recorded as if only a single migration had taken place just as a person who only moved once. Further, with a longer time period there is a problem of which value of a (temporal) explanatory value to use. Most cross sectional studies use the beginning of period, the end of period or an average value for the study period. Such variables are only approximations to the true explanatory factors (the values examined by the individuals themselves) of migration.

The alternative is to adopt a shorter period of analysis, say one year, in which case the problem of multiple moves and approximate explanatory variables will be lessened. Shorter periods however, have the disadvantage of capturing temporary or short lived movements particularly those induced by erroneous information. People make their decisions on the basis of the information at their disposal. Erroneous information could lead to wrong choices which may be short lived and corrected when superior information is available. To the extent that such moves may be captured by shorter migration period of analysis, then the results could also be misleading. It is therefore evident that empirical studies should be examined in light of such limitations in terms of the choice of period of analysis.

In this study, migration choice is measured annually such that a change of residence associated with each survey year is considered as migration.

The size of the geographic unit of analysis also has important impact on the result of the study and there is a trade-off one has to bear. Larger geographic units such as states and regions would induce less variation in the explanatory variables and could possibly mask the true explanation. Smaller geographic units on the other hand, while allowing for sufficient variation in the factors of concern, may become cumbersome numerically especially if some variables have to be estimated for every observation. The overriding criterion in selecting a geographic unit should however be the approximation of the information actually used by individuals.

In this study counties are used as geographic units of analysis because they are thought to be a better approximation to the (local) data actually available to individuals than data formed from by aggregating over larger geographic units such as states or metropolitan areas.

4.1.2 Specification of Explanatory Factors

The selection of the explanatory variables is guided by the formulation given in chapter three which is based on human capital and life cycle theory and also on previous empirical research.[1] The measurement of explanatory variables is made prior to the period in which migration occurred. Thus for the migration that occurs between 1979-1980, the explanatory variables were measured on the survey date in 1979.

<u>Location Specific Human Capital Variables</u>

Following DaVanzo and Morrison (1981) and Dierx (1988), a distinction between location specific and non-location specific human capital is hypothesized as an important

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[1]See Appendix A for list of variables, measurement levels and sources.

distinguishing factor in the migration behavior of people from depressed and non-depressed regions. Since direct information on an individual's endowment of location specific (K) and non-location specific (M) capital is not available, values for K and M are constructed following the suggestion by Dierx (1988).[2] The first stage in the construction of such variable is the assumption that wage income depends only on the individuals' endowment of location specific and non-location specific human capital. In order to account for regional differences in amenities and cost of living a real wage is used in place of nominal wage income. Thus we can write

$$RW = f(K+M), \qquad (29)$$

where RW is real wage income,

K is the location specific human capital,

M is the non-location specific human capital.

This implies that RW is a function of K+M. Then K is assumed to depend linearly on number of weeks that the individual has been employed at his (her) current job in a year (TENURE) and the number of years the individual has lived in the county where he or she currently resides (YRRES), while M is assumed to depend linearly on the amount of the individual's education, i.e., highest level of grade the individual completed (GRADE), and the individual's score on the armed forces qualification test

[2] The suggestion by Dierx (1988) considers nominal wage income as a function of non specific and specific capital weighted by rent per unit of human capital. The rent per human capital was approximated by a typical wage in the county. Annual income was then substituted for wage and the derivation was done in the form of K+M =F/RHC where F is annual income and RHC is rent per unit capital. We believe real wage is an appropriate proxy for K+M rather than income which also depends on the hours of supply. Further Dierx (1988) assumes all the variables explaining wage to have positive influence. We however recognize the negative influence of YRRES on wage and hence provide two specifications.

(AFQT), a measure of IQ. To disentangle the relationship we assume that the influences of all other factors, represented by random variables e_k and e_m are independent so that

$$RW = \beta(TENURE, YRRES) + \gamma(GRADE, AFQT)^3 + A, \quad (30)$$

$$K = \beta(TENURE, YRRES) + e_k, \quad (31)$$

$$M = \gamma(EI, AFQT) + e_m, \quad (32)$$

$$A = e_k + e_m. \quad (33)$$

In the above decomposition of the relationship we have assumed that YRRES will positively influence the wage through location specific human capital endowments. This may come about through familiarity of the place and friendship with employers hence contribute to location specific capital.

A competing explanation is for YRRES to exhibit a negative influence on wage as people who stay in one place for a long period may not be able to get a higher wage compared with those who choose to move. A negative influence of YRRES would then decrease the non-location specific capital of an individual. Thus an alternative disentanglement of the above relationship could take the form

$$K = \beta(TENURE) + e_k, \quad (34)$$

$$M = \gamma(GRADE, AFQT, YRRES) + e_m. \quad (35)$$

Which of the two specifications is appropriate is an empirical matter that depends on the strength of the different influences of YRRES.

[3] β(TENURE, YRRES) and γ(GRADE, AFQT) are innner products. We write for example β(TENURE, YRRES) for β_1TENURE+β_2YRRES and γ(GRADE, AFQT) for γ_1GRADE+γ_2AFQT.

Location Preference Variable

Variables which are thought to measure locational preference are those which express some form of regional attachments.

The regional attachments are measured in terms of personal relationship and ties which are utility enhancing in the origin region. The variables are

1. Residence since birth (LIVBIR)- A dummy that equals one if the individual had lived in current location since birth.

2. Own race composition (OWNRACE)- proportion of county population which belongs to the individual's race.

Development Related Contextual Variables

Community or county level variables pertaining to the level of economic, socio-demographic and infrastructural development are used in this section. Hence, following the work of other researchers who focussed on community contextual factors (Brown and Goetz, 1987, Findley, 1987) the variables we have chosen to use is percent urban population (PTURBAN) and percent urban job (PTURJB). Percent urban population (PTURBAN) is the percentage of total population living in places designated as urban by the Bureau of Census. This variable is used as an indication of the level of modernity a county experiences. The variable stands for the level of services, information and infrastructure availability that go with urban places. Percent urban job (PTURJB) is the percent of total employment that is in secondary or tertiary sector. This variable indicates the level of urban job opportunity. It is thought to represent the level of economic development a county experiences.

The above three sets of variables are thought to distinguish the migration behavior of people from depressed and non-depressed regions as outlined in chapter III. Variables commonly present in migration models that are related to migration returns, costs and socio economic characteristics are also included in this study.

Migration Returns

a. Industry Specific Wage

For most individuals the main component of migration returns is the present value of the difference between potential lifetime earnings after migrating and what would be earned at origin in the absence of migration (DaVanzo, 1976). The construction of such a measure entails estimating the wage a person would earn at different locations through the wage equation. Such an exercise necessitates adequate sample size for the wage equation to be estimated in the different alternatives. This would require a larger sample size than is available to us. Hence we use the county-based industry specific wage for an individual in the different alternative as a proxy for the returns to migration.[4] The industry of an individual is noted and the corresponding average wage for that industry is derived from County Business Patterns. For individuals with no industry or who are not working currently this measure would be 0. The nominal industry wage is converted to a real wage by using the state cost of living. The real wage is then weighted by regional employment probability to account for the different risk involved in getting employment (Todaro, 1969). Then a difference between the maximum wage the person would earn if he (she) migrates to one of his (her) alternatives and what he (she) would earn at the origin is computed as a measure of his (her) pecuniary return.[5]

b. Employment Status

The second component of migration benefit is the expectation of being employed. Unemployed workers are expected to move to areas where they are more likely to find

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[4] The use of occupation specific wage would have been even a better proxy of benefit than industry specific wage. Its unavailability however precludes the use of such a variable

[5] We used current wage difference as opposed to life- time earnings because it was not possible to identify differences in wage growth rate between locations for the same industry the person is assumed to keep after moving.

jobs. The status of personal employment is an important determinant of migration benefit and the variable measuring the employment status is the number of weeks of unemployment in a year experienced by the individuals (WKUNEP).

c. Amenity Variables

The migration literature identifies amenity variables to be included as part of the benefit of migration (Cebula, 1979; Boadway and Flatters, 1982). Four amenity variables are included in this study.[6] These are crime rate (CRM) , average educational attainment (EDUATT), cooling degree days (COOLDD) and COAST, a dummy variable which is equal to 1 if the county borders one of the great lakes or an ocean. CRM is measured as number of crimes per 100,000 population. EDUATT is the percent of people over 25 years of age who have completed 4 years of high school and 3 years of college. COOLDD is the number of cooling degree days based on 65 degree fahrenheit temperature.[7]

d. Macro Economic Factors

Macro economic factors have long been discussed in migration studies acting as pull or push factors (Lowry, 1966; DaVanzo, 1978; Olvey, 1972; Miller, 1972). In this study we have used two county level macro economic factors, the unemployment rate (UNRA), and average employment change (AVEMPCHG). A moving average lagged one year was taken for the latter variable. The variable is used as a proxy for job growth which is thought to be a main attraction of migrants.

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[6]The amenity variables are for the origin in the migration decision model and they are for the destination in the destination choice model. See below for a discussion on the two types of models we are estimating.

[7] CRM and EDUATT are derived from County Statistics while COOLDD is derived from Climates of the State (1950-1980). The dummy for coast is constructed from an atlas of the U.S.

Costs of Migration

Personal factors which are related to the cost of migration are several. The following dummy variables are included to account for these variables. Home ownership (HOME) is considered to be a deterrent of migration, reflecting the transaction cost of selling a house. Home ownership equals 1 if the youth owns a house and 0 if the youth does not own a house. Single people are expected to be less tied to their present locations while married persons have higher relocation costs. An individual with a spouse working would find movement to be expensive as the household has to find jobs for two people in the new labor market area. Marriage (MARIT) equals 1 if the youth is married and 0 otherwise. Poor health which might be work-limiting would also affect migration. Health (HELT) equals 1 if the person has a work-limiting health problem and 0 otherwise.

Age measured by the variable AGE is commonly associated with stages of life cycle affecting mobility. Younger people are more apt to migrate than the old since going through social changes and being uprooted is less costly for them than the old. Also, youth can receive the benefit of a higher wage in the destination area for a longer time.[8]

The current income of a person is also thought to pose a deterrent as one could suspect that people with high income may not like to change the environment (DaVanzo, 1976).[9]

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[8]Our sample is a youth population for whom age may not be a very significant factor. We however chose to include age in our model to see if the migration decision of the youth changes as they grow older during the ten years study period of time.

[9] There exists an alternative view for the influence of income on migration. If migration is thought as superior good, then higher income would result in higher migration than lower migration. People would easily be able to finance migration and one would expect higher migration among high income people than low income people.

Enrollment

Enrollment in school and particularly in college is supposed to increase migration of individuals. Thus controlling for school enrollment is important particularly in studies involving a youth population. ENROLL is a dummy variable used to measure school enrollment status.

4.2 Method of Analysis

The previous discussion has noted that the NLSY data is a longitudinal data set that records events for sample individuals.[10] Standard multiple regression analysis can not handle event data, because such data have two features - censoring and time-varying explanatory variables - that would bias the results or lead to loss of information (Allison, 1984).

Censoring is said to exist when the event (migration) is not observed for some individuals. In fact some youths stay put in their original residence for the study period. Hence censoring is part of the NLSY data. Censoring becomes a problem in the standard regression method because if length of period until the event (migration) is used as a dependent variable then the value of the dependent variable will not be known for those who did not experience the event.[11] Alternatively we may decide to exclude the censored observation from the study but this will result in large biases especially if the censored cases are large as in the case of NLSY sample.

Time-varying explanatory variables are those which take different values for different times. Incorporating time-varying exogenous explanatory variable in a

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[10]Event data also called event history data are records of when events occurred to a sample of individuals (Allison, 1984).

[11]An ad hoc approach may be to assign a value of the maximum length of time observed for the censored observation. This however underestimates the true value and results in a bias (Allison, 1984).

regression method has a problem of making the same variables endogenous. For example in a study of migration over ten years period, if income is measured for each year, it may seem reasonable to incorporate 10 different measures of income in the multiple regression, one for each year. This method may be plausible for a person who did not migrate until the ninth year, it is not however plausible for a person who migrated after the first year. His later income is irrelevant to the analysis and in fact it becomes a consequence rather than a cause of migration.

To cope with these problems the event history method has been developed by different authors (Allison, 1984, 1982; Coleman, 1981; Cox, 1972). The method is designed to analyze repeated versus non-repeated events. A non-repeated event is an event which occurs once in the life cycle of individuals, whereas repeated events can occur often. Death is an example of non-repeatable event, while marriage, divorce, job change are examples of repeatable events. Events could also be treated as differentiated versus undifferentiated. For example, job change may be considered as undifferentiated in one study while in other study it may be differentiated in terms of being voluntary, involuntary or other.

The event history method is characterized as being parametric versus non-parametric, and continuous versus discrete. Parametric models are those which assume a specific distribution for the time until an event occurs or the time between events. The Exponential, Weibull and Gompertz distributions are the most common parametric assumptions in this connection (Allison, 1984). Non-parametric models are those which make no assumption about the distribution of inter-event time. Cox (1972) developed a model which may be called semi parametric in that, while it makes no assumption of the distribution of time, it provides a functional form of the model. This model is also called a proportional hazard model. The measurement of the time of occurrence of the event gives rise to continuous-or discrete-time models. In the continuous time model, time is measured in small units. The measurement of time in larger units of months, years or decades gives rise to a discrete time framework.

In the present study we measure the event (migration) annually, and we treat migration as occurring once in the study period. The appropriate model is then the single event discrete time formulation. We now present the single event discrete time method which draws heavily on Allison's (1982) exposition.

The Hazard Rate: Discrete Time

Central to the method of event history is the hazard rate. In a continuous time the hazard rate is the instantaneous rate of experiencing an event at time t given that the individual has not yet experienced the event. When time is measured in discrete units the hazard rate becomes a conditional probability that an event occurs at time t given that it has not already occurred. The discrete hazard rate is defined as

$$P_{it}=Pr[T_i=t \mid T_i \geq t, X_{it}] \tag{36}$$

where T is a discrete random variable giving the uncensored time of event occurrence. X_{it} is a vector of time-varying explanatory variables. A common choice for the functional form of the hazard rate is the logistic equation[12] given by

$$P_{it}=1/[1+\exp(-\alpha t-\beta X_{it}] \tag{37}$$

or

$$\log[P_{it}/1-P_{it}]=\alpha t+\beta X_{it} \tag{38}$$

[12]The logistic equation is chosen for several reasons: It constrains P_{it} to lie in the unit interval for any values of β and X, it is computationally convenient and it implies that there are sufficient statistics (Allison, 1982).

where αt is a set of constants. If it is thought that the data is generated by a continuous time proportional hazard model the corresponding discrete time hazard function is

$$P_{it}=1-\exp[-\exp(\alpha t+\beta X_{it})] \tag{39}$$

The likelihood of the data is

$$L=\prod_{i=1}^{n}[Pr(T_i=ti)^{\alpha i}[Pr(T_i>ti)]^{1-\alpha i} \tag{40}$$

where

$$Pr(T_i=t)=P_{it}\prod_{j=1}^{t-1}(1-P_{ij}) \tag{41}$$

$$Pr(T_i>t)=\prod_{j=1}^{t}(1-P_{ij}) \tag{42}$$

If (41) and (42) are substituted in (40) and its logarithm taken we get (43).

$$\log L=\sum_{i=1}^{n}\alpha i\log P_{it}/(1-P_{it})+\sum_{i=1}^{n}\sum_{j=1}^{t}\log(1-P_{ij}) \tag{43}$$

The function is maximized with respect to α and β after the appropriate regression form is inserted for P_{it}. Allison (1982) proposes to extend (43) by defining a dummy variable y_{it} equal to 1 if person i experiences the event at time t and 0 otherwise which would give the log likelihood for dichotomous dependent variable

$$\log L=\sum_{i=1}^{n}\sum_{j=1}^{t}y_{it}\log P_{ij}/(1-P_{ij})+\sum_{i=1}^{n}\sum_{j=1}^{t}\log(1-P_{ij}) \tag{44}$$

The empirical implementation of the procedure proceeds by treating each discrete time unit for each individual as a separate observation or unit of analysis. The dependent variable will be recorded 1 if the event occurred at that time and is recorded 0 if otherwise. The 0's are entered for each period of time the event did not occur and 1 is entered for the period of the event occurrence. Since the hazard rate is conditional on the event not having occurred the observation is dropped from the sample thereafter. The explanatory variables are assigned the values they take in each period. The constants αt are estimated by entering a dummy variable, equal to time-1. The dummys allow for autonomous change in the hazard rate.[13]

The procedure described above deals with censoring and time varying explanatory variables. The major assumption of the model however is the treatment of time units for individuals as though they were independent. This raises two questions. First it may be thought that the procedure inflates sample size, leading to test statistics that may be misleadingly high. It is however true that if (37-39) are the true representation of the data generation, then the derivation in (40) through (44) is the ML (maximum likelihood) estimator for the corresponding model. Thus the estimates possess the properties of being consistent, asymptotically efficient and asymptotically normally distributed and the fact that the estimates could be derived by assuming time units for individuals to be independent becomes merely an incidental convenience (Allison, 1982).

The above discussion is based on the truth of the original model. The original model however may be thought to be unrealistic in that it suggests all the variation in hazard rate to be exhausted by the explanatory variables. To over come this, we may be able simply to include a disturbance term e^*_{it} and assume e^*_{it} and X_{it} to be independent for all i and for t. One may however suspect that the e^*_{it}s will be stable over time leading to inefficient coefficients and biased standard errors. Allison (1982) argues that while this problem may not be neglected, it is not unique to discrete hazard

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[13] The alternative is to impose a constraint of $\alpha_t = \alpha$. This is equivalent to assuming that each person's hazard rate does not change autonomously over time-any change must occur in response to changes in the explanatory variables.

model. Continuous hazard model may also suffer from the same problem and the use of independent time units in discrete model is only incidental. The discrete hazard model would however become problematic when we have large sample size and shorter time duration both leading to a very huge person-years in the analysis.

Estimation Procedure

In order to reduce the computational cost and to facilitate the direct test of our hypotheses, we chose to model the decision to migrate and the destination choice separately.[14]

The decision to migrate is a hazard model involving a dichotomous choice. At any time t a latent variable Y(t) is given for life time utility. If the life time utility of any of the destinations available to an individual exceeds that of the origin, we observe the individual migrating and the latent variable takes the value of 1. On the other hand if the life time utility of the origin exceed that of any destinations, the individual decides to stay and the latent variable takes the value of 0, i.e,

$$y(t) = 1 \text{ if at t } U_d > U_o, \qquad (45)$$

$$y(t) = 0 \text{ otherwise,}$$

where U_d is the highest year-t value of life time utility at destination,

U_o is the year-t value of life time utility at the origin.

One framework for analyzing a dichotomous decision is the logit form. The logit model assumes that elements of choice unobserved by us in time t, have type -1- extreme value. The logit equation is given in (37) and (38). In our estimation we impose the

[14] This study however does not share the idea of migration being a two stage decision process. Migration is believed to be a simultaneous decision where destination choice and a decision to migrate can not be easily disentangled. It is only computational ease which facilitated the adoption of such strategy.

constraint $\alpha_t = \alpha$. Hence any change in the hazard rate is in response to changes to explanatory variables. The maximum likelihood estimate of the logit model in the hazard formulation is given in (40) through (44). The general representation of our model takes the form

$$Y(t) = \beta(X_t, Z_t) + e \quad (46)$$

where X_t is a vector of personal characteristics

Z_t is a vector of economic, amenities and development related contextual factors.

The above model allows testing of hypotheses one, two, three, four and five. Hypothesis five can be tested by estimating the full models and a reduced model. The full models are the unrestricted models which are thought to be appropriate. In our case the full model represents the two separate logit models of the depressed and non-depressed regions. The restricted model is found by pooling the observations of the depressed and non-depressed regions. The appropriate test is the likelihood ratio test. The test is computed as

$$-2\log(L_r/L_{unr}) = (-2\log L_r)-(-2\log L_{unr}) =$$
$$-2(\log L_r - \log L_{unr1} - \log L_{unr2})_{df} = X^2 \quad (47)$$

where L_{unr} is the value of the likelihood function for the unrestricted or the full model and L_r is the likelihood function for the restricted model. In our case the value of the likelihood for the full model is the likelihood values for the depressed region model and the likelihood value for the non-depressed region model. The restricted model is formed by pooling the depressed and the non-depressed regions together so as to impose the restriction of equality of coefficients between the two regions.

Hypotheses one, two, three and four which posit differences in the responsiveness to the endowment of capital, location preferences and development related contextual factors can be tested by estimating the restricted model with the relevant interaction terms and studying their t-score values.

The second model of destination choice, analyses the choice of one among the many alternatives available to the individual. The appropriate statistical models for analyzing individual choice among set of j alternatives are multinomial logit (MNLGT) and conditional logit (CLGT)[15]. The distinction between the two is that MNLGT focuses on individuals as the unit of analysis and uses the personal characteristics as explanatory variables and the CLGT focuses on the set of alternatives for each individual and the explanatory variables are characteristics of those alternatives (Hoffman and Duncan, 1988). The choice probabilities in the two models are

$$MNLGT = P_{ij} = \exp(X_i \beta j) / \sum_{k=1}^{j} \exp(X_i \beta K) \tag{48}$$

$$CLGT = P_{ij} = \exp(Z_{ij} \alpha) / \sum_{k=1}^{j} \exp(Z_{ik} \alpha) \tag{49}$$

where j is the number of alternatives,

P_{ij} is the probability that individual i chooses alternative j,

X_i is the vector of characteristics of individual i,

Z_{ij} is the vector of characteristics of the jth, alternative as perceived by individual i,

β and α are parameters.

[15]Maddala (1983) has shown that these two models can in fact be combined.

We believe that the destination choice of individuals will be affected by the characteristics of the alternatives and of the individual. The individual characteristics become important because two individuals facing the same alternative characteristics may differ in their selection of alternatives. In order to account for such differences the specification of our destination model must exhibit an interaction between the individual characteristics and the alternative attributes.[16] We therefore adopt a conditional logit specification modified by interaction terms. The sample log likelihood function of the CLGT model is

$$\log L=\sum_{i=1}^{n}\sum_{j=1}^{m} Y_{ij} lnP_{ij} \tag{50}$$

where y_{ij} = 1 if individual i chooses alternative j and equals 0 otherwise.

The conditional logit model will be estimated for those who have decided to migrate. The model will help us test hypotheses six and seven. Hypothesis seven can be tested in the same way hypothesis five is tested by employing a likelihood ratio test. Hypothesis six can be tested by looking at the role of the interaction terms of the destination characteristics and location specific and non-specific capital of an individual.

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[16]Note, in the conditional logit model Zij is the characteristics of the jth alternative to individual i. In our model we will not be able to measure the characteristics of an alternative (county) for an individual, instead we accept the average characteristics of the county to be common for all individuals for whom a county is relevant. The use of an interaction variable is an attempt to capture individual differences among those for whom a county is relevant.

CHAPTER V

REGIONAL IDENTIFICATION AND OVERVIEW OF MIGRATION PATTERNS

5.1 Regional Identification

The main objective of this study is the comparison of migration determinants of the depressed regions and non-depressed regions. The identification of such regions is then of central importance for the study.

The 12686 respondents of the NLSY are sampled from 609 counties in 1979.[1] We use these counties to allocate the observations which belong to depressed counties and those which do not.

Generally, a depressed area is one experiencing severe economic conditions. Parr (1966) mentions that depressed areas are characterized by persistently high rates of unemployment or in the case of rural depressed areas, high rates of underemployment. Other characteristics of depressed areas include a narrow range of economic activities, declining basic industry, unskilled or unadaptable labor force and decayed or inefficient infrastructure.

Gallaway (1971) defines depressed areas as areas in which the level of unemployment is "persistently" and "substantially" in excess of the national level. He also mentions that the level of per capita income or the level of production in an area are other relevant indicators. Leviatan (1964) for his part mentions that other than chronic

[1]The counties are listed in Appendix B.

unemployment, the socioeconomic characteristics of depressed areas include a stagnating population, deterioration in the quality of labor force, declining labor force participation rate and low income.

The Economic Development Administration (EDA) of the U.S Department of Commerce uses unemployment and income as criteria to identify regions which qualify for financial assistance. The department however includes other criteria such as special impact area or Indian reservation sites to qualify for assistance. The specific criteria used are 1) substantial and persistent unemployment 2) low median family income 3) Indian reservation or trust or restricted Indian owned land 4) unusual and abrupt rise in unemployment resulting from the loss, removal, curtailment or closing of a major employment source 5) special impact area 6) one redevelopment area designated in a state originally not having a designated redevelopment area qualified on any other basis 7) decline in per capita employment. An area will become qualified for financial assistance if it meets one criterion or a combination of these criteria.

The Economic Development Administration lists all the counties in each state which qualify for assistance.[2] This listing is wide ranging and includes areas which are unlikely to be depressed areas. An obvious illustration is the inclusion of California as qualifying area for assistance on the basis of high unemployment. The high unemployment in California is however caused by a higher rate of in-migration than a lower rate of growth of employment opportunity. Leviatan (1964) observed that areas designated as qualifying by EDA display little of the character of distressed areas.

Perloff (1963) distinguishes between two measures of economic improvement and decline. These are changes and levels associated with individuals and those associated with the volume of economic activities. He maintains that the most common measure

[2] See EDA, Qualifying areas 1976, 1978 among others.

of the average economic status of families and individuals is the relative level of per capita real income and the changes in these levels. Growth or decline in volume of economic activity may be measured by increase in population, increase in total employment and or increases in total income. Garn (1981) making a distinction between development and growth, associates the former with increased levels of individual welfare and the latter with aggregate changes. Under this definition, an increase in income or employment per capita within a geographical area is considered a positive development outcome and an increase in aggregate income or employment in the same geographical area is a growth outcome (Garn, 1981).

Following the arguments made above, the economic indicators used in this study are levels and changes in per capita income and levels and changes in the unemployment rate.

We experimented on different uses of the per capita income and unemployment rate. First we examined counties which have real per capita income not more than 75% of the comparable national figure in 1979. Real personal per capita income is the nominal per capita income adjusted for state cost of living. The state cost of living was obtained from Fourner and Rasmussen (1986) who used the Bureau of Labor Statistics (BLS) data for an intermediate budget of four person to estimate state cost of living for 1980.[3]

In this paper the cost of living was updated for different years using a consumer price index. We have chosen to use state cost of living primarily because of cost of

[3] Fourner and Rasumussen regressed BLS data on population, median house value, per capita state government revenue, per capita local government revenue, three regional dummies, a dummy for the year 1970 and interaction variables for regional dummies and house values. They then estimated cost of living for metropolitan and non-metropolitan areas in each state and a state wide cost of living is found by taking a weighted average where the weights are the fraction of population in each area.

living data unavailability for counties. Further it may be assumed that intra state variation in the cost of living is less severe than inter-state variation. The assumption is based on the fact that all counties in a state are subject to the same state policy that may affect housing values, state tax and population growth that are found to be important determinants of cost of living. Counties in a state may also be more homogeneous in their physical and cultural characteristics that may affect cost of living.

The real per capita income showed that 85 counties out of the original 609 were found to have income less than 75% of the national figure. (See Table 2 for the listing of these counties). These low income counties are mainly found in the southern states of Mississippi, Alabama, North Carolina, Tennessee and Texas. New York is the only northern state where some counties are identified as low income. In order to examine whether these low income counties remain low income during the study period, the per capita income was examined for the period through 1979-86.[4] With few exceptions, these counties remained low income for 90% of the time. The exceptions were Livingston, Oneida, Seneca counties in New York, Prince George county in Virginia and Center county in Pennsylvania which showed an increase in income.

The other criterion used was the unemployment rate. The common expectation is unemployment will be higher in backward regions showing a substantial excess over the national figure. An unemployment rate twice the national average was used as a criterion to delineate backward regions.[5] For 1979, the national figure was 5.8%.

[4] The use of the period 1979-86 to check the persistence of low income is mainly due to a need to remain consistent with unemployment rate which is available for 1979-86

[5]Gallaway used a cut off point of 6% to identify persistent unemployment when the national figure was 3.8%. Similarly Leviatan(1964) also used unemployment rate of twice the national figure together with per capita income not more than 80% of the national figure to delineate depressed regions

Table 2. Per capita Income (PCI) and Unemployment Rate (UNRA) of Low Income Counties from NLSY Samples Locations for 1979.

Areaname	PCI	UNRA	Areaname	PCI	UNRA
1. Dale, AL	6713.60	7.4	41. Oswego, NY	6101.65	7.4
2. Macon, AL	5292.24	7.9	42. Seneca, NY	6698.95	5.1
3. Perry, AL	5024.22	8.0	43. Tompkins,NY	5700.80	4.4
4. Pike, Al	6682.85	5.3	44. Wyoming, NY	6030.29	6.5
5. Washington, AL	6591.68	9.9	45. Ashe, NC	6215.52	5.3
6. Coconino, AZ	6602.81	6.7	46. Avery, NC	5852.67	6.4
7. Hempstead, AR	6566.33	4.4	47. Jackson, NC	6322.95	5.7
8. St.Francis, AR	6385.25	12.4	48. Madison, NC	5808.82	3.8
9 Washington,FL	6058.93	7.6	49. Onslow,NC	6153.03	5.4
10.Coffee, GA	6062.28	5.0	50. Swain, NC	5614.79	7.2
11.Decatur, GA	6466.50	5.0	51. Vance, NC	6716.49	6.8
12.Sumter,GA	6686.99	5.8	52. Watauga, NC	6134.40	5.8
13.Taylor, GA	6495.68	6.4	53. Adams, OH	5221.88	10.9
14.Bracken, KY	6181.63	6.1	54. Athens, Oh,	5979.30	5.4
15.Lincoln, LA	6727.00	4.6	55. Holmes, OH	5655.12	4.5
16.Vernon, LA	5919.97	12.3	56. Scioto, OH	6617.66	8.9
17.Waldo, ME	6085.37	11.9	57. Cherokee,OH	5970.01	5.0
18.Wicomico,MD	6577.02	8.7	58. Centre, PA	6739.88	5.8
19.Gogebic, MI	6389.78	8.0	59. Abbeville,SC	6518.94	6.8
20.Houghton,MI	6028.82	9.7	60. Marion, SC	5877.83	7.1
21.Lake, MI	5200.39	12.4	61. Orangeburg,SC	6457.36	5.6
22.Beltrami, MN	5881.04	5.2	62. Unioin, SC	6628.91	6.4
23.Calhoun, MS	6193.40	5.2	63. Clairborne,TN	6593.04	10.7
24.Greene, MS	4876.52	7.6	64. Hawkins, TN	6381.88	5.8
25.Holmes, MS	5347.70	8.0	65. Lake, TN	6237.46	9.7
26.Jasper, MS	5812.29	6.4	66. Monroe, TN	5901.57	11.2
27.Smith, MS	5484.99	4.0	67. Scott, TN	5357.81	10.5
28.Wayne, MS	5614.59	5.7	68. Cameron, TX	5683.00	8.5
29.New Madrid, MO	6360.27	5.8	69. El Paso, TX	6698.32	7.9
30.Phelps, MO	6586.40	4.8	70. Hidalgo, Tx	5142.79	12.0
31.Pulaski, MO	5275.67	5.6	71. Walker, TX	6382.66	2.4
32.Wayne, MO	4693.46	8.1	72. Willacy, TX	4618.86	10.8
33.Dona Ana, NM	6439.13	7.3	73. Utah, UT	6129.25	5.5
34.Bronx, NY	6273.44	7.7	74. Madison, VA	6598.48	4.4
35.Cattaraugus,NY	5972.14	6.9	75. Montegomery,VA	6581.30	4.3
36.Chautauqua, NY	6597.63	6.0	76.Prince Edward,VA	6332.18	3.7
37.Clinton, NY	5584.51	8.5	77.Prince George,VA	6566.26	3.2
38.Livingston, NY	6543.01	5.9	78.Smyth, VA	6671.50	9.6
39.Madison, NY	6186.22	6.6	79.Lewis, WV	6542.28	9.1
40.Oneida, NY	6668.11	5.8	80.Preston, WV	5982.23	8.6

Table 2 (continued)

	Areaname	PCI	UNRA
81.	Upshur, WV	6277.57	7.0
82.	Burnett, WI	6480.06	5.8
83.	Dunn, Wi	6764.30	4.1
84.	Iron, WI	6530.85	5.8
85.	Sawyer,WI	6310.09	8.7

PCI = Per capita income UNRA = Unemployment rate

Hence counties with unemployment rate of at least 11.6 were selected by this criterion.

Surprisingly, this resulted in selecting very few counties: only five from the low income counties of Table 2 and five other counties from the high income state of California. This confirms the point made earlier that using the unemployment rate as a criterion picks those regions which experienced higher rates of in-migration rather than lower employment opportunity.

The unemployment rates of the low income counties given in Table 2 were examined and it was found that while about half of the counties show unemployment rate higher than the national average, there are counties whose unemployment rate is approximately equal to or below the national average.

The reason why low income regions may have low unemployment, contrary to expectation, is that first, in depressed regions the most pervasive problem may be underemployment rather than unemployment; and secondly, workers in depressed regions may be discouraged workers or voluntarily idle workers not choosing to participate in the labor force. As a result the unemployment rate may not capture the full gravity of the problem. The labor force participation rate may be a better indicator of depressed regions. However it is unavailable by county and for different years. From the foregoing discussion, we can conclude that the unemployment rate cannot be used as an indicator of depressed regions, particularly in isolation from other criteria. However, the unemployment rate does reflect the fact that depressed regions do not provide adequate opportunities for those who are not discouraged workers or for those who choose to work. Therefore while it should be used with caution, the unemployment rate may be valuable as a supplementary indicator.

In this research we constructed a distress index with income playing a leading role and unemployment playing a secondary role. The distress index is constructed using the 1979 level and 1979-1986 changes in per capita income and unemployment rate. The values were then standardized to enable comparison across the variables in terms of deviations from the mean. The standardized values of income and change in income were weighted by 2 to emphasize their leading role. The values for each county were then summed resulting in the county distress index. Finally, counties more than two standard deviations below the national value were selected as distressed areas. This captured about 80 counties from the NLSY samples (See Table 3 for the listing of these counties).[6] A comparison of Tables 2 and 3 shows that about 50 low income counties from Table 2 qualified as distressed areas in Table 3. The counties in Table 3 are again mainly concentrated in the southern poor regions of the nation such as Mississippi, Tennessee, South Carolina. Poor regions in the Midwest and North are also represented in this group. These areas form the geographical basis of depressed regions in this study. Areas outside this group are counted as non-depressed areas.

The classification resulted in civilian population of 1171 in depressed region and 9441 in non-depressed region. Further restriction of the sample to those 18 years old

[6] Throughout the nation however about 700 counties out of the 3200 fall in this category

Table 3. Declining Counties of NLSY Sample County Name

1.	Clarke, AL	48.	Fulton, PA
2.	Jackson, AL	49.	Abbeville, SC
3.	Macon, AL	50.	Chester, SC
4.	Perry, AL	51.	Marion, SC
5.	Washington, AL	52.	Orangeburg, SC
6.	Hotspring, AR	53.	Union, SC
7.	St.Francis, AR	54.	Clairborn, SC
8.	Yuba, CA	55.	Hawkins, TN
9.	Hardee, FL	56.	Lake, TN
10.	Washington, FL	57.	Monroe, TN
11.	Taylor, GA	58.	Scott, TN
12.	Bracken, KY	59.	Warren, TN
13.	St. Mary, LA	60.	White, TN
14.	Vernon, LA	61.	Cameron, TX
15.	Waldo, ME	62.	El Paso, TX
16.	Gogebic, Mi	63.	Hidalgo, TX
17.	Houghton,MI	64.	Jasper, TX
18.	Lake, MI	65.	Liberty, TX
19.	Marquett, MI	66.	Morris, TX
20.	Newaygo, MI	67.	Willacy, TX
21.	Beltrami, MN	68.	Uintah, UT
22.	Calhoun, MS	69.	Utah, UT
23.	Greene, MS	70.	Prince Edward, VA
24.	Holmes, MS	71.	Lynchburg, VA
25.	Jasper, MS	72.	Williamsburg, VA
26.	Leflore, MS	73.	Lewis, WV
27.	Madison, MS	74.	McDowell, WV
28.	Smith, MS	75.	Marion, WV
29.	Wayne, MS	76.	Preston, WV
30.	New Madrid, MO	77.	Raleigh, WV
31.	Pulaski, MO	78.	Randolph, WV
32.	Wayne, MO	79.	Upshru, WV
33.	Grant, NM	80.	Wetzel, WV
34.	Cattaraugus, NY		
35.	Clinton, NY		
36.	Oswego, NY		
37.	Wyoming, NY		
38.	Madison, NC		
39.	Swain,NC		
40.	Athens, OH		
41.	Belmont, OH		
42.	Carroll, OH		
43.	Columbiana, OH		
44.	Holmes, OH		
45.	Scioto, OH		
46.	Cherokee, OK		
47.	Okumlagee, OK		

and above in 1979 and who have valid addresses that could be used in the study resulted in a sample size of 516 individuals in depressed region and 3941 individuals in non-depressed regions. Our longitudinal analysis uses the concept of person-years and hence the units of analysis will be much higher. For the overview of migration patterns in the next section however, we limit ourselves to individuals instead of person years.

5.2 Overview of Migration Patterns

An overview of people's movements is studied by comparing the annual geographic location and the duration of stay in a given location. The latter is studied by estimating the survivor functions.

In this context, a survival function is the probability that an individual stays in his or her location at least until time t ($t>0$) (Gross and Clark, 1975). Geographic information on the county and state of individuals is given on the geocode file of NLSY. The geographic information however is not complete. There are individuals whose locations are not known at different times in the survey period. This happens when a military personnel is overseas or when an individual disappears from the survey. Individuals may disappear from the survey temporarily or permanently.

The temporary and permanent disappearance of individuals has implications for the methodology to be used in this paper. A temporary disappearance introduces a break in the event history of individuals. As a result the duration of stay which is to be modeled in this paper lacks continuity. The permanent disappearance of different individuals at different times implies a loss of information which makes the censoring random instead of fixed as it would have been the case had all individuals stayed in the study for the study period. While the former poses a problem for the methodology the latter necessitates to make an assumption that censoring time and time of event occurrence are independent.

In cases, where individuals disappear temporarily, namely for one year, the following decision rule is applied. The previous and subsequent location of the individual is compared and if the two locations are the same, the individual is assumed to have remained in the same location. No movement is recorded in such instance. If the locations subsequent and prior to the missing period are different then the individual is assumed to have moved to the subsequent location during the missing period and one move is recorded. If the person disappears for two or more years the information is considered lost and the individual is deleted. The result is a data set containing no temporary breaks.

By way of an overview of the movement patterns, an annual comparison of individual's movement is done for those who started in depressed region and for those who started in non-depressed region during the beginning of the survey year. This doesn't record the distribution of the duration of stay in a particular location which could be derived from the survivor functions. The comparison may however throw light on whether there is statistically significant difference in the annual migration of the two groups or not.

Table 4 shows the frequency and percentage of movers and stayers for each year for those who started in the depressed regions. Table 5 is the counterpart of Table 4 for those who started in non-depressed regions.

An examination of the tables reveal that the percentages of movement for the two groups of people remain fairly similar. In order to see whether there is a statistically significant difference in the two groups the Pearson chi square test statistic was computed.[7] The null hypothesis is that the regional classification has no effect on move not move decision. We accept the null hypothesis if the computed χ^2 is less than 3.841

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[7]The statistics is computed as $\chi^2 = (O\text{-}E)^2 / E$ where O is the observed frequency and E is the expected frequency.

Table 4. Total Movement of People who Started in Depressed Regions in 1979

year	count	not move	move	total[a]
1979-80	frequency	419	97	516
	percent	81.2	18.8	100
1980-81	frequency	408	107	515
	percent	79.2	20.8	100
1981-82	frequency	416	97	513
	percent	81.1	18.9	100
1982-83	frequency	428	84	512
	percent	83.6	16.4	100
1983-84	frequency	449	60	509
	percent	88.2	11.8	100
1984-85	frequency	439	65	504
	percent	87.1	12.9	100
1985-86	frequency	429	75	504
	percent	85.1	14.9	100
1986-87	frequency	412	84	496
	percent	83.1	16.9	100
1987-88	frequency	448	41	489
	percent	91.6	8.4	100
1988-89	frequency	438	52	490
	percent	89.4	10.6	100

a = The change in the total figure with time is due to the addresses of some individuals missing for some times. The rule discussed above for approximating the locations is not applied for the overview of the percent movement.

Table 5. Total Movement of People who Started in Non-Depressed Region in 1979

year	count	not move	move	total
1979-80	frequency	3188	753	3941
	percent	80.9	19.1	100
1980-81	frequency	3144	788	3932
	percent	80.0	20.0	100
1981-82	frequency	3217	701	3918
	percent	82.1	17.9	100
1982-83	frequency	3252	658	3910
	percent	83.2	16.8	100
1983-84	frequency	3468	423	3891
	percent	89.1	10.9	100
1984-85	frequency	3397	429	3826
	percent	88.8	11.2	100
1985-86	frequency	3290	509	3799
	percent	86.6	13.4	100
1986-87	frequency	3063	710	3773
	percent	81.2	18.8	100
1987-88	frequency	3354	396	3750
	percent	89.4	10.6	100
1988-89	frequency	3323	450	3773
	percent	88.1	11.9	100

for an α level of 0.05. The computed χ^2s given in Table 6 led us to accept the null hypothesis.

The implication of the above result is that starting place doesn't bring much difference in subsequent migration pattern. The result seems to corroborate Lansing and Mueller (1967) who reported no difference in the out-migration rates of those from redevelopment areas and development areas.

Table 6. Computed χ^2 for Two by Two Contingency Table for Each Year

Year	χ^2
1979-80	0.0284
1980-81	0.1552
1981-82	0.318
1982-83	0.0584
1983-84	0.3873
1984-85	1.2488
1985-86	0.8289
1986-87	1.0283
1987-88	2.2145
1988-89	0.762

The regional movement of the NLSY sample was examined by looking at how the sample population distribute themselves between depressed and non-depressed regions and within these regions in different years. Table 7 shows the regional movement of the sample population once the two regions,the depressed and non-depressed regions, are fixed nationally.

Table 7 shows that most of the movement of the NLSY sample is within the non-depressed regions; ie, from one county in non-depressed region to another county in non-depressed region. Out-migration from non-depressed to depressed region is mostly less than the in-migration to non-depressed region. In 1982-83, 1983-84 and 1987-88 however out-migration from depressed region seems to be about equal to in-migration. The movement of people from depressed regions is largely to non-depressed regions. There is however movement within the depressed regions; i.e., from one depressed county to another depressed county.

A comparison of row 1 and row 2 in Table 7 shows that movement within a depressed region is about a fifth or a sixth of movement out of depressed region. A comparison of row 1 (out-migration from depressed region) and row 4 (in-migration to depressed region) gives the net migration experienced in the depressed regions by NLSY sample. The absolute figures of these two rows shows that except for 1982-83, 1983-84 and 1987-88, out-migration from depressed to non-depressed region is about one and half times in excess of the in-migrating to depressed regions.

Usually migration is studied by computing rates in which the absolute number is standardized by population at risk method. In this paper we are hesitant to use rates as a comparison index because the sample extracted from the NLSY population seems to be highly biased towards those in non-depressed regions in terms of numbers. Thus out-migration rates for depressed region would thus be much higher than the non-depressed region because of the base population over which the statndardization is to be made and the in-migration rate would be smaller for the same reason.

The Survival Function

An appropriate measure of comparison in our study and one that falls in line with the modeling to be made in this paper is the survival functions. This depicts how quickly people from depressed and non-depressed regions experience an event of migration. It is the probability that an individual stays at least time t before the event or migration takes place.

Table 7. Regional Movement of NLSY Sample for Different Years

move	1979-80		1980-81		1981-82		1982-83		1983-84		1984-85		1985-86		1986-87		1987-88		1988-89	
type	freq	%	freq	%	freq	%	freq	%	freq	%	freq	%	freq	%	freq	%	freq	%	freq	%
1	72	1.6	70	1.6	61	1.4	42	0.9	27	0.6	42	0.9	42	0.9	46	1.0	22	0.5	24	0.5
2	12	0.3	9	0.2	6	0.1	9	0.2	5	0.1	4	0.1	6	0.1	7	0.2	3	0.1	1	0.0
3	386	8.7	357	8.0	341	7.7	338	7.6	353	7.9	338	7.6	321	7.2	295	6.6	308	6.9	310	7.0
4	38	0.9	42	0.9	42	0.9	40	0.9	29	0.7	27	0.6	22	0.5	31	0.7	22	0.5	16	0.4
5	728	16.3	774	17.4	689	15.5	651	14.6	422	9.5	421	9.4	514	11.5	710	15.9	390	8.8	461	10.3
6	3221	72.3	3195	71.7	3292	73.9	3342	75.0	3564	80.0	3498	78.5	3398	76.2	3180	71.3	3494	78.4	3451	77.4

The movement types are
1= out-migration from depressed to non-depressed region.
2= migration within depressed regions
3= remain in depressed region
4= out-migration from non-depressed to depressed region
5= migration within non-depressed region
6= remain in non-depressed region

The probability is such that at the initial time the entire population has a probability of surviving migration of 1.0, and at the end of the study period the probability of surviving migration decreases to 0.

Most data and particularly the NLSY data are censored data. When censorship is an important aspect of the data, the censorship time is assumed to be independent of the occurrence of the event (Kaplan and Meier, 1958). There are parametric and non-parametric ways of estimating the survival function.[8]

Among the non-parametric methods are the life-table method and Kaplan-Meier product limit method. The two methods differ in the way they handle intervals. In the life table method survival time is grouped by intervals while in the Kaplan-Meier method ordered observations are used instead of grouped data (Gross and Clark, 1975). However, for large sample sizes, the two techniques are asymptotically equivalent (Bailey, 1989a).

In this paper life table is estimated for our regions. The survival functions for two years interval for the depressed and non-depressed regions are given in Tables 8 and 9 respectively. The results of the two survival function indicate that depressed regions show a slightly higher survival rate than the non-depressed regions. Depressed regions have nearly 40% of their people being censored i.e., surviving migration for 10 years while the non-depressed regions have a censorship rate of 37%. The mean residual life time is 6 years for the depressed regions while it is 5 years for the non-depressed regions. The conditonal probability of failure (migration) indicates that depressed regions

[8] The basic distinction between parametric and non parametric models is the assumptions made on the distribution of time. While parametric models specify a form of the distribution of time , the non-parametric models do not. It makes sense to use the non -parametric models if there is no strong theoretical argument for assuming a particular form of the time distribution.

Table 8. Life Table Survival Estimates for Depressed Region

Interval [lower	upper)	Number failed	Number censored	effective sample size	conditional probability of failure	survival	failure	hazard
0	2	157	0	516	0.3043	1.00	0.0	0.1794
2	4	73	0	359	0.2033	0.70	0.30	0.1132
4	6	30	0	286	0.1049	0.55	0.45	0.0554
6	8	39	0	256	0.1523	0.50	0.50	0.0825
8	10	11	0	217	0.0507	0.42	0.58	0.0260
10	12	0	206	103	0	0.40	0.60	0.0000

Mean residual lifetime = 5.87 % censored = 39.92

Table 9. Life Table Survival Estimates for Non-Depressed Region

Interval [lower	upper)	Number failed	Number censored	effective sample size	conditional probability of failure	survival	failure	hazard
0	2	1267	0	3941	0.3225	1.00	0.00	0.1923
2	4	580	0	2670	0.2172	0.68	0.32	0.1218
4	6	231	0	2090	0.1105	0.53	0.47	0.0585
6	8	262	0	1859	0.1409	0.47	0.53	0.0758
8	10	130	0	1597	0.0814	0.41	0.59	0.0424
10	12	0	1467	733.5	0	0.37	0.63	0.0000

mean residual lifetime = 5.03 % censored = 37.22

Table 10. Rank Statistics and Tests of Equality Over Strata

	Rank statistics		Tests of homogeneity		
	region1	region2	chi-square	df	Pr > chi-square
Log-rank	-17.736	17.736	1.2548	1	0.2626
Wilcoxen	-53512	53512	1.0028	1	0.3166
-2log(LR)			1.8038	1	0.1793

have a slightly lower probability for all interval years. This is also evident in the survival and failure columns as well. These differences however are not significant enough to indicate statistical differences between the two regions. This is evident from the two statistics of homogeneity: the log rank and the Wilcoxen test (see Table 10).

Both statistics show that the samples are statistically similar in their distribution of time until migration. This finding corroborates the previous finding which reported similar percentage of movement between the two regions.

Summary

In this chapter we have provided an operational method to distinguish between depressed and non-depressed regions. The identification was based on an index in which income is made to play a leading role with unemployment acting as a supplementary indicator. The two criteria entered in our distress index by examining their levels and changes.

On the basis of this, about 80 NLS counties out of the original 609 in 1979 were designated as depressed regions. The youths sampled from this region then form a separate sample from those in the remaining counties.

The patterns of their movements and regional distribution were studied by comparing annual movements. The two groups showed no differences in their subsequent movement after an initial time. Most migration is within the non-depressed regions and those from the depressed regions prefer to go to non-depressed regions though there is some movement within the depressed regions.

The distribution of the duration of time until migration was examined by estimating a survival function. The survival function showed that youths in depressed regions have slightly higher probability of surviving migration than those in non-depressed regions. The result however is not statistically significant implying that the samples resemble each other in their distribution of time until migration. The survival function by itself however doesn't explain the determinants of migration or the contribution of variables towards duration of stay. We now turn to estimating the discrete hazard model that takes a form of person years of dichotomous dependent variable (see Chapter IV for the method).

CHAPTER VI

EMPIRICAL RESULTS AND DISCUSSION

6.1 Introduction

The main goal of the empirical work is to test the validity of our hypotheses. In chapter four we were able to specify the explanatory variables that make up our model and the methodology we are going to employ. Our estimation methodology has two parts: the decision to migrate and the destination choice. The former is a binary decision involving whether to migrate or not and the latter is a multinomial decision of choosing among the possible destinations. The estimation of our models require fulfilling two requirements. The first is the determination of the alternative sets necessary for the destination choice model and the second is the construction of variables that are not directly observable from NLSY data. These two requirements are discussed in sections 6.2 and 6.3 respectively. In section 6.4 we discuss the empirical results and the validity of our hypotheses.

6.2 Alternative Sets

The estimation of destination choice requires that the set of alternatives available to an individual be defined. The alternatives constitute the choices the migrant faces once she (he) has made the decision to migrate. In this section we define the alternative sets

Table 26. Estimates of the Full Models and Restricted Models for Migration Decision in the Depressed Region.

	Full model		EDUATT restricted		EDUATT,PTURBAN restricted		EDUATT,PTURBAN, COOLDD restricted	
Variable	Estimate	Wald χ^2	Estimate	Wald χ^2	Estimate	Wald χ^2	Estimate	Wald χ^2
INTERCEPT	-0.069	0.005	0.717	1.194	0.664	1.032	0.781	1.474
NSCAPL	0.439	40.004*	0.442	40.625*	0.443	40.770*	0.430	39.743*
LSCAPL	-0.068	2.506	-0.065	2.320	-0.063	2.182	-0.062	2.143
WKUNEP	-0.007	1.433	-0.007	1.421	-0.007	1.139	-0.007	1.463
MARIT	-0.065	0.163	-0.064	0.154	-0.065	0.162	-0.062	0.146
LIVBIR	-0.511	13.964*	-0.510	13.951*	-0.504	13.608*	-0.488	12.965*
HOME	-0.876	14.844*	-0.875	14.804*	-0.883	15.073*	-0.899	15.719*
AGE	-0.141	22.917*	-0.143	23.653*	-0.141	23.148*	-0.138	22.507*
HELT	-0.281	1.021	-0.275	0.976	-0.269	0.938	-0.286	1.058
FINC	-6.16E-6	1.095	-5.27E-6	0.812	-4.97E-6	0.724	-5.55E-6	0.91
ENROLL	0.062	0.148	0.056	0.121	0.064	0.162	0.069	0.183
WGDIFF	7.42E-6	0.260	6.29E-6	0.187	6.80E-6	0.219	6.55E-6	0.203
AVEMPCHG	-0.0001	4.983*	-0.0001	5.209*	-0.0001	4.263 *	-0.00009	3.580*
UNRA	0.001	0.317	0.0008	0.218	0.0009	0.309	0.0009	0.300
PTURBAN	-0.0004	0.009	0.0035	0.870				
CRM	-5.26E-6	0.012	-6.31E-6	0.018	0.00002	0.561	0.00002	0.515
EDUATT	0.014	1.533						
COOLDD	0.0001	2.504	0.00007	0.985	0.00007	1.022		
COAST	-0.045	0.060	-0.030	0.026	0.024	0.019	0.070	0.176
OWNRACE	-0.001	0.437	-0.001	0.298	-0.001	0.207	-0.002	0.748

* = significant at 0.05 level
** = significant at 0.1 level

Table 27. Principal Component Analysis for the Non-Depressed Region Sample

VARS	Principal Components																		
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19
NS	.32	.30	-.18	.11	-.02	.16	.15	-.07	.22	.23	-.18	.27	.23	.03	-.19	-.03	-.13	-.62	-.08
LS	.33	.21	.10	.31	.06	-.08	-.17	.02	.11	-.16	.01	.07	-.13	.07	.79	.09	-.08	-.03	.02
WK	-.15	-.15	.14	-.22	.26	.09	.35	-.46	.19	.52	.07	-.20	-.00	-.01	.33	.06	-.05	-.02	-.00
MA	.32	.10	.17	-.42	-.17	-.02	.07	.06	-.33	.02	.14	-.06	-.21	-.07	-.07	.63	-.17	-.13	-.02
LI	.02	-.09	.23	.30	.27	.08	-.53	-.09	-.31	.41	.31	.20	.07	-.06	-.13	.08	.14	-.09	-.02
HO	.35	.14	.11	-.29	-.20	.03	.10	.02	-.30	.19	.17	.09	-.19	-.02	.09	-.69	.13	.06	.03
AG	.32	.26	.26	-.08	.13	.02	-.04	-.20	.29	.05	-.29	.27	.05	-.01	-.23	.13	.15	.59	-.01
HE	-.04	-.06	.01	-.42	.06	.09	-.41	.57	.47	.28	-.01	-.04	-.04	.03	.08	-.03	-.03	-.04	-.01
EN	-.17	-.06	-.32	-.24	-.27	.14	.20	.24	-.15	.44	-.23	.34	-.34	.01	.12	.18	.06	.23	.01
IN	.20	.27	-.06	.31	.03	.11	-.04	.12	-.07	.24	-.17	-.77	-.12	.03	-.15	-.02	.01	.10	-.06
Wg	.18	-.06	.02	.26	.03	-.49	.32	.21	.36	.11	.52	.03	-.18	-.07	-.21	.03	.03	.04	.03
UN	.06	-.18	.41	.10	.19	.34	. 35	.32	-.06	-.12	-.03	.02	.04	.53	-.02	.05	.30	-.11	.05
AV	-.14	.24	-.08	-.14	.04	-.63	-.06	.00	-.20	.22	-.15	.01	.19	.58	.03	.02	.05	-.01	.03
PT	-.30	.46	.08	.01	.06	.17	-.00	-.02	.05	-.03	.16	.04	-.17	.04	-.08	-.01	-.18	-.03	.74
CR	-.30	.35	.24	.08	-.18	.18	.06	.07	.10	.02	.30	.07	.12	.16	-.00	-.06	-.42	.18	-.54
ED	-.13	.39	-.36	-.16	.13	.15	-.00	-.09	.06	-.13	.30	-.01	-.11	.01	.07	.14	.64	-.04	-.24
CO	-.09	.03	.29	.08	-.70	-.03	-.04	-.05	.15	.12	.04	-.13	.37	-.12	.10	.11	.37	-.06	.16
CA	-.17	.26	.19	-.01	.32	-.17	.26	.38	-.23	.04	-.19	.03	.29	-.56	.13	-.02	.09	-.03	-.03
MO	.26	-.07	-.41	-.04	.05	.19	.09	.14	-.12	.05	.31	-.02	.60	.08	.12	.08	-.13	.33	.22
EV	2.82	2.22	1.72	1.23	1.17	1.10	1.01	0.93	0.92	0.90	0.80	0.74	0.70	0.61	0.58	0.50	0.41	0.34	0.29
CI	1.00	1.12	1.28	1.51	1.55	1.60	1.67	1.74	1.75	1.77	1.88	1.95	2.00	2.15	2.20	2.37	2.62	2.88	3.11

Table 28. Variance Inflation Factors and Proportional Principal Component Contribution to Non-Depressed Region Sample

VARS	VIF	Principal Components																		
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19
NS	1.75	.02	.02	.01	.01	.00	.01	.01	.00	.03	.03	.02	.06	.04	.00	.03	.00	.02	.65	.01
LS	1.36	.03	.01	.00	.06	.00	.00	.02	.00	.01	.02	.00	.01	.02	.01	.78	.01	.01	.00	.00
WK	1.09	.01	.01	.01	.03	.05	.01	.11	.21	.04	.28	.01	.05	.00	.00	.17	.01	.01	.00	.00
MA	1.41	.02	.00	.01	.10	.02	.00	.00	.00	.08	.00	.02	.00	.04	.01	.01	.58	.05	.04	.00
LI	1.08	.00	.00	.03	.07	.06	.00	.26	.01	.10	.17	.11	.05	.01	.01	.03	.01	.05	.02	.00
HO	1.44	.03	.01	.01	.05	.02	.00	.01	.00	.07	.03	.02	.01	.04	.00	.01	.66	.03	.01	.00
AG	1.70	.02	.02	.02	.00	.01	.00	.00	.02	.05	.00	.06	.06	.00	.00	.05	.02	.03	.61	.00
HE	1.02	.00	.00	.00	.14	.00	.01	.16	.34	.23	.08	.00	.00	.00	.00	.01	.00	.00	.01	.00
EN	1.20	.01	.00	.05	.04	.05	.01	.03	.05	.02	.17	.06	.13	.14	.00	.02	.06	.01	.13	.00
IN	1.19	.01	.03	.00	.07	.00	.01	.00	.01	.00	.05	.03	.69	.02	.00	.03	.00	.00	.03	.01
Wg	1.08	.01	.00	.00	.05	.00	.19	.10	.04	.13	.01	.31	.00	.04	.01	.07	.00	.00	.00	.00
UN	1.25	.00	.01	.08	.01	.02	.08	.09	.09	.00	.01	.00	.00	.00	.37	.00	.00	.18	.03	.01
AV	1.16	.01	.02	.00	.01	.00	.31	.00	.00	.04	.04	.02	.00	.04	.47	.00	.00	.01	.00	.00
PT	2.25	.01	.04	.00	.00	.00	.01	.00	.00	.00	.00	.01	.00	.02	.00	.00	.00	.03	.00	.85
CR	1.93	.02	.03	.02	.00	.01	.01	.00	.00	.00	.00	.06	.00	.01	.02	.00	.00	.23	.05	.52
ED	1.64	.00	.04	.05	.01	.01	.01	.00	.01	.00	.01	.07	.00	.01	.00	.01	.02	.61	.00	.12
CO	1.25	.00	.00	.04	.00	.34	.00	.00	.00	.02	.01	.00	.02	.15	.02	.01	.02	.27	.01	.07
CA	1.20	.01	.02	.02	.00	.07	.02	.06	.13	.05	.00	.04	.00	.10	.42	.02	.00	.02	.00	.00
MO	1.44	.02	.00	.07	.00	.00	.02	.01	.01	.01	.00	.08	.00	.35	.01	.02	.01	.03	.23	.12

Table 29. Estimates of the Full Models and Restricted Models for Migration Decision in the Non-Depressed Region.

Variable	Full model		PTURBAN restricted		PTURBAN,NSCAPL restricted	
	Estimae	Wald χ^2	Estimate	Wald χ^2	Estimate	Wald χ^2
INTERCEPT	0.135	0.194	0.183	0.358	-0.508	3.025**
NSCAPL	0.182	63.868*	0.178	61.546*		
LSCAPL	-0.098	29.800*	-0.098	29.741*	-0.083	22.171*
WKUNEP	-0.0006	0.060	-0.007	0.096	-0.002	0.617
MARIT	-0.165	7.711*	-0.151	6.532*	-0.184	9.707*
LIVBIR	-0.486	95.487*	-0.487	96.203*	-0.522	111.454*
HOME	-0.654	61.097*	-0.642	58.933*	-0.575	48.196*
AGE	-0.112	111.869*	-0.115	118.902*	-0.074	69.158*
HELT	-0.169	3.333**	-0.174	3.547**	-0.229	6.199*
FINC	-3.02E-6	4.314*	-3.78E-6	6.708*	-1.64E-6	1.377
ENROLL	0.376	48.395*	0.374	48.125*	0.477	82.816*
WGDIFF	1.35E-6	0.057	4.83E-6	0.762	8.01E-6	2.103
AVEMPCHG	-9.7E-6	1.466	-1.22E-6	2.331	-1.33E-6	2.767
UNRA	-0.004	25.010*	-0.004	23.411*	-0.005	30.949*
PTURBAN	-0.007	26.544*				
CRM	-0.00001	1.224	-0.00002	2.605	-0.00002	1.968
EDUATT	0.010	15.479*	0.004	1.886	0.006	4.283*
COOLDD	0.0001	15.479*	0.0001	17.211*	0.0001	17.446*
COAST	-0.173	8.746*	-0.214	13.652*	-0.220	14.557*
OWNRACE	0.004	25.916*	0.005	42.831*	0.006	83.232*

* = Significant at 0.05 level
** = Significant at 0.1 level

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Setting the partial derivatives to 0 yields the equations

$$(R_{xx}-L_1 I_k)\, a_1=0 \tag{72}$$

$$\acute{a}_1 a_1=1 \tag{73}$$

From the above equations we have

$$R_{xx}a_1=L_1 a_1 \tag{74}$$

Consequently we have

$$S^2 W_1=\acute{a}_1 R_{xx}a_1=L_1 \acute{a}_1 a_1=L_1 \tag{75}$$

We select the largest eigenvlue (L_1) of R_{xx} to define the first Principal component. The second Principal Component is derived similarly under the further restriction of it be orthogonal to the first.

In diagnosing collinearity Fox (1984) noted that the least square estimator has the covariance matrix.

$$V(b)=\sigma^2\epsilon/(n-1)\,R^{-1}xx \tag{76}$$

The sampling variance of Bj is given by the j th diagonal entry of V(b). The jth diagonal entry of $R^{-1}{}_{xx}$ is $1/(1-R^2_j)$ where R^{2j} is the multiple correlation coefficient. This gives us

$$V(B_j)=\sigma^2\epsilon/(n-1)*1/(1-R^2j) \tag{77}$$

The expression $1/(1-R^2_j)$ is called the Variance Inflation Factor (VIF). VIF takes a value of unity for orthogonal data and has a larger value if there is strong linear dependency of the data.

Fox (1984) mentioned that the VIFs can be expressed as functions of the eigenvalues of Rxx and the Principal Component coefficients i.e.,

$$VIF_j = \sum_{l=1}^{k} A^2 jl / L_l \tag{78}$$

The relative size of the eigenvalues indicate the degree of collinearity in the data. A condition number is an index that indicates a global instability in the regression. The condition number is defined as

$$K = \sqrt{L_1 / L_k} \tag{79}$$

where L_1 is the largest eigenvalue and L_k is the smallest eigenvalue. A large condition number is indicative of large changes in the estimates that may result from small changes in the data. The rule of thumb for large condition number is in the neighborhood of 30. A condition number could also be defined for each Principal Components as

$$K_j = \sqrt{L_1 / L_J} \tag{80}$$

Thus the number of large condition indices points to the number of different collinear relations among the regressors. The variables involved in collinear relations could be identified by examining the contribution of the Principal Components to the VIF for each regressor. This is defined as

$$P_{jl}=(A^2jl/L_l)/VIF_j \qquad (81)$$

Large Principal Component contribution to the VIF (near 0.5) together with large condition index indicates that the jth regressor is implicated in the near dependency represented by the lth Principal Component.

In the above procedure the condition index would tell us whether serious collinearity exists, the Variance Inflation Factors would tell us which regression coefficients are affected by collinearity and the component contribution to the VIF would tell us which regressors are involved in collinear relations.

Diagnostic Results.

The results of the diagnosis of collinearity for the depressed region sample is described in Tables 24 and 25. Table 24 gives the results of the principal component analysis with the condition index. Table 25 gives the variance inflation factors and proportional principal component contribution to VIFs. The condition indices in Table 24 shows that none of them qualify to be considered large by the standard of the rule of thumb described above. We may thus conclude that the data set may not contain a seriously degrading collineariy. The largest condition index is 5.53 for P19 followed by 3.38 for P18. Though the condition indices do not qualify to be large we went ahead and computed the VIFs and the proportional Principal Component contribution on the basis that some collinearity might exist related to the largest condition index of the data set. The VIFs in Table 25 shows that the highest values are for PTURBAN (Percent urban), EDUATT (Education), COOLDD (Cooling degree day), CRIME (Crime) etc. This shows that, as we have suspected, the coefficients that are relatively highly affected by collinear relations are those macro factors as opposed to personal factors. Corresponding to P19 three variables PTURBAN, EDUATT and COOLDD show proportional contribution to the VIF in excess of 50%.

The degradation of estimates caused by collinearity can only be rectified by introducing new information, whether it be additional data or a Bayesian prior to bear upon new estimation (Mueller, 1982). This is so because collinearity is a data problem rather than a statistical problem.

In the absence of additional information the analyst can introduce priors in the model by constraining the coefficients of the regressors that happen to be offending. This procedure however is not based on theoretical justification and it might as well result in a mis-specification of the theoretical model. The method however allows one to see how the structure of collinearity is affected when the collinear variables are omitted.

In our model we omitted the above variables implicated in the collinear relation. The results are given in Table 26. Upon omitting the EDUATT, the standard error of PTURBAN dropped slightly from 0.005 to 0.004, but the coefficient changed sign. The level of significance however did not change.

Table 24. Principal Component Analysis for the Depressed Region Sample

VARS	Principal Components																		
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19
NS	.10	.22	-.34	-.16	-.13	-.31	-.21	-.06	-.05	.25	.42	.07	-.15	.46	.32	.13	.13	.05	.00
LS	-.09	.30	.21	-.38	.15	.15	-.16	.12	-.05	.02	.10	-.03	.65	-.03	.32	-.18	-.23	.01	-.00
WK	.00	-.14	-.06	.39	.14	.36	.12	-.45	-.22	.51	.28	-.11	.18	-.05	.02	-.01	-.05	-.00	-.01
MA	-.24	.30	.15	.08	-.23	-.07	.12	-.32	.38	.04	-.13	-.08	-.04	-.12	.20	.56	-.33	.01	-.00
LI	.02	-.04	.31	-.08	.20	.18	.70	.29	.08	.03	.17	.08	-.12	.33	.20	.13	.10	-.05	-.00
HO	-.25	.28	.13	-.02	-.34	-.08	.24	-.30	.23	.11	-.09	-.02	.05	.22	-.20	-.58	.25	.04	-.00
AG	-.27	.24	.29	.11	-.10	.03	-.17	.15	-.21	-.01	.34	.29	.13	.05	-.54	.33	.17	-.11	.00
HE	-.02	-.04	-.08	.29	-.24	.28	-.24	.56	.50	.34	.04	-.08	.01	-.01	.04	-.08	.00	.00	-.00
EN	.23	-.13	-.25	-.20	-.08	-.28	.29	.06	.10	.42	-.23	.39	.40	-.12	-.23	.16	-.01	-.05	.01
IN	-.03	.34	.04	-.25	.01	-.11	.14	.24	-.30	.42	-.00	-.37	-.35	-.43	-.09	-.04	.00	-.01	-.02
Wg	.05	.17	.08	-.26	.45	.35	-.30	-.18	.18	.26	-.39	.20	-.25	.20	-.12	.09	.16	-.01	.01
UN	-.21	.15	.12	.46	.13	-.26	-.04	.15	-.28	.14	-.29	.47	-.11	.01	.32	-.20	-.16	.00	.07
AV	.37	.05	.14	-.17	-.29	.24	-.01	-.12	.03	-.03	.27	.42	-.31	-.16	-.03	-.23	-.43	-.17	.05
PT	.46	.28	.12	.21	-.06	.04	.03	.02	-.06	-.07	-.08	.02	.07	.01	-.02	.05	.07	.47	-.63
CR	.43	.18	.18	.18	-.19	.01	-.05	-.05	-.10	-.04	-.20	-.15	.13	-.02	.21	.09	.37	-.61	.15
ED	.16	.38	-.34	.13	-.05	.26	.17	.10	-.16	-.17	-.14	-.07	.07	.16	-.16	.05	-.14	.30	.58
CO	.24	-.17	.49	.01	.03	-.25	-.13	-.08	.14	.13	.13	-.01	.00	-.16	.06	.01	.20	.46	.48
CA	.24	.18	.06	.23	.46	-.38	-.00	.01	.28	.00	.16	-.23	.03	.17	-.31	-.14	-.36	-.23	.00
MO	-.04	.29	-.30	.10	.31	.02	.13	-.06	.31	-.20	.29	.25	.00	-.50	.13	-.06	.36	-.01	.02
EV	2.75	2.69	2.08	1.33	1.24	1.07	0.98	0.97	0.93	0.82	0.72	0.65	0.61	0.54	0.46	0.43	0.39	0.24	0.09
CI	1.00	1.01	1.14	1.43	1.48	1.60	1.67	1.68	1.72	1.83	1.95	2.06	2.12	2.26	2.44	2.53	2.65	3.38	5.53

NS = NSCAPL LS = LSCAPL WK = WKUNEP MA = MARIT LI = LIVBIR HO = HOME
AG = AGE HE = HELT EN = ENROLL IN = INCOME WG = WGDIFF UN = UNRA
AV = AVEMPCHG PT = PTURBAN CR = CRM ED = EDUATT CO = COOLDD CA = COAST
MO = OWNRACE EV = Eigenvalue CI = Condition index

Table 24. Variance Inflation Factors and Proportional Principal Component Contribution to Depressed Region Sample

VARS	VIF	Principal Components																		
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19
NS	1.35	.00	.01	.04	.01	.01	.06	.03	.00	.00	.06	.18	.00	.03	.29	.17	.03	.03	.01	.00
LS	1.39	.00	.02	.02	.08	.01	.01	.02	.01	.00	.00	.01	.00	.50	.00	.16	.05	.09	.00	.00
WK	1.07	.00	.01	.00	.10	.01	.12	.01	.20	.05	.30	.10	.02	.05	.00	.00	.00	.01	.00	.00
MA	1.55	.01	.02	.01	.00	.03	.00	.01	.07	.10	.00	.01	.01	.00	.02	.05	.46	.18	.00	.00
LI	1.17	.00	.00	.04	.00	.03	.03	.43	.07	.01	.00	.03	.01	.02	.18	.08	.03	.02	.01	.00
HO	1.54	.01	.02	.00	.00	.06	.00	.04	.06	.04	.01	.01	.00	.00	.06	.05	.51	.10	.00	.00
AG	1.55	.02	.01	.03	.01	.01	.00	.02	.01	.03	.00	.10	.08	.02	.00	.41	.16	.05	.03	.00
HE	1.03	.00	.00	.00	.06	.05	.07	.06	.32	.26	.14	.00	.01	.00	.00	.00	.02	.00	.00	.00
EN	1.27	.02	.01	.02	.02	.00	.06	.07	.00	.01	.17	.06	.18	.21	.02	.09	.04	.00	.01	.00
IN	1.28	.00	.03	.00	.03	.00	.01	.01	.05	.08	.16	.00	.16	.16	.26	.01	.00	.00	.00	.01
Wg	1.15	.00	.01	.00	.04	.14	.10	.08	.03	.03	.07	.18	.05	.09	.06	.03	.01	.06	.00	.00
UN	1.32	.01	.01	.01	.11	.01	.05	.00	.01	.06	.02	.09	.25	.01	.00	.17	.07	.05	.00	.03
AV	1.57	.03	.00	.01	.01	.04	.03	.00	.01	.00	.00	.06	.18	.10	.03	.00	.08	.31	.07	.02
PT	5.38	.01	.01	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.17	.79
CR	2.55	.03	.00	.00	.01	.01	.00	.00	.00	.00	.00	.02	.01	.01	.00	.03	.01	.14	.61	.10
ED	4.48	.00	.01	.01	.00	.00	.01	.01	.00	.01	.01	.01	.00	.00	.01	.01	.00	.01	.08	.80
CO	3.90	.00	.00	.03	.00	.00	.01	.00	.00	.00	.01	.01	.00	.00	.01	.00	.00	.02	.23	.65
CA	1.48	.01	.01	.00	.03	.11	.09	.00	.00	.05	.00	.02	.06	.00	.04	.15	.03	.22	.16	.00
MO	1.42	.00	.02	.03	.00	.06	.00	.01	.00	.07	.03	.08	.07	.00	.32	.03	.01	.24	.00	.00

NS = NSCAPL   LS = LSCAPL   WK = WKUNEP   MA = MARIT   LI = LIVBIR   HO = HOME
AG = AGE   HE = HELT   EN = ENROLL   IN = INCOME   WG = WGDIFF   UN = UNRA
AV = AVEMPCHG   PT = PTURBAN   CR = CRM   ED = EDUATT   CO = COOLDD   CA = COAST
MO = OWNRACE   Ev = Eigenvalue   CI = condition index   VIF = Varience inflation factor

The effect on COOLDD is a slight change in the coefficient estimate and standard error. Both PTURBAN and EDUATT were then dropped and COOLDD showed again a slight change in its estimate and standard error. The variable COAST however changed its sign though it kept its insignificance. The effect of dropping all the three variable is almost the same as dropping the first two variables. Generally the effects of the three variables thought to have collinear relations is not high except for the sign change observed in PTURBAN and COAST. Thus we may conclude that collinearity is not a significant problem for the model of the depressed region.

For the non-depressed region the variables thought to be involved in collinear relations involve CRM and PTURBAN from P19 and AGE and NSCAPL from P18. This is shown in Table 28 derived from Table 27 in the same way as the above procedure. A restricted model for the non-depressed region is then estimated to see the effects of the collinear variables.

PTURBAN was first dropped and the result is seen in columns 2 and 3 of Table 29. Upon omitting PTURBAN, CRM showed a slight change in the coefficient estimates and standard error, EDUATT however is seriously affected and not only it showed a substantial change in the coefficient estimate but also it lost its previous significance. Upon dropping the NSCAPL variable which showed some collinear relations with AGE, AGE showed little change in coefficient and standard error. HELT on the other hand is substantially affected that it changed significance from 0.1 to 0.05 level.

Our forgoing results on the diagnosis showed us that in our data set collinearity is not a major problem. This is evident from the low condition indices observed in

Tables 24 and 27 that do fall below the rule of thumb for such analysis. Some collinear relation mainly between macro factors were however found when the analysis was made depending on the largest condition index of our data. The effects of omitting such variables did not change the estimates terribly. The only caution we need to make is that for depressed region the estimate of PTURBAN is not credibly established and the estimate of EDUATT is not credibly established for the non-depressed regions. Thus our results could be understood in light of these qualifications.

Table 22 (continued)

Buffalo, NE	Oneida, NY	Swain, NC
Lancaster, NE	Onondaga, NY	Vance, NC
Sarpy, NE	Ontario, NY	Wake, NC
Clark, NV	Oswego, NY	Watauga, NC
Washoe, NV	Queens, NY	Wayne, NC
Cheshire, NH	Richmond, NY	Wilkes, NC
Strafford, MH	Rockland, NY	Wells, NC
Atlantic, NJ	Seneca, NY	Adams, OH
Burlington, NJ	Sufflok, NY	Allen, OH
Camden, NJ	Tomkins, NY	Ashtabula, OH
Essex, NJ	Ulster, NY	Athens, OH
Hudson, NJ	Westchester, NY	Auglaize, OH
Mercer, NJ	Wyoming, NY	Belmont, OH
Middlesex, NJ	Alexander, NC	Butler, OH
Monnouth, NJ	Ashe, NC	Carroll. OH
Morris, NJ	Avery, NC	Clinton, OH
Passiac, NJ	Burke, NC	Columbiana, OH
Salem, NJ	Cabarrus, NC	Crawford, OH
Sussex, NJ	Catawba, NC	Cuyahoga, OH
Union, NJ	Craven, NC	Delaware, OH
Warren, NJ	Cumberland, NC	Fairfield, OH
Bernalillo, NM.	Durham, NC	Franklin, OH
Chaves, NM	Edgecombe, NC	Greene, OH
Dona Ana, NM	Forsyth, NC	Hamilton, OH
Grant, NM	Guilford, NC	Holmes, OH
Albany, NY	Iredell, NC	Huron, OH
Bronx, NY	Jackson, NC	Jefferson, OH
Cattaraugus, NY	Madison, NC	Knox, OH
Lorain, OH	Berks, PA	Pickens, SC
Lucas, OH	Bradford, PA	Richland, SC
Mahoning, OH	Bucks, PA	Spartanburg, SC
Marion, OH	Butler, PA	Union, SC
Medina, OH	Centre, PA	Brookings, SD
Mercer, OH	Chester, PA	Davision, SD
Montgomery, OH	Clarion, PA	Lake, SD
Pickaway, OH	Columbia, PA	Minnehaha, SD
Portage, OH	Crawford,PA	Pennington, SD
Richland, OH	Cumberland,PA	Sanborn, SD
Ross, OH	Dauphin, PA	Anderson, TN
Scioto, OH	Erie, PA	Blount, TN
Shelby, OH	Franklin, PA	Clairborne, Tn
Stark, OH	Fulton, PA	Davidson, TN
Summit, OH	Lackawanna, PA	Hamilton, TN
Trumbull, OH	Lancaster, PA	Hawkins, TN
Warren, OH	Lehigh, PA	Knox, TN
Wayne, OH	Mercer, PA	Lake, TN
Cherokee, OK	Monroe, PA	Louden, TN
Cleveland, OK	Montgomery, PA	Monroe, TN
Comanche, OK	Northhampton, PA	Montegomery, TN
Creek, OK	Northumberland, PA	Scott, TN
Garvin, Ok	Philadelphia, PA	Schelby, TN
Kiowa, OK	Schuylkill, PA	Warren, TN
Muskogee, OK	Snyder, PA	Washington, TN
Oklahoma, OK	Washington, PA	White, TN
Okmulgee, OK	Westmoreland, PA	Wilson, TN
Payne, OK	Wyoming, PA	Belle, TX
Tulsa, Ok	York, PA	Bowie, TX
Washington, OK	Newport, RI	Brazoria, TX

Table 22 (continued)

Woodward, OK	Providence, RI	Brazos, TX
Clackamas, OR	Abbeville, Sc	Cameron, TX
Clatsop, OR	Beaufort, Sc	Clay, TX
Columbia, OR	Chester, SC	Cochran, TX
Lane, OR	Florence, SC	Collin, TX
Multnomah, OR	Greenville, SC	Cooke, TX
Umatilla, OR	Lexington, SC	Dallas, TX
Washington, OR	Marion, SC	Denton, TX
Allegheny, PA	Orangeburg, SC	De Witt, TX
El Paso, Tx	Arlington, VA	Upshur, WV
Erath, TX	Henrico, VA	Wetzel, WV
Fort Bend, TX	Madison, VA	Brown, WI
Grayson, TX	Mecklenburg, VA	Burnett, WI
Guadalupe, TX	Montgomery, VA	Dane, WI
Hardin, TX	Prince Edward, VA	Door, WI
Harris, TX	Prince George, VA	Dunn, WI
Hays, TX	Prince William, VA	Iron, WI
Hidalgo, TX	Rappahannock, VA	Jefferson, WI
Hill, TX	Rockingham, VA	Kenosha, WI
Jackson, TX	Smyth, VA	La Crosse, WI
Jasper, TX	Washington, VA	Manitowoc, WI
Jefferson, TX	Wythe, Va	Milwaukee, WI
Kleberg, TX	Chesapeake, VA	Outagamie, WI
Mclennan, TX	Fairfax, VA	Ozaukee, WI
Madison, TX	Hampton, VA	Pierce, WI
Morris, TX	Lynchburg, VA	Racine, WI
Newton, TX	Newport News, VA	Rock, WI
Nueces, TX	Norfolk, VA	Sawyer, WI
Polk, TX	Portsmouth, VA	Sheboygan, WI
Tarrant, TX	Richmond, VA	Vilas, WI
Titus, TX	Williamsburg, VA	Walworth, WI
Travis, TX	King, WA	Washburn, WI
Tyler, TX	Kittitas, WA	Waukesha, WI
Van Zandt, TX	Pierce, WA	Winnebago, WI
Victoria, TX	Spokane, WA	Albany, WY
Walker, TX	Whatcom, WA	Sweetwater, WY
Waller, TX	Whitman, WA	Wichita, Tx
Yakima, WA	Willacy, TX	Cabell, WV
Wood, TX	Lewise, WV	Carbon, UT
Mcdowell, WV	Salt Lake, UT	Marion, WV
Uintah, UT	Mineral, WV	Utah, UT
Monongalia, WV	Weber, UT	Ohio, WV
Chittenden, VT	Preston, W	Rutland, VT
Raleigh, WV	Windham, VT	Randolph, WV

Similarly the inadequacy of our industry specific wage variable is described in chapter VI. A measure related to occupation specific wage might be thought to give a better result.

Our decision to estimate the decision to migrate and destination choice models separately is governed by considerations of computational ease. Migration however is a simultaneous decision and simultaneous estimation might give a better result. Thus future research of comparative analysis might attempt to model a simultaneous decision by overcoming the artificial separation of the two decision processes.

We have limited our destination choices to six choices and we have adopted a sample choice method to arrive at these choices. While increasing the choices has its own cost, it may well be undertaken to gain precision in estimation.

While the above suggest the need for additional migration research, the results also suggest an alternative strategy that focusses on issues other than migration to explain the persistence of regional imbalances. Our overview of migration showed that though migration is low in depressed region, it is not sufficiently low as to preclude regional convergence. The overall migration behavior is also found to be the same in the two regions.

Thus immobility of the population in non-depressed regions does not appear to be a central reason for lack of regional convergence. Hence other factors that could lead to persistence of regional imbalance must be studied. In this regard, for example there is a need to study if there is any labor supply (natural growth) differential between the two regions. If depressed regions are found to have significantly higher natural growth then regional disparity will persist whether there is or there is no migration. Alternatively, we also need to study the industrial structure of depressed regions and non-depressed regions. Depressed regions may be specializing in low labor skills and if this is the case migration studies will not be of much help to explain the differential propensity of mobility or by implication the persistence of regional disparity.

APPENDIX A

VARIABLE ACRONYMS, SOURCES AND MEASUREMENT LEVELS

Table 21. List of Variables, Sources and Measurement Levels

Variable Acronym	Variable Description	Measurement Level	Source
AGE	Age of an individual	absolute	NLSY
AFQT	Armed force qualification test	percent	NLSY
AVEMPCHG	Average employment change	absolute	CS
BLACK	Black race	dummy	NLSY
COAST	Presence of ocean or great lake coast in a county	dummy	AUS
COOLDD	Cool degree day	absolute	CTS
CRM	Crime rate of a county	absolute	CS
DEP	Depressed region	dummy	CON
DEP*NSTCAP	Interaction between DEP and NSTCAP	absolute	CON
DEP*LSTCAP	Interaction between Dep and LSTCAP	absolute	CON
DEP*PTURBAN	Interaction between DEP and PTURBAN	absolute	CON
DEP*LIVBIR	Interaction between DEP and LIVBIR	absolute	CON
DEP*OWNRACE	Interaction between DEP and OWNRACE	absolute	CON
EDUATT	Average educational attainment of a county	percent	CS
ENROLL	School enrollment status	dummy	NLSY
GRADE	Highest level of grade completed by the individual	absolute	NLSY
HDD	Heat degree day	absolute	CTS
HOME	Home ownership	dummy	NLSY
HELT	Poor health status	dummy	NLSY
FINC	Family income	absolute	NLSY

Table 21 (continued)

Variable Acronym	Variable Description	Measurement Level	Source
MARIT	Marital status of an individual	dummy	NLSY
LIVBIR	Lived since birth in a county of current residence	dummy	NLSY
LSCAPL	Location specific capital of an individual	absolute	CON
LSLURBJ	Interaction between location-specific capital and urban job	absolute	CON
NSCAPL	Non-location specific capital of an individual	absolute	CON
NSLURBJ	Interaction between non-location specific capital and percent urban job	absolute	CON
OWNRACE	Proportion of own race in a county	percent	CS
PTURBAN	Percent urban	percent	CS
TENURE	Number of weeks the individual has been employed in current job	absolute	NLSY
UNRA	County unemployment rate	percent	CS
WAGE	Industry specific wage at destinations	absolute	CBP
WHITE	White race	dummy	NLSY
WKUNEP	Number of weeks unemployed in a year	absolute	NLSY
WGDIFF	Maximum wage difference between current residence and the alternatives	absolute	CBP
YRRES	Number of years the individual has lived in current residence	absolute	CON

CBP = County Business Pattern
CS = County Statistics
NLSY = National Longitudinal Survey
AUS = Atlas of the United States
CTS = Climates of the States
CON = Constructed

APPENDIX B

COUNTY LOCATIONS OF NLSY RESPONDENTS

Table 22. County and State Names of NLSY Respondent's Locations

Baldwin, AL	San Franscio, CA	Clarke, GA
Calhoun,AL	San Jouquin, Ca	Clayton, GA
Chambers, AL	San Mateo, CA	Cobb, GA
Clarke,AL	Santa Barbara, CA	Coffee, GA
Dale,AL	Santa Clara, CA	Decatur, GA
Houston,AL	Solano, Ca	De Kalb, GA
Jackson,AL	Sonoma, CA	Dougherty, GA
Jefferson, AL	Stanislaus, Ca	Floyd, GA
Macon, AL	Sutter, CA	Fulton, GA
Mobile, AL	Ventura, Ca	Gordon, GA
Montegomery,AL	Yolo, CA	Hall, GA
Perry,AL	Yuba, CA	Lowndes, GA
Pike,AL	Adams, CO	Monroe, GA
Shelby, AL	Arapahoe, CO	Richmond, GA
Tuscaloosa,AL	Boulder, Co	Sumter, GA
Walker, AL	Denver, Co	Taylor, GA
Washington, AL	Eagle, CO	Ware, GA
Anchorage,AK	El Paso, Co	Bond, IL
Fairbanks North star, AK	Jefferson, CO	Carroll, IL
Juneau, AK	Mesa, CO	Champaign, IL
Coconino, AZ	Montezuma, CO	Coles, IL
Maricopa, AZ	San Miguel, Co	Cook, IL
Pima, AZ	Weld, CO	De Kalb, IL
Yuma, AZ	Fairfield, CT	Du page, IL
Clark, AR	Hartford, CT	Grundy, IL
Craighead, AR	New Haven, CT	Kane, IL
Faulkner, AR	New London, CT	Kankakee, IL
Hempstead, AR	Tolland, CT	Lake, IL
Hot spring, AR	Washington, DC	Mcdonough, IL
Jefferson, AR	Alachua, FL	Mchenry, Il
Lonoke, AR	Broward, FL	McLean, IL
Pope, AR	Collier, FL	Madison, IL
Pulaski, AR	Dade, FL	Peoria, IL
St. Francis, AR	Duval, FL	St. Clair,IL
Saline, AR	Escambia, FL	Sangamon, IL
Washington, AR	Hardee, FL	Allen, IN
Alameda, CA	Highlands, FL	Delaware, IN
Butte, CA	Hillsborough, FL	Hancook, IN
Colusa, CA	Lee, FL	Jefferson, IN
Contra Costa, CA	Marion, FL	Johnson, IN
Fresno, CA	Orange, FL	Lake, IN
Los Angeles, CA	Palm Beach, FL	Marion, IN
Madera, CA	St. Lucie, FL	Marshall, IN

Table 22 (continued)

Marin, CA	Santa Rosa, FL	Monroe, IN
Merced, CA	Seminole, FL	Porter, IN
Orange, CA	Volusia, FL	Putnam, IN
Plumas, CA	Washington, FL	Tippeanoe, IN
Riverside, CA	Baldwin, GA	Vigo, IN
Sacramento, CA	Bartow, GA	Wabash, IN
San Bernardino, CA	Bibb, GA	Wayne, IN
San Diego, CA	Chatham, GA	Boone, IA
Fremont, IA	Prince George, MD	Fairbault, MN
Ida, IA	Washington, MD	Freeborn, MN
Johnson, IA	Wicomico, MD	Hennepin, MN
Muscatine, IA	Baltimore city, MD	Lincoln, MN
Page, IA	Berkshire, MA	Lyon, MN
Polk, IA	Bristol, MA	Nobles, MN
Pottawattamie, IA	Essex, MA	Olmsted, MN
Story, IA	Franklin, MA	Ramsey, MN
Wapello, IA	Hampden, MA	Rock, MN
Woodbury, IA	Hampshire, MA	St. Louis, MN
Cloud, KS	Middlesex, MA	Stearns, MN
Douglas, KS	Nantucket, MA	Steele, MN
Finney, KS	Norfolk, MA	Stevens, MN
Johnson, KS	Plymouth, MA	Washington, MN
Rooks, KS	Suffold, MA	Winona, MN
Sedgwick, KS	Worcester, MA	Calhoun, MS
Shawnee, KS	Delta, MI	Forrest, MS
Wayndotte, KS	Genesee, MI	Greene, MS
Bracken, KY	Gogebic, MI	Harrison, MS
Calloway, KY	Houghton, MI	Hinds, MS
Fayette, KY	Ingham, MI	Holmes, MS
Madison, KY	Kent, MI	Jasper, MS
Scott,KY	Lake, MI	Leflore, MS
Warren, KY	Lapeer, MI	Lowndes, MS
Calcasieu, LA	Macomb, MI	Madison, MS
East Baton Rouge, LA	Marquette, MI	Smith,MS
Jefferson, LA	Monroe, MI	Wayne, MS
Lincoln, LA	Muskegon, MI	Boone, MO
Orleans, LA	Newaygo, MI	Buchanan, MO
St. Mary, LA	Oakland, MI	Callaway, MO
St. Tammany, LA	Ottawa, MI	Cape Girardeau, MO
Vernon, LA	Washtenaw, MI	Carroll, MO
Kennebec, ME	Wayne, MI	Greene, MO
Waldo, ME	Anoke, MN	Jackson, MO
Anne Arundel, MD	Beltrami, MN	Jefferson, MO
Baltimore, MD	Blue earth, MN	Johnson, MO
Carroll, MD	Brown, MN	Livingston, MO
Fredrick, MD	Clay, MN	New Madrid, MO
Montegomery, MD	Cook, MN	Nodaway, MO
Phelps, MO	Chautauqua, NY	Necklenburg, NC
Pulaski, MO	Clinton, NY	Nash, NC
St. Louis, MO	Dutchess, NY	Onslow, NC
Scott, MO	Erie, NY	Orange, NC
Wayne, MO	Genesee, NY	Pasquotank, NC
St. Louis city, MO	Kings, NY	Perquimans, NC
Cascade, MT	Livingston, NY	Polk, NC
Deer Lodge, MT	Madison, NY	Rockingham, NC
Gallatin, MT	Monroe, NY	Rowan, NC
Lewis and Clark, MT	Nassau, NY	Stanley, NC
Missoula, MT	New York, NY	Surry, NC

the two models could be pooled showing similarity in general behavior. Thus, while there is some evidence in terms of differences to specific variables, the evidences are not conclusive to warrant general behavioral differences.

The failure to find overall behavioral differences implies that they can not be used to explain differential propensity of mobility in the two regions.

The level of these variables however showed that depressed regions have lower mobility characteristics. The average endowment of non-location specific capital is lower for depressed region, while the endowment of location specific capital is about the same. An average youth in depressed region lives in a county with a higher percentage of own race composition and also lives in a county that has lower modern element as measured by percent urban population. An average depressed region also contains a higher number of youths who have lived in the county since birth. These mobility characteristics when weighted by their respective coefficients showed us that they have a greater negative influence on out-migration from depressed region. This became more evident when the predicted out-migration probability turned to be lower for depressed region.

The destination choice model exhibited similarity in general behavior. However, there seems to be a difference in the destination choice in the two regions in terms of the location specific and non-location specific capitals. This again led us to conclude that there are some evidence of differences for individual variables but the differences are not conclusive as they do not translate to general differences in the destination choice behavior.

7.2 Implication for Policy

The regional convergence theory predicts that regional parity will be achieved through factor flows (Borts and Stein, 1964). Labor is assumed to flow from low wage to high wage regions and capital will flow in the opposite direction until factor returns are equalized in each region.

The implication of this theory for regional migration policy is that migration is efficient and it contributes to wage equalization between regions. Migrants do also come from correct origin (low wage area) and flow to correct destination (high wage region) hence there is no need to attempt to influence regional migration.

The cumulative disequilibrium model predicts inequality and divergence of interregional wage differential (Kaldor, 1970). Initial regional economic disparities are reinforced and regional divergence occurs as a result of increasing returns to scale. Given increasing returns to scale in high wage regions, migration of labor from low to high wage regions reinforces the dominance of spatio-economic core and regional differences (Clark, 1983).

Alonso (1988) observed that differences in monetary income persist after adjustment is made for such obvious consideration as cost of living and unemployment.

The Kaldorian-Alonso perspective implies that some forms of policy intervention might be useful for equity and for efficiency. Public investment may be needed to stimulate growth in lagging regions or subsidies to firms may be provided to locate in lagging regions. Alternatively subsidies to labor may be given to facilitate their movement. The latter policy requires a detailed study of the anatomy of regional migration and labor movement. As our study deals with the reason for migration from regional perspective, it falls in the realm of regional labor movement policy.

Our result has shown us that in terms of model performance, amenity variables do not seem to influence migration decision and destination choice of people from depressed region. This implies that amenity variables may not be used as a policy instrument to influence migration from depressed region. Instead migration policies may focus on personal and economic factors.

The results of our hypotheses test serve as pointer to be aware of the possibilities of behavioral differences to specific factors though the overall behavior may be similar. Thus there is a need to consider details in directing migration streams. In this study responsiveness to urban elements and own race were found to be different in the two regions. These two factors should then be considered in making migration policies for depressed and non-depressed regions.

The negative coefficient of own race for the depressed region suggests that a movement policy from depressed region may be successful if the people are taken to places where they can feel comfortable in terms of the social atmosphere. In other words a policy that creates a sense of belongingness is likely to succeed than one which only considers economic incentive to migrate from depressed regions.

The implication of the influence of percent urban, which has a greater negative influence for the non-depressed region, is that we can not hope to reduce migration probability from the depressed region by creating an urban atmosphere in the depressed region as we may be able to do so for non-depressed region. People in depressed region may need more than an urban atmosphere such as job growth to significantly influence their decision.

The differential influence of the level of our hypothesized variables alone or together with entire set of personal and macro variables also points to the need for policy intervention. If facilitating labor movement is the desired policy goal, then intervention that affects the levels of our hypothesized variables may be an appropriate tool. For example one may suggest to increase the non-location specific human capital through training and skill upgrading in the depressed region where it is much lower and is known to be positively associated with migration.

Similarly for the destination choice the endowment of different type of human capital plays a role in the effects of destination variables for the two regions.

7.3 Implication for Research

In reviewing our research, some points which may indicate useful exercises for future research crop up. The first point relates to extending our research to different socio-economic group of the population. Studies have shown that migration determinant of the unemployed differ from those of the employed (DaVanzo, 1978). A parallel question could be whether the migration determinant of the unemployed from the depressed region is similar with those from non-depressed regions. Similar analysis could also be done for different income groups or occupation groups. This will ascertain whether the poor in non-depressed regions are comparable with the poor in depressed regions and whether people having different skills in the two regions are comparable.

In our study we have adopted a two fold classification of regions based mainly on economic indicators. The level of development of an area however transcends economic indicators and may well go to social, psychological and cultural factors. Including such variables may improve the classification of regions which in turn may help approximate the true migration behavior.

Other recommendations for further research are related to improvements in the model specification.

In this study we have proxied the level of information and elements of modernity by percent urban population in the origin. The level of urbanization however measures some other unintended variables such as crime rate and external diseconomies which may mask the desired effects of information availability and modernity in urban region. Thus percent urbanization may have unintended effect on migration studies. This may be improved by employing a better measure of information availability and factors that measure only modernity and excludes externalities.

Table 20. Mean Values and Differential Influence of Hypothesized Variables in Depressed and Non-Depressed Regions

Variable	Depressed	Non-depressed	Differential influence
Location specific capital	1.92	1.[illegible]9	-0.0126
Non-location specific capital	1.47	2.69	[illegible]0.[illegible]611
Lived since birth	0.56	0.45	-0.0512
Own house	74.98	62.51	-0.2624
Percent urban	41.79	78.61	0.46668

We have found that these variables decrease the probability of migration in depressed regions relative to non-depressed regions. We could also study the effects of the level of the entire set of variables on the probability of migration by predicting the probability of out-migration for an average resident in each of the two regions. This is done by computing P(X) where P(X) is defined as

$$P(X) = e^{g(x)}/1 + e^{g(x)} \tag{64}$$

where $g(x) = \alpha 0 + \alpha 1x1 + \alpha 2x2 + \ldots\ldots \alpha pxp$.

α is given in our partially restricted model of Table 16 and x is the region-specific sample mean of the explanatory variables.

The result of the computation was P(X) = 0.081 for the non-depressed regions and P(X) = 0.0468 for the depressed regions. Hence the level of the personal and macro factors is such that when weighted by the same set of coefficients, except for the two variables of OWNRACE and PTURBAN,[14] results in predicting a lower incidence of migration probability for an average resident in the depressed regions. The apparent lack of higher mobility from the depressed regions can thus be explained by the level of personal and macro factors these people face together with the different sensitivity for the two factors namely OWNRACE and PTURBAN.

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[14]Note, we have used different sets of coefficients for the two variables, PTURBAN and OWNRACE, in the two kinds of regions since their coefficients are statistically different from each other.

CHAPTER VII

SUMMARY AND CONCLUSION

7.1 Summary

This study makes a comparative analysis of migration decision and destination choice between people of depressed and non-depressed regions. The basis for such study is the findings reported in the literature concerning the relative low propensity of mobility of people from depressed regions (Gallaway, 1961; Cordey-Heayes and Gleave, 1974; Parr, 1966; Clark, 1983) and the inability of migration as a regional adjustment mechanism (Alonso, 1988; Clark, 1983).

In this study we sought for an explanation by examining the extent and degree of behavioral differences in the migration decision and destination choice of youths from depressed and non-depressed regions.

The study is approached in a disaggregate behavioral context. This allows for the use of individual micro data that are more relevant than the aggregate migration data.

Different perspectives are put together to account for possible behavioral differences. The potential migrant was viewed as a utility maximizing agent whose utility depends on, among others, individual endowment of location specific and non-location specific capital, location preference and development context. Hypotheses which conjecture behavioral differences between depressed and non-depressed regions on the basis of these variables were put forward.

The hypotheses were tested on data from different sources. The principal data covering personal attributes and locational choice were from the youth cohort of the

National Longitudinal Survey (NLSY). Thus the results are limited to the youth population of the two regions.[1] Other data sources used in the study include County Statistics, County Business Pattern and Climates of the States. The NLSY sample was allocated to depressed and non-depressed region on the basis of operational criterion developed in the paper. This allocation then forms a basis for the comparative analysis of the study.

The analysis was carried out by separately estimating the decision to migrate and destination choice for the purpose of facilitating the computation. The decision to migrate was modeled as a binary logistic model for a period of time that spans from 1979 to 1988. In effect we estimated a discrete hazard function of time until migration. The destination choice is a multinomial choice in which those who have migrated choose one of the alternatives available to them. A conditional logit model of discrete choice was estimated for this part of the study.

The results of the binary and conditional logit models are discussed in chapter VI. Various propositions in the migration literature seem to gain credence particularly from our fully restricted models. The human capital model asserts that the costs of migration decrease the likelihood of mobility. This is confirmed in the form of our personal factors such as, home ownership, marital status, age, poor health and family income. Unlike the expectation of the human capital model, however, our measure of gain, which is industry specific wage fails to show significance in the decision to migrate. The measure is thought to be inadequate since industry specific wage cuts across occupational group. Other personal factors such as enrollment status, length of stay in a region since birth are found to significantly affect out-migration.

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[1]The use of other population cohort of NLS data might give a different result from what is reported in this study.

As hypothesized in our study, location specific capital and non-location specific capital are found to strongly influence migration decisions. The former is a negative influence for out-migration while the latter is a positive influence. This confirms the discussions present in DaVanzo and Morrison (1981), Dierx (1984) which suggest that location specific capital ties a person to a particular place.

Our model also confirms the effects of development related contextual factors as suggested in Brown and Jones (1985), Brown and Goetz (1987), Findley (1987). In our case the level of urbanization intended to measure urban services and market transparency is found to influence migration.

In line with labor market studies (Miller, 1973; DaVanzo, 1978) and amenity studies (Graves, 1980, Cebula, 1979), most of the macro economic and macro amenity factors turned out to be significant both in destination choice and decision to migrate. Some however failed to be significant. For example, job growth as measured by average employment change in a county is insignificant both in destination choice and the decision to migrate. The level of crime rates also failed to be significant in the decision to migrate.

With regard to the two kinds of regions, which are the focus of this study, there is evidence that personal and economic factors are related to migration decision of both depressed and non-depressed regions. The amenity variables either individually or as a group however seem to play little role in the migration decision of depressed region. This is thought to be due to the income elastic nature of the amenity variables.

In terms of our hypotheses, the findings seem to confirm few of them while most were rejected. The finding indicates that there is a behavioral difference for the two of our five hypothesized variables for the decision to migrate. These variables are own race and urbanization level as measured by percent urban. The differences in the responsiveness to the two variables however did not translate to general behavioral difference as

The crime rate is correctly signed and found to deter immigration from depressed regions.

The result for non-depressed regions in columns 4 and 5 shows that all the variables except AVEMPCHG are related to destination choice. All the variables, except LSLURJ and CRM are significant at the 0.05 level.

Both NSLURJB and LSLURJB have opposite signs from those in the depressed regions. Thus for the non-depressed regions, people with more non-location specific capital will immigrate to more urban places where they can compete and sell their skills. People with location specific capital however shy away from urban places. These people are not perhaps as enthusiastic as their counterparts in depressed regions are in getting low skill manual jobs away from home.

A higher unemployment rate is expected to discourage immigration to places and thus have a negative sign. The positive sign of unemployment for non-depressed regions however can be explained by exactly the same story told in the case of the decision to migrate. Higher unemployment is not a deterring factor for immigration in the destination choice as it was not an influencing factor for out-migration in the decision to migrate.

Amenity variables have showed strong association for immigration in the non-depressed regions. While CRM, EDUATT and COAST are correctly signed, the positive sign of COOLDD is unexpected. High COOLDD counties may however include those counties which are economically healthy (such as counties in Texas and Florida) and thus attract immigrants. The strong association of amenities and immigration for non-depressed regions may also be related to the income elastic nature of amenities in the same way we have accounted for the decision to migrate from this region.

The destination choice model can also be seen from a group of variables perspective. Two groups of variables were identified in our model. These are economic and amenity factors. The economic factors were PTURJB, WAGE, UNRA and AVEMPCHG plus the two interaction terms of LSLURJB and NSLURJB while the amenity factors are CRM, EDUATT, COAST and COOLDD.

The effect of the economic variables were studied by restricting the coefficients of amenity variables to 0. These results are given in Table 18. The results in Table 18 tell us that the economic factors as a group are significant in both the depressed and non-depressed regions. A comparison of Tables 17 and 18 shows that the macro amenity factors are not significant for depressed regions while they are significant for non-depressed regions. This finding repeats what we found for the effect of the amenity variables for the decision to migrate. It suggests that amenity factors are not related to the two components of migration, the decision to migrate and destination choice, for the depressed regions.

Testing Destination Choice Hypotheses.

Our two destination choice hypotheses that were stated in chapter three are

1. The responsiveness of people from depressed regions to destination variables will be different from that of people in non-depressed regions, based on their non-specific and location specific capital.

2. The destination choice behavior of people from depressed regions is different from that of people in non-depressed regions.

Table 18. Conditional Logit Estimates for Destination Choice: Economic Factors

	Depressed regions		Non-depressed regions	
variable	Estimates	t-score	Estimate	t-score
LSLURJB	0.308	0.131	-0.101	3.156*
NSLURJB	-0.910	-2.802*	0.175	3.156*
PTURJB	0.131	1.809**	-0.413	-2.264*
AVEMPCHG	-0.237	-0.825	0.869	1.004
UNRA	0.426	0.209	0.126	1.291
WAGE	-0.174	-0.777	0.317	3.870*
log likelihood		-518.89		-4212.9
Chi-square		12.188		31.288
significance level		0.57E-01		0.217E-05
N		1758		14160

* = Significant at 0.05 level
** = Significant at 0.1 level

In testing our two hypotheses that relate to destination choice we have estimated two variants of the restricted model for the destination choice. The first model which may be called partially restricted model allows for the two variables NSLURJB and LSLURJB to vary between the two regions. This is achieved by interacting the two variables with a dummy for depressed regions in a pooled model. The second model restricts all the variables in the model including the NSLURJB and LSLURJB.

The results of the restricted models are given in Table 19. Hypothesis one is tested by examining the t-scores for the coefficients of the interaction between a dummy for depressed regions , DEP, and NSLURJB and LSLURJB. The scores for the coefficients were significant indicating that the individual responsiveness of people to destination choice differs in terms of their endowment of location specific and non-specific capital. This result is interesting in so far as it tells us that individual endowment, though unimportant for migration decision between the depressed and non-depressed regions, tends to differentiate people in their destination choice.

Thus people in depressed and non-depressed regions respond differently to destination choice factors and by implication to where they go once they have decided to migrate.

In order to examine whether the difference to the interaction terms translate to general differences in the destination choice behavior and test our hypothesis two, we computed the difference in the likelihood ratio between the restricted models and the full models in the same way we did for the decision to migrate analysis. The difference in the likelihood ratios when the model is partially restricted is

$$D = -2(-4726.1)-(-2)(-4200.7)-(-2)(-524.99)$$
$$= 1.32$$

The critical χ^2 for eight degrees of freedom is 15.5 at an alpha level of 0.05.[11] Thus the two models are not different from each other as far as the partially restricted model is concerned. The likelihood ratios from the fully restricted model is

[11]In order to be consistent with previous discussion in which we have reported the critical level for 0.01, we mention that the critical level for alpha level of 0.01 is 20.1. But it is obvious that if the computed value is not in the critical level of 0.05 then it will not be in the critical level of 0.01.

Table 19. Conditional Logit Estimates of Restricted Models of the Destination Choice.

Variables	Partially restricted Estimate	Partially restricted t-score	Fully restricted Estimate	Fully restricted t-score
LSURJB	-0.978	-2.043*	-0.750	-1.621
NSURJB	0.176	3.072*	0.163	2.865*
WAGE	0.211	2.620*	0.215	2.664*
UNRA	0.299	2.966*	0.313	3.107*
AVEMPCHG	0.184	0.216	0.213	0.250
PTURJ	-0.352	-1.969**	-0.367	-2.056*
EDUATT	0.113	3.722*	0.109	3.582*
CRM	-0.203	-2.041*	-0.243	-2.467*
COOLDD	0.874	3.062*	0.884	3.103*
COAST	0.902	1.615	0.956	1.714**
DEP*NSURJB	-0.523	-3.292*		
DEP*LSURJB	0.579	2.329*		
Log likelihood		-4726.1		-4731.8
chi squared		54.79		43.41
significance level		0.70E-08		0.35E-06
N		15918		15918

* = Significant at 0.05 level
** = Significant at 0.1 level

$$D^* = -2(-4731.8)-(-2)(-524.99) - (-2)(-4200.7)$$
$$= 12.22$$

The critical χ^2 for 10 degrees of freedom at an alpha level of 0.05 is 18.3.[12] This test again tells us that the two models are essentially similar. Had the test on the fully restricted model turned out to show us differences we would have attributed the similarity in the partially restricted model to the two variables allowed to vary. This however is not the case and thus we reject our hypothesis of overall behavioral difference.

The fact that we have accepted our hypothesis of difference for the interaction terms but not for the overall behavioral difference leads us to conclude again that we have found some evidence of difference, however our evidence is not conclusive to generalize overall behavioral difference in the destination choice of people from the depressed and non-depressed regions.

6.6 Out-Migration Probability and Differential Influences of Explanatory Factors

In chapter one we noted that researchers who studied migration from depressed regions have reported a relatively lower mobility from depressed regions. For example Gallaway (1961), Cordey Heyes and Gleave (1974) reported low mobility rates of people from depressed regions while Lansing and Mueller (1967) found no difference in out-migration rate from development and non-development areas and Parr (1966) documented a reluctance to move on the part of people from depressed regions. Our overview of

[12]The critical level for 0.01 is 23.2.

migration in our sample in chapter five showed a similarity of annual movements and duration of stay in the two regions. All these are pointers to the relatively lower mobility of people from depressed regions from where a higher rate of migration is expected to be the norm.

The results of our hypotheses tests in section 6.4 showed that there is some evidence of behavioral differences but the evidence is not conclusive as it cannot transcend to overall behavioral differences.

This suggests that behavioral differences alone are not at the root of relative lower mobility from the depressed regions. While the evidence we found on the difference for the two variables could go towards explaining the lower mobility rates, it is quite possible that people in depressed regions face different levels of the hypothesized variables and hence affecting their relative rates of out-migration.

The effects of the combination of the different incidence of the level of the hypothesized variables and differences in behavior is studied by examining the weighted influence of the hypothesized variables.

Table 20 shows the mean values of the hypothesized variables in the two regions and the differential influence of the levels of these variables on the decision to migrate. The differential influence of the level of the variables is found by weighting the mean values by the appropriate coefficients. The coefficients are those from Table 16 in column 2.[13]

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[13] As on overview of the use of the coefficients, consider the following simplified situation.

$$y = \alpha 0 + \alpha 1D + \alpha 2X1 + \alpha 3(DX1).$$

In section 6.4 it was found that OWNRACE has different coefficient in the two regions. The differential influence of OWNRACE in column 3 of Table 20 is then computed as

$$\alpha_d OWNRACE - \alpha_{nd} OWNRACE \qquad (61)$$

where α_d and α_{nd} are coefficients of the depressed and non-depressed regions respectively.

Similarly PTURBAN has shown different coefficient in the two regions. Hence the differential influence of PTURBAN would be

$$\beta_d PTURBAN - \beta_{nd} PTURBAN \qquad (62)$$

where β_d and β_{nd} are the coefficients of depressed and non-depressed regions respectively.

The remaining variables when interacted with depressed region had insignificant Wald chi-scores. This implies that the coefficients of these variables for the two regions

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where D is 1 if the observation lies in depressed region
is 0 if the observation lies in non-depressed region.
The coefficients $\alpha 1$ and $\alpha 3$ are the differential intercept and differential slope coefficients respectively. If $\alpha 1$ is statistically significant the intercept value of the depressed region is found by $\alpha 1 + \alpha 0$, $\alpha 0$ in this case being the intercept value of the non-depressed region. If $\alpha 1$ is statistically insignificant, $\alpha 0$ then gives an estimate of common intercept of both regions. If $\alpha 3$ is statistically significant, the slope value of the depressed region is $\alpha 3 + \alpha 2$, $\alpha 2$ being the slope value of the non-depressed region. If $\alpha 3$ is statistically insignificant, $\alpha 2$ gives the slope value which is common to both. (Gujarati, 1970).

are statistically similar and hence they will have similar weights (Gujarati, 1970) i.e.,

$$\alpha X_d - \alpha X_{nd} = \alpha (X_d - X_{nd}) \tag{63}$$

where X_d and X_{nd} are the values of the three variables.

The mean values in Table 20 indicate that depressed region has a slightly higher location specific capital on average while the non-depressed region has almost twice as much non-specific capital. The residence since birth and own race composition are higher for depressed region, while PTURBAN is higher for non-depressed region. The mean values in the table tend to suggest that people in depressed regions have low mobility characteristics. The differential influence of these variables is given in column 3.

OWNRACE has a more negative influence on the migration decision in depressed regions than in non-depressed regions. Location specific capital and Lived Since Birth which are negative influences in both regions, tend to show a higher negative influence for the depressed regions.

Non-location specific capital is a positive influence on the migration decision. The lower endowment of people in depressed regions however has made the influence of non-specific capital to be less in depressed regions. Percent urban, while it is a negative influence, it shows a greater negative influence for non-depressed regions than depressed regions. This may tell us the extent to which the level of contextual modern elements play little role in depressed regions as opposed to non-depressed regions.

the depressed and non-depressed regions. As a result a significant Wald chi-score is evidence for the hypothesis, while an insignificant Wald chi-score leads to rejection of the hypothesis.

Our Wald chi-scores shows that the coefficients of the interactions of the dummy with LSCAPL, NSCAPL, LIVBIR, are not significant. Therefore our hypotheses one, two, and three-B must be rejected. The coefficient of the interaction of OWNRACE with the dummy however is significant, though, at the 0.1 level, lending credence to hypothesis three-A.

The coefficient of the interaction of PTURBAN and the dummy is significant at the 0.05 level lending credence to hypothesis four. Thus the results of the test on the differences in the responsiveness of the different determinants have shown that the two groups of people are behaviorally different in two factors out of the stated five hypothesized variables.

OWNRACE is one of the two factors employed to measure locational preference. The reason why this factor is important in showing regional behavioral differences could be due to the fact that most of the depressed regions are found in the southern part of the country (from where people have migrated) and there may be higher valuation of own race among those who remain to stay. Another possibility may be due to what we observed above in discussing our model for the non-depressed regions. That is OWNRACE is positively correlated with WHITE which in turn tended to show a positively significant association to the migration decision in non-depressed regions.

Table 16. Logit Estimates of Restricted Models of the Decision to Migrate

	Partially restricted		Fully restricted	
Variable	Estimates	Wald χ_2	Estimates	Wald χ^2
Intercept	0.015	0.003	-0.023	0.007
DEP	0.038	0.023		
NSTCAP	0.214	87.047*	0.220	101.340*
LSTCAP	-0.097	32.476*	-0.094	33.723*
WKUNEP	-0.001	0.451	-0.001	0.504
HOME	-0.698	78.814*	-0.697	78.718*
MARIT	-0.143	6.635*	-0.144	6.737*
LIVBIR	-0.465	87.589*	-0.485	108.719*
AGE	-0.115	140.976*	-0.117	144.607*
HELT	-0.175	4.010*	-0.171	3.812*
OWNRACE	0.003	23.476*	0.003	23.086*
ENROLL	0.333	42.362*	0.335	42.833*
FINC	-3.36E-6	5.652*	-3.44E-6	5.923*
WGDIFF	1.56E-6	0.090	2.34E-6	0.206
PTURBAN	-0.007	26.716*	-0.006	24.803*
AVEMPCHG	-8.78E-7	1.240	-9.56E-7	1.482
UNRA	-0.003	16.482*	-0.003	15.999*
CRM	7.29E-6	0.343	5.77E-6	0.222
EDUATT	0.011	14.983*	0.011	15.499*
COOLDD	0.0001	22.077*	0.0001	24.843*
COAST	-0.144	6.855*	-0.147	7.238*
DEP*NSTCAP	0.059	1.056		
DEP*LSTCAP	0.021	0.203		
DEP*PTURBAN	0.005	4.042*		
DEP*LIVBIR	-0.196	1.978		
DEP*OWNRACE	-0.004	3.087**		
K		26		20
χ^2K		1325.433		1315.42
-2log L		15628.085		15638.08
N		25052		25052

* = Significant at 0.05 level
** = Significant at 0.1 level
K = Number of parameters estimated
N = Number of cases used in estimation

PTURBAN is a variable that measures elements of urban and a higher level of opportunity in various spheres of life such as education, work, information and entertainment. Its effect is thus to reduce out-migration. The significant difference in the responsiveness to this variable between the two groups of people suggests a higher sensitivity of the non-depressed region's people than their counterparts in depressed regions. That is, the level of urbanization reduces migration for those in non-depressed regions more so than for those in depressed regions. This may be due to the fact that those who are in non-depressed regions are in the mainstream of the economy and they value such modern elements highly. In contrast, for those in depressed regions these modern elements do not affect their daily life and hence are not as influenced by this variable as their counterparts are in their migration decision.

The fact that the groups show similar responsiveness to most of the determinants thought to be major distinguishing factors lead us to test whether the intercepts are the same. The Wald chi-score for the dummy variable of depressed regions was examined in the restricted model given in columns 2 and 3 of Table 16. It was found that the value is insignificant implying that we can not reject the hypothesis that the two intercepts terms are identical. A similar intercept implies the same level of migration for the depressed and non-depressed regions given a constancy of all other variables. This strengthens our findings in the previous chapter where we found the percentage of migration for the two regions to be about the same. In a similar vein Lansing and Mueller (1967) have found no differences in out-migration rates from development and non-development areas.

Hypothesis five which posit overall differences in the behavior was tested by computing the likelihood ratio statistics from the full models and the restricted models. We have used two variants of the restricted model. The first is the partially restricted model of columns 2 and 3 of Table 16. The second is a fully restricted model which imposes equality of all coefficients and the intercept term. This is given in columns 3 and 4 of Table 16.

The likelihood ratio which has a χ^2 distribution is computed from the likelihood estimates as

$$C = -2\log L_r - (-2\log L_{unr1}) - (-2\log L_{unr2}) \quad (60)$$

If the restriction is true, then the maximized value of the log-likelihood imposing the restriction ($-2\log L_r$) should not be significantly less than the unrestricted maximum values of the log-likelihood (Kennedy, 1987).[10] The unrestricted maximum values of the likelihoods are given in Table 13. The value of the likelihood ratio for the fully restricted model thus computed is

$$C = 15638.088-13869.853-1731.990$$
$$= 36.245$$

[10] In other words if the regions are the same behaviorally the models in table 16 apply. This implies that we can do away with models in table 13 to depict the behavior of the two kinds of regions. On the other hand if the regions are different behaviorally models in table 12 are the appropriate models and we can do away with models in table 16.

In our case the number of restriction is 20. The value of the tabulated χ^2 for 20 degrees of freedom at an alpha level of 0.05 is 31.4 and at an alpha level of 0.01 is 37.6 Thus the result tells us that at 0.01 level we can not accept our hypothesis which states that the two models are different. The test statistic is computed as follows when the hypothesized variables are allowed to vary.

$$C^* = 15628.085-13869.853-1731.990$$

$$= 26.242$$

Our degrees of freedom is 14 since we have allowed five interaction terms and one intercept term to vary between the two regions in our restricted model. The critical χ^2 for 14 degrees of freedom at alpha level of 0.05 is 23.7 and it is 29.1 at 0.01 level of significance. The computed χ^2s from both variants of the restricted models tell us that the two models are similar.

The fact that we find similarity in the partially restricted model would have suggested that the hypothesized variables which were allowed to vary could have been responsible for observing general behavioral difference. Such a conclusion, however is not warranted since we have also found a similarity of the models in the fully restricted model; i.e., when the hypothesized variables were not allowed to vary. The implication is that though we have found behavioral differences in two of our hypothesized variables they are not sufficient to infer general behavioral differences between the two groups of people when we apply a significance criterion of 0.01. We therefore expect general behavioral similarity in the migration decision of people in non-depressed and depressed regions.

The fact that our hypothesized variables, have failed to show us general behavioral difference implies that they can not be used to explain overall migration behavioral differences. They may suggest some evidence of behavior difference but not conclusive evidence to make an assertion of behavioral difference.

6.5 Destination Choice

A conditional logit model was used to estimate the destination choice rule. The destination choice is estimated only for those who migrated for the first time in the ten year period (1979-1988). Each individual has six alternatives including the alternative chosen. The variables used are "choice-based" variables and relate to economic and amenity variables. These are WAGE, UNRA (unemployment rate), AVEMPCHG (average employment change), PTURJB (percent urban job), CRM (crime rate), EDUATT (education attainment), COOLDD (cool degree day) and COAST. Two variables, NSLURJB (the interaction between non-location specific capital and percent urban job) and LSLURJB (the interaction between location specific capital and percent urban job) were added to the choice-based variables. The reason for adding such variables is to test our hypothesis that individual endowment of capital will help us see behavioral differences in the destination choice of people from non-depressed and depressed regions. The pure conditional model is then modified by including the above mentioned interaction terms.

The analysis proceeds by first estimating separate models for depressed and non-depressed regions and then estimating the restricted model in which the observations from both regions are put together. The destination choice models for the depressed and the non-depressed regions are given in Table 17. Columns 2 and 3 are the coefficient estimates and the t-statistics for the depressed regions while columns 4 and 5 are the coefficient estimates and t-scores for the non-depressed regions.

The results of Table 17 in columns 2 and 3, show that for depressed regions, three variables NSLURJB, PTURJB and CRM are significant. While NSLURJB and PTURJB are significant at 0.05 level, CRM is significant at 0.1 level.

Table 17. Conditional Logit Estimates for the Destination Choice: Depressed and Non-Depressed Regions.

	Depressed Regions		Non-Depressed Regions	
Variable	Estimate	t-score	Estimate	t-score
LSLURJB	0.292	1.440	-0.953	-1.885**
NSLURJB	-0.892	-2.778*	0.174	3.142*
WAGE	-0.847	-0.362	0.247	2.850*
UNRA	-0.441	-0.178	0.357	3.199*
AVEMPCHG	-0.183	-0.640	0.373	0.412
PTURJB	0.174	2.331*	-0.405	-2.220*
CRM	-0.655	-1.814**	-0.197	-1.868**
EDUATT	-0.263	-0.261	0.131	4.043*
COOLDD	-0.512	-0.531	0.103	3.385*
COAST	-0.105	-0.695	0.138	2.257*
Log likelihood		-524.99		-4200.7
chi square (10)		18.501		55.62
significance level		0.47E-01		0.30E-09
N		1758		14160

* = Significant at 0.05 level
** = Significant at 0.1 level

PTURJB has a positive sign indicating that places with higher urban job opportunity generally attract migrants from the depressed regions.

The interaction variable, NSLURJB, has a negative sign. This implies that urban job tends to decrease immigration for those with non-location specific capital. This seems surprising, as people with non-location specific capital will be expected to be gravitated towards places with plenty of urban jobs. Note, however that this is a depressed region and capital formation in depressed regions is assumed to differ from non-depressed regions. As a result, the value of a unit of non-specific capital in a depressed region will not be the same as a unit of non-location specific capital in a non-depressed region. Thus those endowed with non-specific capital from depressed regions may not go to places where they may face higher competition from people of non-depressed regions. If places with more urban jobs happen to be places where many migrants come, and this results in more competition, then people from depressed regions with some non-specific capital may not go to areas of higher urban concentration.

One would however suspect that they would go to places where they would face less competition and find jobs. This conjecture could be reversed for those with location specific capital. Note that the interaction variable LSLURJ, though insignificant, shows a positive sign. This implies that those with location specific capital from depressed regions, if they migrate, do in fact migrate to urban places. This may be because these people expect to get non-professional, low skill manual jobs as opposed to those with non-location specific capital from the same region in places with more urban jobs.

Table 14. Logit Estimates of the Migration Decision : Personal Variables.

	Depressed regions		Non-depressed regions	
Variable	Estimate	Wald χ^2	Estimate	Wald χ^2
Intercept	0.641	1.258	0.909	19.869*
NSCAPL	0.404	38.349*	0.256	147.692*
LSCAPL	-0.065	2.547	-0.097	29.937*
WKUNEP	-0.007	1.471	-0.003	2.067
MARIT	-0.052	0.109	-0.114	3.783**
LIVBIR	-0.520	15.200*	-0.528	118.818*
HOME	-0.908	16.172*	-0.587	49.771*
AGE	-0.127	23.533*	-0.145	203.276*
HELT	-0.297	1.151	-0.140	2.342
ENROLL	0.038	0.059	0.381	51.502*
FINC	-4.29E-6	0.549	-4.31E-6	8.669*
K		11		11
χ^2k		174.42		997.093
-2 log L		1746.922		14060.337
N		2961		22091

* = Significant at alpha 0.05 level.
** = Significant at alpha 0.1 level.
K = Number of parameters estimated.
N = Number of cases used in the estimation.

Table 15. Logit Estimates of the Migration Decision: Personal and Macro Economic Factors.

	Depressed Regions		Non-Depressed Regions	
Variable	Estimate	Wald χ^2	Estimate	Wald χ^2
Intercept	0.647	1.166	1.571	53.646*
NSCAPL	0.416	39.634*	0.228	114.272*
LSCAPL	-0.068	2.543	-0.098	29.784*
WKUNEP	-0.007	1.586	-0.001	0.461
MARIT	-0.078	0.237	-0.144	5.906*
LIVBIR	-0.495	13.492*	-0.525	115.910*
HOME	-0.896	15.663*	-0.622	55.491*
AGE	-0.138	22.928*	-0.127	153.146*
HELT	-0.295	1.126	-0.151	2.697
FINC	-5.79E-6	0.986	-3.05E-6	4.424*
ENROLL	0.066	0.171	0.374	48.639*
WGDIFF	5.001E-6	0.121	-6.87E-7	0.015
UNRA	0.0008	0.200	-0.006	53.843*
AVEMPCHG	-0.0001	4.344*	-1.83E-6	5.757*
PTURBAN	0.003	1.635	-0.006	46.534*
K		15		15
χ^2k		180.46		1097.66
-2log L		1735.43		13938.27
N		2961		22091

* = Significant at alpha 0.05
K = Number of parameters estimated
N = Number of cases used in estimation

With regard to non-depressed regions, the same exercise was repeated and all the three groups of variables are significantly related to migration decision.

Our foregoing result seems to draw a wedge in the debate in the literature concerning the effects of origin condition in affecting out-migration.

The effects of macro variables, individually or as a group in non-depressed regions seem to confirm the findings of Miller (1973), DaVanzo (1978), and Clark and Ballard (1980) who found origin conditions to significantly affect out-migration. The results for the depressed regions seems to partially support Lowry's (1966) asymmetric hypothesis which states no push or no origin condition to affect migration and Morrision (1972) who stated that people do not come from the right origin. Our study however suggests a need to qualify Lowry's and Morrison's statements by limiting the non-push factors mainly to amenity variables rather than generalized "origin conditions".

The insignificance of amenity variables for the depressed regions either individually or as a group makes sense if we view an amenity as a superior good. The role of amenities in migration studies is recognized not so much for their direct effect, but for their derived demand impact (Graves, 1980). The demand for amenities changes with changes in income, life cycle etc. Thus as people enter high income brackets, they consume more amenities by moving to places which offer greater amenities. Similarly, elderly people and people with children will have a different preference for amenity bundles than younger and single people. This would be reflected in the migration decisions of people in different life cycle stages. As our sample in both depressed and non-depressed regions constitutes people of the same age brackets we tend to believe that life cycle plays little role for the observed differential influence of amenity on migration. Income, on the other hand should play a significant role as youths in depressed regions may be thought to have lower income than those in non-depressed regions. Consequently, amenity is not in the priority list of youths from depressed regions and hence may show little or no significance on their migration decision.

The above exposition was an account of the performance of our model in the two regions. The main purpose of this study however is making inferences about the differences in migration behavior in the depressed and non-depressed regions. This is accomplished below by a formal testing of our hypotheses.

As an overview of the tests, consider the following simplified situation, in which an individual's decision (which may be either the decision to migrate, or the conditional choice of destination) represented by the variable y depends on two variables, x_1 and x_2, plus a constant. Then one way to conceptualize the possibility of an overall behavioral difference in the two kinds of regions would be to posit, for depressed regions,

$$y = \alpha_d + \beta_{1d}x_1 + \beta_{2d}x_2 \tag{56}$$

while for non-depressed regions

$$y = \alpha_{nd} + \beta_{1nd}x_1 + \beta_{2nd}x_2 \tag{57}$$

These models are full models. If there is overall behavioral difference between the two regions, then $\alpha_d \neq \alpha_{nd}$, $\beta_{1d} \neq \beta_{1nd}$, $\beta_{2d} \neq \beta_{2nd}$. In order to test this, we need to estimate what I shall refer to as the "fully restricted model", where, for each individual, no matter which region,

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 \tag{58}$$

that is, each influencing factor is treated behaviorally the same way by any individual. The test for overall behavioral difference is that the likelihood from the fully restricted model will not be significantly different from the separate full models of the two regions.

However, there is a second way of conceptualizing the problem that particularly leads to identifying behavioral differences for specific factors. This necessitates constructing what I shall refer to as "partially restricted model". In the "partially restricted model" the "fully restricted model" is allowed to have some interaction terms for some variables which signifies that the observation comes from one or the other region. In our example the "partially restricted model" is

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 DEP^* x_2 \tag{59}$$

where DEP is an indicator variable denoting whether an observation is from depressed region. In this example x_2 is treated behavioral different in the two regions while the constant, α and the variable x_1 are treated behaviorally the same. The coefficient of

DEP*x_2 (i.e, β_3) is a difference of the coefficients for the variable x_2 between the two regions. If β_3 turns out to be significant then it indicates a behavioral difference between the two regions for the variable x_2.

The "partially restricted" model would also help us test overall behavioral difference. In this case the overall behavioral difference to be tested is $\alpha_d \neq \alpha_{nd}, \beta_{1d} \neq \beta_{1nd}$.[9] The "partially restricted" model imposes equality of these coefficients and can be used as a basis to test whether the restriction is true. Again the test is that the difference in likelihood from the "partially restricted model" will not be significantly less than the likelihoods from the full models.

There is an advantage of testing overall behavioral difference from the two versions of the model. If our result tells us that the full models are similar to the "partially restricted model", but not to the "fully restricted model", then we will conclude that the variable x_2 is responsible for showing us overall behavioral differences between the two regions in our comparison of the "fully restricted model" and the full models. This is because the variable x_2 when allowed to vary in "partially restricted model" resulted in the similarity of the full models and the "partially restricted model".

Testing the Out-Migration Hypotheses

In chapter III we stated five hypotheses related to the decision to migrate and two hypotheses related to destination choice. Of the five hypotheses of the decision to

[9]Note that in partially restricted model we have already allowed for $\beta_{2d} \neq \beta_{2nd}$ via the interaction term. Thus we are testing for equlity (differnce) of less number of variables than in the fully restricted model.

migrate, the first four concern the responsiveness of people to specific variables while the fifth hypothesis concerns general behavioral differences.

The four specific variables are non-location specific capital, location specific capital, location preference and contextual factors. They form hypotheses one, two, three and four respectively. While non-location specific and location-specific capitals are constructed using the method described in section 6.3, location preferences and contextual factors are generic concepts that need to be specified for the hypothesis test.

In chapter four we have specified location preference to be measured using one personal variable and one macro variable. The personal variable is LIVBIR (Lived since birth in county of origin) and the macro variable is OWNRACE (percent composition of ownrace in a county). These two variables would then form test variables for location preference. Since they can be tested separately we will have two hypotheses related to location preference.

Contextual factors for the origin are measured by PTURBAN (percent urban). Thus PTURBAN is a test variable for the hypothesis pertaining to contextual factor. We now re-state our hypotheses of the decision to migrate (out-migration hypotheses) in terms of the specific variables that are identifiable in our models.

The Out-Migration Hypotheses

Concerning the responsiveness of the decision to migrate to specific variables:

Hypothesis one: The responsiveness of people in the depressed regions to location-specific capital will be different from that of the non-depressed regions.

Hypothesis two: The responsiveness of people in the depressed regions to non-location specific capital will be different from that of non-depressed regions.

Hypothesis three-A: The responsiveness of people in the depressed regions to OWNRACE will be different from that of people in non-depressed regions.

Hypothesis three-B: The responsiveness of people to long term residence in a place will be different in the two regions.

Hypothesis four: The responsiveness of people to percent urban will be different in the two regions.

Hypothesis five: The overall migration behavior of people in depressed regions is different from people in non-depressed regions.

In order to test these hypotheses a partially restricted model is specified. The model is formed by pooling all the observations and including an indicator variable for depressed regions and interactions between the hypothesized variables (LSCAPL, NSCAPL, OWNRACE, LIVBIR, PTURBAN) and the indicator for the depressed region. The indicator for depressed regions has a value of one if the observation is from depressed regions and 0 otherwise. This variable is termed DEP. The result of this specification is given in columns 2 and 3 of Table 16. The hypotheses are tested by examining the Wald chi-square statistics for the interactions between the hypothesized variables (LSCAPL, NSCAPL, LIVBIR, OWNRACE, PTURBAN) and the dummy for depressed region. Each interaction coefficient is the difference in responsiveness between

6.4 The Decision to Migrate

A binary logistic model was used to model the decision to migrate. We have estimated the full and restricted model to test our various hypotheses. Before we formally test our hypotheses, however, we give an account of our models to see how they fare in light of the findings by other researchers.

The full models are given in Table 13. Columns 1 and 2 pertain to the depressed regions while columns 3 and 4 are results for non-depressed regions. In all cases the values of the log-likelihood indicate that the models significantly explain the decision to migrate. Considering the results of the depressed regions, the effect of the personal variables are of expected sign. Four variables, NSCAPL (non-location specific capital), LIVBIR (lived since birth), HOME, and AGE are significant at 0.05 level. All the personal variables however are found significant when viewed as a group.[4]

For the non-depressed regions all the personal variables are of expected sign and almost all variables except WKUNEP (number of weeks unemployed) are significant at the 0.05 level. The effects of macro variables pertaining to economic, amenity and development context are mixed. For the depressed regions AVEMPCHG (average employment change) is correctly signed and is significant at 0.05 level. The remaining variables, though most of them are correctly signed turned out to be insignificant. WGDIFF (Wage difference) also correctly signed, is insignificant. This is disturbing as one would expect pecuniary returns to be significantly related to

[4] see below for a table of personal variables alone and discussion on their significance.

Table 13. Logit Estimates for the Decision to Migrate: Depressed and Non-Depressed Regions.

	Depressed regions		Non-depressed regions	
Variable	Estimate	Wald χ^2	Estimate	Wald χ^2
Intercept	-0.069	0.005	0.135	0.194
NSCAPL	0.439	40.004*	0.182	63.868*
LSCAPL	-0.068	2.506	-0.098	29.800*
WKUNEP	-0.007	1.433	-0.0006	0.060
MARIT	-0.065	0.163	-0.165	7.711*
LIVBIR	-0.511	13.964*	-0.486	95.487*
HOME	-0.876	14.844*	-0.654	61.097*
AGE	-0.141	22.917*	-0.112	111.869*
HELT	-0.281	1.021	-0.169	3.333**
FINC	-6.16E-6	1.095	-3.02E-6	4.314*
ENROLL	0.062	0.148	0.376	48.395*
WGDIFF	7.42E-6	0.260	1.35E-6	0.057
AVEMPCHG	-0.0001	4.983*	-9.7E-7	1.466
UNRA	0.001	0.317	-0.004	25.010*
PTURBAN	-0.0004	0.009	-0.007	26.544*
CRM	-5.26E-6	0.012	0.00001	1.224
EDUATT	0.014	1.533	0.010	15.479*
COOLDD	0.0001	2.504	0.0001	15.479*
COAST	-0.045	0.060	-0.173	8.746*
OWNRACE	-0.001	0.437	0.004	25.916*
K		20		20
χ^2k		183.906		1166.080
-2 log L		1731.990		13869.853
N		2961		22091

* = Significant at alpha level of 0.05
** = Significant at alpha level of 0.1
K = Number of parameters estimated
N = Number of cases used in estimation.

migration decision.[5] WGDIFF however is derived from County Business Patterns which cut across occupational groups in an industry.

Thus an industry specific wage could be thought of as an inadequate measure of pecuniary return. A better measure could have been occupation specific wage, but this is not available for counties.

The amenity variables and the macro economic factors for non-depressed regions showed a different result. Of the four environmental and non-environmental amenity variables (COOLDD,COAST,CRM and EDUATT), three, COOLDD, COAST and EDUATT were significant at the 0.05 level.[6] EDUATT, has a positive sign. The sign for EDUATT on apriori grounds can go either way, i.e., there are arguments for both a positive and a negative sign. The negative sign may be due to the fact that people may prefer to be near educated people on the theory that there is a positive externality from such proximity. An example would be people enjoying a higher level of environmental or other consciousness of the community. Such consciousness will be higher among more educated communities. On the other hand, a positive sign may be due to the effect of a higher level of information and knowledge about the outside world that possibly

[5] Mueller (1982) who also used the same variable found it to have wrong sign and to be insignificant.

[6] We estimated alternative models for both depressed and non-depressed regions in which we constructed an amenity index out of CRM,EDUATT,HDD,COOLDD. The composite index was found to be significant for the non-depressed region and the same variable failed to attain significance for the depressed region (See Appendix C for the result).

exists in more educated communities. If the nature of the information is such that it favors moving, then EDUATT is expected to be positively related with out-migration.

Out of the two macro economic variables, one variable namely, UNRA (unemployment rate) was significant. The variable seems to be wrongly signed. We must however understand that in non-depressed regions a higher unemployment rate may be caused by higher in-migration rather than by fewer job opportunities. Consequently, unemployment in this region could be a demand side problem rather than a supply side problem. Higher unemployment thus tends to reduce migration than commonly thought when unemployment is viewed as a supply side problem.

AVEMPCHG (Average employment change), though correctly signed is insignificant in the non-depressed regions. This may lead one to suspect that people in non-depressed regions may not be highly sensitive to job growth as their counter- parts are in depressed regions. PTURBAN (percent urban) is significant and correctly signed for the non-depressed regions. WGDIFF which is an economic return in our study tended to be correctly signed but is insignificant as in the case of the depressed regions. OWNRACE is significant and positively signed for the non-depressed regions. This is contrary to our expectation in which we would expect OWNRACE to be important and negative for the depressed regions. Our preliminary investigation however has shown us that OWNRACE is highly correlated to individual race attributes. It was found that it has a high positive correlation with WHITE and a high negative correlation with BLACK. Further, WHITE individual race has a significant and positive relation with migration decision. We thus suspect that the positive sign and significance of OWNRACE in non-depressed regions may be due to a higher number of white migrants from non-depressed regions.

The foregoing discussion was a variable by variable discussion of our models. An alternative way to view the models may be to look at them from a group of variables perspective. This is of interest because it will help us understand which variables as a group do influence the migration decision though the individual variables making the group may not be significantly related to the migration decision.[7]

In order to facilitate the discussion, we identify three groups of variables in our models. These are personal variables constituting: NSCAPL, LSCAPL, WKUNEP, MARIT, LIVBIR, HOME, AGE, HELT, ENROLL, FINC; macro economic variables constituting WGDIFF, AVEMPCHG, UNRA, PTURBAN; and macro amenity variables constituting CRM, EDUATT, COOLDD, COAST, OWNRACE.

The effects of these groups of variables can be studied by estimating the migration decision as a function of only one group of variables at first and then adding the other groups of variables and studying the behavior of the resulting likelihood ratio. We thus first estimated migration decision only as a function of the personal characteristics constraining all the coefficients of the macro economic variables to be zero. The result is given in Table 14. At this stage we assume that the full model is composed of only the personal and the macro economic variables. We then allowed the coefficients of the macro economic variables to be different from zero and estimated a model constituting

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[7] Since most of the variables in the depressed region model turned out to be insignificant, viewing them as a group would highlight the underlying decision process not evident from single variable perspective.

personal characteristics and macro economic factors. The result is presented in Table 15. In the second stage the restricted model is assumed to constitute the individual and the macro economic variables with the restriction being all the coefficients of the macro amenity variables to be zero. The restriction was then relaxed and the final model contains all the individual, macro economic and macro amenity variables. This is the model reported in Table 13.

Our result showed us that for the depressed regions first, the personal variables as a group are significant. This is ascertained by looking at the value of the log likelihood in Table 14 which is found to be significant.

The significance of the macro economic variables is studied by examining the log-likelihoods of Tables 14 and 15. A difference in the two will tell us about the significance of the four macro economic variables that were added to the personal characteristics.

The difference of the two log-likelihoods turned is 11.492 which is significant at 0.05 level for a χ^2 distribution with 4 degrees of freedom.[8]

The effect of the macro amenity variables was studied by finding the difference of the likelihood of Tables 15 and 13. This value turns out to be 3.44 which is insignificant at an alpha level of 0.05. Thus the macro amenity factors as a group are not systematically related to migration decision of the depressed regions as are the individual variables constituting this group.

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[8] We have decided to measure significance at 0.05 level for a group of variables since we have adopted the same level for variable significance at individual level.

In strategy (B) the objective is to design a sample of alternatives in which the alternative most likely to be chosen by the decision maker has a higher probability of being selected. This is sampling with unequal probabilities or importance sampling. BenAkiva and Lerman (1985) have shown that this results in consistent estimates of parameters. In this method, the design of sample alternatives may follow different rules and some hypotheses may be employed in determining alternatives. For example, the notions of maximum travel time to work for residential location models or central place theory for retail sales areas are used in practical determination of alternatives.

In the context of migration, Mueller (1982) followed strategy (B) and applied aggregate migration behavior and sample choice methods to determine sets of alternatives. Aggregate migration between state economic areas was examined and relative frequencies of migration streams between places were established. Primary alternatives for each state economic areas were then determined based on certain cut off-point. These primary alternatives of counties were later augmented by alternatives chosen by the sample population from each origin area. This process resulted in 38 origin-specific destinations for each county.

In this study, we apply a sample choice method, a variant of strategy (B) and used by Mueller (1982). The actual choice of alternatives (counties moved to) by individuals from each state was identified.[2] The choice set for an individual is then assumed to be

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[2]The reason of using states instead of counties for observing actual choice of alternatives is because we found that there are numerous counties from which no move was made.

the set of counties appropriate for his or her state. This results in different number of choices for individuals depending on whether there were few or many actual choices observed. In order to reduce the number of choices, a random sample of five non-chosen counties were selected from the appropriate choice set to form the final choice set of an individual[3]. In cases where we don't observe any actual choices from a given state (these are few in number) individuals are assumed to have the choice set of those individuals from one of the contiguous states.

6.3 Construction of Variables

The variables which required construction are the quantities of location specific and non-location specific human capital. The form of construction of these variables is outlined in chapter four. We use a tobit procedure to regress real wage, RW, on the four variables, TENURE, YRRES, GRADE, and AFQT, for all youths in the region.

The use of the tobit equation is due to the limitation of the observation of the wage data to workers only. The estimation of wages based only on workers who decide to work may bias the coefficients (Haurin and Haurin, 1991).

Separate regressions were estimated for the depressed and the non-depressed regions for each year from 1979-1989, based on the assumption that the rate of human capital formation for the people in the two regions will be different. For example, the

[3] The selection of six counties (five non-chosen and one actually chosen) is purely a matter of computational consideration, otherwise one can select any number of counties and the asymptotic result will not be affected.

level of competition for jobs, in depressed and non-depressed regions will be different and hence the addition of tenure for the human capital component will be different in the two regions. Similarly, the educational quality in the two regions will vary reflecting a difference in return to a given quantity of education.

The results of the two equations are given in Tables 11 and 12. As shown in these Tables, the explanatory variables significantly explain the wage equation for most years. The coefficients from these equations are then used as weights for determining the quantity of location specific and non-location specific capital for each individual. For example from Table 11, for the year 1979 the non-location specific capital (M) of an individual from non-depressed regions is

$$M = 0.142*GRADE + 0.014*AFQT \tag{54}$$

while the location specific capital (K) is

$$K = 0.018*TENURE + 0.005*YRRES \tag{55}$$

where GRADE is highest grade completed by an individual

AFQT is the individual's score on armed forces qualification test

TENURE is the number of weeks the individual has been employed in his job

YRRES is the number of years the individual has lived in the county of current residence

Table 11. Tobit Equation for Non-Depressed Regions for Different Years
(Dependent Variable is the Real Wage of Youth)

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Grade	0.142 (11.34)	0.117 (9.68)	0.133 (10.59)	0.137 (9.34)	0.156 (10.96)	0.176 (12.44)	0.199 (13.04)	0.184 (9.60)	0.219 (10.88)	0.236 (11.1)	0.314 (14.40)
AFQT	0.014 (7.50)	0.117 (8.83)	0.024 (10.97)	0.030 (11.21)	0.033 (12.22)	0 .036 (13.25)	0.039 (13.13)	0.062 (21.2)	0.066 (21.26)	0.068 (20.61)	0.049 (11.36)
Tenure	0.018 (11.74)	0.022 (18.65)	0.020 (19.76)	0.020 (20.79)	0.018 (22.47)	0.016 (23.08)	0.016 (24.37)	0.014 (21.04)	0.013 (21.25)	0.014 (23.42)	0.014 (22.55)
YRRES	0.005 (0.77)	0.005 (0.90)	-0.968 (-1.47)	-0.025 (-3.29)	-0.030 (-4.18)	-0.030 (-4.24)	-0.397 (-5.26)	0.029 (-3.3)	-0.037 (-4.15)	-0.047 (-5.10)	-0.051 (-5.31)
Log liklihood	-10042	-10058	-10293	-10839	-10709	-10720	-10908	-11337	-11481	-11507	-11756
Number of obs.	4193	4189	4188	4186	4153	4101	4060	4036	3998	3954	3920

Note - t values are in parenthesis
- The total number of observations used in the estimation differs over time mainly because some of the explanatory variables show missing values for some observation for some years during which time the observation is deleted

Table 12. Tobit Equation for Depressed Regions for Different Years (Dependent Variable is the Real Wage of Youth)

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Grade	0.084	0.136	0.143	0.185	0.174	0.190	0.152	0.194	0.246	0.212	0.301
	(2.03)	(4.28)	(4.56)	(5.39)	(4.88)	(5.38)	(3.84)	(4.13)	(5.29)	(4.73)	(6.87)
AFQT	0.018	0.011	0.009	0.004	0.018	0.020	0.041	0.031	0.033	0.047	0.035
	(3.07)	(2.04)	(1.56)	(0.71)	(2.52)	(2.91)	(5.14)	(3.23)	(3.37)	(4.99)	(3.76)
Tenure	0.030	0.027	0.028	0.025	0.025	0.023	0.020	0.023	0.019	0.017	0.015
	(6.68)	(8.91)	(10.96)	(10.47)	(11.93)	(12.62)	(11.26)	(11.96)	(11.75)	(11.51)	(11.09)
YRRES	-0.007	-0.023	-0.043	-0.083	-0.107	-0.099	-0.094	-0.133	-0.142	-0.11	-0.091
	(-0.33)	(-1.4)	(-2.67)	(-4.53)	(-5.92)	(-5.65)	(-4.97)	(-5.86)	(-6.54)	(-5.47)	(-4.63)
Log liklihood	-1197.8	-1014.3	-1178.2	-1193.6	-1211.1	-1201.8	-1241.0	-1284.9	-1253	-1254.3	-1325.5
Number of obs.	528	466	527	522	527	518	514	511	488	488	500

Note - t values are in parenthesis
- The total number of observations used in the estimation differs over time mainly because some of the explanatory variables show missing values for some observation for some years during which time the observation is deleted

coefficient vector. This property implies that the corrective terms for alternative sampling bias are equal and therefore cancel out in the choice probabilities.

While the above theoretical results of McFadden (1978) show the properties of the logit model that enable one to estimate a consistent parameter from a subset of choices, the practical problem that remains is how to obtain the sample of alternatives. Researchers have employed two primary strategies of alternative sampling. These are strategy (A) which is a random sampling with uniform selection probabilities and strategy (B) which is sampling with unequal selection probabilities designed to reflect different levels of importance of alternative (BenAkiva and Lerman, 1985).

In strategy (A) or a random sampling method, the approach is to form a choice set by adding a random sample of the non-chosen alternatives to the chosen alternatives. In this method, it is not clear how large the size of the constructed choice set should be. It is however clear that, for a given number of coefficients and a given sample size, the cost of estimating a multinomial logit model grows linearly with the choice set size. Lerman (1983) indicates that, while each of the added alternatives implies some increase in the precision of parameter estimates, the incremental precision gained by increasing the choice set beyond about 10 to 20 alternatives is quite small and declines further as the choice set size increases.

The random sampling of alternatives assumes equal probability for all alternatives and does not consider the chance that there may be many zero probability alternatives for a decision maker. In such instances sampling mis-specification may result and the resulting estimated coefficients may be biased (Lerman, 1983).

$$\text{If } j \in D \subseteq C \text{ and } \pi(D|i,z) > 0 \text{ then } \pi(D|j,z) > 0. \quad (51)$$

This states that if j is an element of sampled subset D, from the full choice set C, the condition requires that if the probability of the analyst sampling subset D given i was chosen by the decision maker is positive, then the probability of sampling D given j was chosen must also be positive (Lerman, 1983). McFadden (1978) shows the maximization of a modified MNL log likelihood yields consistent estimates of the parameter vector ß under this condition. The log likelihood is

$$1/T \sum \ln(\exp[xit\beta + \ln\Pi(Dt|it,xt)] / \sum Dt\exp[xj\beta + \ln\Pi(Dt|j,xt)]) \quad (52)$$

The above model includes as one of the x's an additive alternative specific correction for the bias introduced by the sampling alternatives. The coefficient of this correction variable is constrained to be 1 (Ben Akiva and Lerman , 1985).

McFadden's second condition is the uniform conditioning property given by if

$$i,j \in D \subseteq C, \text{ then } \pi(D|i,z) = \pi(D|j,z). \quad (53)$$

i.e., for two alternatives i and j which are elements of D, the probability of drawing D from complete set C is the same regardless of whether i or j was chosen and regardless of the independent variables (Lerman, 1983). Under this condition the standard maximum likelihood based on the sampled choice set gives consistent estimates of the facing the migrant to set the stage for the estimation of our conditional logit model of the destination choice.

In a study dealing with inter-county movement in a country, the default choice set is a set consisting of all counties in that country. In our study the default choice set constitutes the 3141 counties in the U.S.

The use of the full choice set, however is inefficient on two grounds. First, the use of full choice set poses enormous computational problem, which becomes prohibitively expensive and impractical given the large number of observations. Second, it is not realistic to assume that, individuals consider the full choice set in making migration decision as they are constrained by their information field and their inability to process different information simultaneously.[1] There is then a need to sample alternatives given the inefficiencies of using the full choice set. The sampling however has to yield consistent estimates of the parameters.

The solution to the problem is found by utilizing the independence from irrelevant alternatives property of the logit model. This property, as described in chapter three, permits consistent estimation with only a subset of the alternatives (including the chosen and a sample of non chosen alternatives) (Ben Akiva and Lerman, 1985). McFadden (1978) gave two conditions under which consistent estimates of the parameters of the strict utility function can be obtained from a subset of alternatives. The first is the positive conditioning property given by

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[1]In fact many migration studies assume that individuals make binary comparison in making their choices (see Schultz, (1982), Field (1982)).

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