Rural Out-Migration, Income, and Poverty: Are Those Who Move Truly Better Off?[1]

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Selected Paper prepared for presentation at the Agricultural & Applied Economics Association 2009 AAEA & ACCI Joint Annual Meeting, Milwaukee, Wisconsin, July 26-29, 2009

[1] Financial support for this research was provided by: USDA-ERS cooperative agreement #58-5 with Oregon State University, the Oregon State University Rural Studies Program, and the Oregon State University Agricultural Experiment Station. The author would like to thank Bruce Weber, Monica Fisher, Robert Gibbs, and John Cromartie for their comments and suggestions. The views expressed in this paper are the author's and do not necessarily reflect those of the U.S. Department of Agriculture.

"*To know that we know what we know,*
and that we do not know what we do not know, that is true knowledge."

- Henry David Thoreau

1. Introduction

Between 1995 and 2000 roughly 5.7 million people migrated from nonmetropolitan to metropolitan counties. During that five year period, nonmetropolitan out-migrants constituted about 11% of nonmetropolitan residents. The empirical research on migration provides mixed results on the determinative power of differential earnings on the migration decision (Greenwood 1997). Some evidence suggests that economic incentives, in part, drive the decision to migrate; including in the case of young adult nonmetropolitan out-migration (Nakosteen and Zimmer 1980, Mills and Hazarika 2001). Studies of nonmetropolitan out-migration show that leaving a nonmetropolitan county reduces a person's poverty risk and unemployment spells, and increases wages, income and hours worked over time (Wenk and Hardesty 1993, Rodgers and Rodgers 1997, Glaeser and Maré 2001).

These rural migration choices take place in the economic and social contexts of rural communities throughout the United States. Rural areas in the United States have a litany of disadvantages relative to urban areas for economic development. Compared with urban areas, rural areas have lower levels of educational attainment and lower returns to education (Kusmin 2007; McLaughlin and Perman 1991). Rural labor markets are characterized by small population sizes and low employment densities (jobs per square mile). Gibbs (2002) notes that "despite a decade of economic expansion, rural labor market outcomes – job growth, unemployment rates, earnings, and wage progression among them – typically fall below the national average, and most show no signs of convergence." Also, rural areas have a higher proportion of marginal jobs, which results in higher underemployment and a higher proportion of rural workers employed in low-skill jobs relative to urban areas (Findeis and Jensen 1998; Gibbs, Kusmin and Cromartie 2005). All of these characteristics suggest that people who live in

rural areas will likely face a higher risk of poverty and lower incomes compared with urban areas.

This research examines the rural to urban migration decision of rural working-age adults and the resulting outcomes over a roughly twenty-year period, 1979 to 1997. In contrast with many empirical studies of the effects of rural out-migration, the empirical strategy employed here builds on recent literature in the area of rural poverty and residential choice by Fisher (2005, 2007) that argues for a closer study of the effects of unobservable characteristics. These characteristics are found to play a role in some periods between 1979 and 1997 that may bias the estimates of the effects of rural out-migration on poverty risk and income.

2. Conceptual Framework

Three questions form the basis for this investigation. First, what drives the decision to leave a rural area? Second, what effect does this decision have on economic outcomes of interest, such as income, poverty risk, or hours worked? Third, what role, if any, do unmeasured characteristics have in determining location and migration decisions and economic outcomes? Empirical research on the migration of individuals and households across geographic boundaries traditionally focuses on the first two questions; estimating the determinants of migration and the effects of this decision on various outcomes. However, recent literature in the field of rural economics employs new techniques that challenge basic assumptions about rural residential choice, poverty and income, by examining the role of unmeasured characteristics. Each of these questions is briefly discussed here to develop a new and useful framework for studying rural out-migration.

Economic theory views the decision to migrate from one region to another as an investment decision, placed squarely in the tradition of human capital theory by Sjaastad (1962). His seminal article on the costs and returns of migration moved the literature to examine more deeply the motivation for migrating and to what degree migration acts as "an equilibrating mechanism in a changing economy," correcting for differences in income across geography. Human capital theory predicts that "like all other human

capital investments, migration decisions are guided by the comparisons of the present value of lifetime earnings in the alternative investment opportunities" (Borjas 2000).

Todaro (1969) developed a model of labor migration that involved a comparison of utility between two regions: the original location, denoted by subscript 0, and the destination location, denoted by subscript 1. For the purposes of this study, assume that location 0 is a nonmetropolitan county and location 1 is a metropolitan county. Utility in both regions is derived from income, *y*, earnings, *w*, and hours worked, *h*. Goetz and Debertin (1996) use such a model in a paper that examines the impacts of farm structure and federal farm programs on rural population decline in during the 1980s. Workers deciding whether or not to move to a region consider the total discounted lifetime utility of staying in the origin location, as shown by equation (1), with the total discounted lifetime utility of moving to the alternative location, shown by equation (2). Moving to the alternative location requires a cost, *c*, which must be subtracted from earnings. The probability of obtaining employment in both regions is given by $\phi(t)$.

$$U(y_0, h_0) = \int_{t=0}^{T} \phi_0(t) U\left[w_0(t), h_0(t)\right] e^{-rt} dt \tag{1}$$

$$U(y_1, h_1) = \int_{t=0}^{T} \phi_1(t) U\left[w_1(t) - c, h_1(t)\right] e^{-rt} dt \tag{2}$$

The difference, *d*, between these two discounted streams is compared by the prospective migrant. If the difference is greater than zero, then the move offers an expected gain in utility and the worker will move to location 1. If not, then the prospective migrant will stay in his or her location of origin.

Much of the literature concerned with the individual or household's decision to migrate flows from Sjaastad's (1962) work. These studies start with a human capital model of the migration decision and seek to test whether or not the expectation of a higher income or wages in the destination location influences the decision to migrate

there. The empirical model of these studies, therefore, is typically a probit model of the observed migration decision, m_i, as shown in equation (3).[2]

$$P_i = E\left(m_i = 1 \mid \Omega_i\right) = \Phi\left(\alpha_0 + \alpha_1\left(\hat{y}_{m=1i} - \hat{y}_{m=0i}\right) + \alpha_2 X_i + \alpha_3 R_i\right) \tag{3}$$

These models include a vector of individual and household characteristics, X_i, and regional characteristics, R_i, likely to influence the migration decision. The term $\left(\hat{y}_{m=1i} - \hat{y}_{m=0i}\right)$ is called the income or earnings differential and represents the change in income or wages the migrant expects to receive. Estimating these values presents a missing data problem, since the observed income of migrants is not observed for non-migrants, and the observed income of non-migrants is not observed for migrants. Therefore, the income or wage equations used to estimate these values include the inverse Mills ratio as an explanatory variable to correct for selection bias (Heckman 1979; Dolton and Makepeace 1987).

Nakosteen and Zimmer (1980) were the first to use Heckman's (1979) two-stage technique for sample selection bias to model the migration decision. Using data from the Social Security Administration Continuous Work History sample for 1971 and 1973, the authors estimate the returns to migration from moving to a different state. The log income differential term in their model of the migration decision is positive and statistically significant, indicating that a larger predicted increase in earnings increases the probability of moving between states, all else equal, as suggested by human capital theory.

Mills and Hazarika (2001) conduct a more recent study in the spirit of Nakosteen and Zimmer's (1980) work. Using data from the National Longitudinal Survey of Youth (NLSY), the authors model the migration decisions of young adults who lived in nonmetropolitan counties at the age of fourteen. The authors seek a deeper understanding of the rural out-migration decision, noting that "nonmetropolitan counties have

[2] The probit model estimates the conditional expectation of success of an outcome for individual *i*, where $\Phi(\bullet)$ is the standard normal cumulative distribution function and Ω_i is the information set (Davidson and MacKinnon 2004, 453-4).

consistently been concerned with retaining productive labor, given high migration propensities among educated young adults and the aging of retained populations." Their results suggest that the log difference in estimated initial hourly earnings from migrating do indeed increase the probability of moving. Through marginal effects analysis, they find that "a 10 percentage point increase in the 'typical' ratio of initial hourly earnings upon migration to initial hourly earnings in the county of origin will result in a 7.9 percentage point increase in the probability of migration."

Another category of literature examines the role of migration in affecting economic outcomes. Rather than using a probit model of the migration decision, this literature follows some form of equation (4) to determine the effect of migration on economic outcomes, y_i, while controlling for individual and regional characteristics.

$$y_i = \alpha_0 + \alpha_1 m_i + \alpha_2 X_i + \alpha_3 R_i + \varepsilon_i \tag{4}$$

Two examples that examine the role of rural to urban migration are discussed in turn.

Wenk and Hardesty (1993) focus on the effect of rural to urban migration on time spent in poverty and time spent unemployed for young adults. The authors select a sample of young adults from the NLSY between the ages of eighteen and twenty-three who ever lived in a rural area between 1980 and 1988. They estimate accelerated failure time models with the dependent variables measured as time spent in poverty and time spent unemployed for four groups divided by race and gender: black and white women and black and white men. Results from these models suggest that rural to urban moves reduce time spent in poverty for black and white women, all else equal, and reduce time spent unemployed for black and white men.

Rodgers and Rodgers (1991) also look at the effects of rural to urban moves, but on a different set of economic outcomes than Wenk and Hardesty (1993). Their study uses data on male household heads between the ages of twenty-four and sixty-five from the 1968 through the 1989 waves of the PSID to examine the effects of such moves on real annual earnings, hourly wages, and annual income for the family unit, and annual number of hours worked for the individual. Of these four economic outcomes, the

authors find a statistically significant effect of rural out-migration on real annual earnings, hourly wages and annual income both three and six years after such a move.

The aforementioned research supports the idea that residential choice affects economic outcomes: living in a rural area increases the risk of being poor through the effects of local labor market characteristics and other factors. Recent papers by Fisher (2005, 2007) examine more closely the effect of rural residence on poverty and challenge the assumption that rural residence is exogenous with economic outcomes. Fisher (2005) replicates the finding that rural residence affects poverty risk and then attempts to correct for the endogeneity of residential choice with poverty. Using data from the 1993 and 1994 waves of the PSID, Fisher (2005) estimates a probit model of poverty status, as shown in equation (5), where n_i is an indicator variable for nonmetropolitan residence.

$$P_i = E(p_i = 1 \mid \Omega_i) = \Phi(\beta_0 + X_i\beta_1 + R_i\beta_2 + n_i\beta_3) \quad (5)$$

Nonmetropolitan residence is estimated to have a positive and statistically significant effect on the probability of being poor.

Noting the typical finding that rural residence increases poverty risk is confirmed, Fisher (2005) argues that this finding is influenced by residential selection bias. This bias poses an empirical problem: "If people who decide to live in rural areas have unmeasured attributes which are related to human impoverishment, estimates of a rural effect can be biased." To account for this self-selection bias, Fisher uses a two-stage instrumental variables approach (Newey 1987). In the first stage a probit model of rural/urban residential choice is estimated. The probability of rural residence is modeled as a function of personal and regional characteristics and two instrumental variables.[3] Predicted rural residence is included as an explanatory variable in a second-stage probit model estimating the probability of being poor. Fisher's (2005) results indicate that once self-selection is accounted for, rural residence does not have an effect on the probability of being poor or on family income-to-need. Therefore, these "empirical findings show

[3] Instrumental variables must be correlated with residential choice and independent of the error term in the economic outcome model given by equations (21.2) and (22.2). Fisher (2005) uses two instrumental variables: a dummy variable indicating whether the family head "has a religious preference uncommon in urban locations...Amish, Mennonite, Church of God, Disciples of Christ, and Church of Christ;" and a dummy variable indicating whether the householder's first occupation was as a farmer.

that failure to account for residential endogeneity and omitted variable bias of general form leads to overestimation of the effect of rural residence on person poverty."

Fisher (2005) writes that these findings are not definitive and do not "rule out the possibility that living in a rural area is a factor which causes poverty in the United States" and calls for future work using other nationally representative data sets. However, if the findings are true, then there are two key questions: "One, why do people with certain attributes related to human impoverishment choose to live in rural places? And two, what combination of human-capital and community-strengthening policies is most likely to reduce rural poverty and its unfavorable consequences?" The first question is directly related to the problem of self-selection. Fisher (2007) studies this question with a sample of 2,007 low-income householders from the PSID during the period 1985 to 1993. Two sets of three empirical models are estimated. The first set of three is shown by equations 6, 7, and 8, where y_i is each household's income-to-need ratio[4], E_i includes variables indicating educational attainment, and F_i captures individual fixed-effects reflecting unobserved income capacity.[5]

$$y_i = \beta_0+\beta_1 X_i+\beta_2 R_i+\beta_3 n_i+\varepsilon_{1i} \quad (6)$$

$$y_i = \beta_0+\beta_1 X_i+\beta_2 R_i+\beta_3 E_i+\beta_4 n_i+\varepsilon_{2i} \quad (7)$$

$$y_i = \beta_0+\beta_1 X_i+\beta_2 R_i+\beta_3 E_i+\beta_4 n_i+\beta_5 F_i+\varepsilon_{3i} \quad (8)$$

Fisher's (2007) primary technique is to analyze the omitted variable bias when factors known to affect both economic well-being and rural residence are excluded from the model. Fisher writes: "There are two components of bias: (1) the "true" effect on income to need of the omitted variable(s) and (2) the correlation between nonmetro residence and the excluded variable(s)." If both bias components have the same sign, then the negative effect of nonmetropolitan residence on *Y* will be understated. If the bias components have opposite signs, then the effect will be overstated. Fisher uses these

[4] A unique feature of this study is that household income is adjusted for differences in housing cost by state and by nonmetropolitan/metropolitan residence using Fair Market Rent data from the U.S. Department of Housing and Urban Development. This is a first step in accounting for cost of living differences between nonmetropolitan and metropolitan areas.

[5] State fixed-effects and dummy variables for each analysis year are included in equations (6)-(8) as explanatory variables.

facts about the nature of omitted variable bias to test two testable hypotheses. The first hypothesis is that "there is a concentration of people with low educational attainment in nonmetro areas." This hypothesis is tested by observing the effect of controlling for educational attainment on the nonmetropolitan effect. The second hypothesis is that "there is a concentration of people with unobserved individual attributes associated with having low income in nonmetro areas." This hypothesis is tested by observing the effect of controlling for individual fixed-effects on the estimated nonmetro coefficient.

Results testing the first hypothesis show that when controls for educational attainment are added, the coefficient on nonmetropolitan residence changes from -0.164 to -0.116, which translates to a thirty percent reduction in the metro income premium when education is controlled for. Low educational attainment, therefore, partly explains the nonmetropolitan effect, which lends support to the residential sorting hypothesis. Individuals with low levels of human capital appear to be sorting themselves to rural areas. Regarding the second hypothesis, results from Fisher's model show that when individual fixed-effects are accounted for (as in equation 8), the estimated coefficient on nonmetropolitan county increases from -0.116 to -0.262. This finding implies that "a householder living in a nonmetro area has income to need that is 15 percent lower than a householder residing in a metro place." Rather than supporting the residential sorting hypothesis, this "provides indirect evidence in favor of the structural condition hypothesis -- that otherwise identical individuals will have lower economic well-being in nonmetro compared with metro settings." Fisher concludes that results support both residential sorting and reduced economic opportunities as contributors to rural poverty.

Using the same data sample and strategy, Fisher (2007) estimates a second set of three equations, with indicator variables for nonmetro-to-metro and metro-to-nonmetro moves as explanatory variables. The author finds that nonmetro-to-metro moves have a positive but statistically insignificant effect on income-to-need. Fisher speculates that it may take time for individuals to realize gains from moving to a metro area. Metro-to-nonmetro moves, on the other hand, were estimated to have a negative effect on income-to-need.

This research builds on Fisher's (2005, 2007) papers by testing and attempting to correct for potential endogeneity between the migration decision and poverty risk and income. Empirical models of poverty risk and income are described in the following paragraphs. The strategies employed in this research exploits instrumental variables provided in the data.

2.1 Poverty Model

The poverty model investigates two questions: (1) what are the determinants of the migration decision and poverty and (2) what, if any, relationship is there between nonmetropolitan out-migration to a metropolitan county and poverty status.

$$\begin{pmatrix} p^* \\ m^* \end{pmatrix} = \begin{pmatrix} X_{t=2}\beta_1 + R_{t=2}\beta_2 + m\beta_3 \\ X_{t=1}\alpha_1 + R_{t=1}\alpha_2 + z\alpha_3 \end{pmatrix} + \begin{pmatrix} \varepsilon \\ \upsilon \end{pmatrix}, \quad \begin{pmatrix} \varepsilon \\ \upsilon \end{pmatrix} \sim NID\left(0, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix}\right) \tag{9}$$

This is known as a *recursive bivariate probit model* (Winkelmann and Boes 2006, p. 118).

The observed poverty status in period two and migration decision between periods one and two is indicated by two binary variables, p_i and m_i, respectively. As is standard for models with discrete variables, assume that there exists latent variables p_i^* and m_i^* that generate the observed values of zero or one for poverty and migration. The dependent variables p^* and m^* are defined as $n \times 1$ vectors of the latent variables p_i^* and m_i^*. $X_{t=1}$ is an an $n \times 12$ matrix of explanatory variables that are hypothesized to affect the migration decision. These variables are: age, age squared, white, male, family size, married, change in marital status, home owner, high school diploma, college, and postgraduate. The vector z is the instrumental variable, grew up rural. $X_{t=2}$ is an $n \times 10$ matrix of explanatory variables that are hypothesized to affect poverty status. These variables are age, age squared, white, male, disabled, married, high school diploma, college, and postgraduate. Regional characteristics in both models, $R_{t=1}$ and $R_{t=2}$ are $n \times 3$ matrices of regional characteristics thought to have an influence on the decision to migrate and on poverty risk: percentage change in total wage and salary employment as a measure of job growth, unemployment rates, and natural amenities.

The key to this model is ρ, the correlation between the error terms in the migration and poverty models. Both error terms, ε and υ, include unobserved characteristics that affect the migration decision and poverty outcomes. If $\rho \neq 0$, then estimation of the poverty model with observed migration as an explanatory variable will result in inconsistent estimates of the coefficients β_1, β_2 and β_3. The recursive bivariate probit model provides a useful tool to test the endogeneity between the two explained variables. Equation (9) is estimated via maximum likelihood, where ρ is a parameter in the likelihood function. Therefore, results from the estimation of (9) also yield an estimate of ρ, with an associated p value. If migration is endogenous with poverty then the null hypothesis that $\rho = 0$ will be rejected in favor of the alternative.

If there is evidence of endogeneity, then one solution is the inclusion of an instrumental variable in the migration model. The PSID provides a potential instrumental variable for this study. Respondents are asked whether or not they grew up in a rural area. This indicator variable is likely correlated with the migration decision of rural people – those who grew up in a rural area might have formed an attachment to rural areas due to quality of life, social networks, or other factors. Any unmeasured characteristics that influence growing up in a rural area, however, are unlikely to influence income or poverty status.

The recursive bivariate probit model is estimated using full maximum likelihood. Although the likelihood function is complex, maximum likelihood estimation results in consistent estimation of the coefficients and accurate standard errors (Wooldridge 2002, p. 477). Two-stage approaches that attempt to use the rationale of two-stage least squares are inappropriate for this model with binary explained variables. For example, in the first stage one might consider estimating a probit model of the migration decision and including predicted values as an explanatory variable in a second stage probit model of poverty status. Wooldridge (2002) refers to this as a 'forbidden regression,' which results in inconsistent estimated slope coefficients and inaccurate standard errors. Inconsistency stems from the binary nature of poverty and migration and the expectation operator. As opposed to two-stage least squares, the indicator function applied to migration and

poverty is nonlinear. Therefore, the expectation operator cannot be passed through the indicator function, which implies that consistency cannot be guaranteed. Inaccurate standard errors result from the fact that predicted values from the first stage are taken as given in the second stage, which results in standard errors that are too small.

2.2 Income Model

Consider a proposed income model shown in equation (10).

$$y = X_{t=2}\beta_1 + R_{t=2}\beta_2 + m\beta_3 + \varepsilon,\ \ \varepsilon \sim NID\left(0, \sigma^2 I\right) \tag{10}$$

This model seeks to estimate the effects of individual and household characteristics, regional characteristics and observed migration on income. Estimation of equation (10) via ordinary least squares (OLS) may result in inconsistent estimates of these effects if observed migration is endogenous with income. To see this, suppose that the migration choice is determined by the process given in equation (11).

$$m^* = X_{t=1}\alpha_1 + R_{t=1}\alpha_2 + \upsilon,\ \ \upsilon \sim NID\left(0, \sigma^2 I\right) \tag{11}$$

Note that the error term, *v*, is a random variable that in part captures the effects of unobserved factors influencing the migration decision. If these unobserved factors also explain income, i.e., $\text{Corr}\left(\upsilon'\varepsilon\right) \neq 0$, then OLS estimates of equation (10) will be inconsistent. A standard test for endogeneity in the context of a linear model is known as the Hausman test. Results of this test are presented in section 4.

Two-stage least squares (2SLS) is the standard econometric method for linear regressions when an explanatory variable is endogenous. It is a type of instrumental variable estimation, where a 'best' instrumental variable is obtained by regressing all exogenous variables and instrumental variables on the endogenous variable. This new instrumental variable, formed by the best fitting linear combination of exogenous and instrumental variables, takes the place of the endogenous variable in a second stage regression.

For the income model, the 2SLS model takes the following form:

$$m = X_{t=2}\alpha_1 + R_{t=2}\alpha_2 + z\alpha_3 + \upsilon,\ \ \upsilon \sim NID\left(0, \sigma^2 I\right) \tag{12}$$

$$y = X_{t=2}\beta_1 + R_{t=2}\beta_2 + \widehat{m}\beta_3 + \varepsilon,\ \ \varepsilon \sim NID\left(0, \sigma^2 I\right). \tag{13}$$

Equation (12) shows the first stage regression and equation (13) shows the second stage regression. Note that the first stage produces an instrumental variable, $\widehat{m}$, that is most highly correlated with observed migration, *m*. Similar to the poverty model, $X_{t=2}$ is an *n* × 10 matrix of explanatory variables that are hypothesized to affect income. Variables include age, age squared, white, male, disabled, married, high school diploma, college, and postgraduate. Regional characteristics are given by the matrix $R_{t=2}$, an *n* × 3 matrix of regional characteristics thought to have an influence on income: percentage change in total wage and salary employment as a measure of job growth, unemployment rates, and natural amenities.

2.3 Determinants of Migration, Poverty, and Income

Age and *age squared* are typically included in migration models. Migration propensity is nonlinear with respect to age. It peaks during the mid-twenties and declines over time (Plane 1993). Viewed in light of human capital theory, the expected future net benefits upon migration are likely to decrease as the potential length of time spent working decreases. *Education* is also likely to affect the migration decision. Migration propensities increase by education attainment (Greenwood 1999). Highly educated workers are more likely to migrate to find jobs that match their skill-level. Costa and Kahn (2000), for example, find that college-educated couples tend to move to cities to find work and enjoy cultural amenities. Life-cycle events, such as *marriage* and *divorce*, should affect place of residence, as people move in response to changes in their lives. While there is little theoretical work in the economics literature on the effect of *race* and *sex* on migration, empirical work shows there to be differences in the likelihood of migrating by race and sex (Wenk and Hardesty 1993). Another factor likely to affect the migration decision is the cost of moving – *family size* and *distance of move* are two variables that reflect the cost of a move. Larger families and longer distances moved should increase the costs of moving and therefore decrease the probability of moving, all else equal. Since the exact residential location is unknown for respondents to the PSID,

the distance of moving may be estimated from the county of origin centroid to the destination county centroid. *Home ownership* is also included as a variable that may influence the migration decision. Selling a home is a potential additional cost that may hinder migration.

Regional characteristics should influence the likelihood of moving as well. Of particular interest in this study is how differences in local labor market characteristics influence the migration behavior of individuals. For example, if the county of origin has a high *unemployment rate* relative to the destination county, then people may be pushed out of the county of origin in search of jobs. However, unemployment rates do not account for discouraged or underemployed workers (Weber *et al.* 2005). An alternative measure is *job growth*. Migrants and commuters often take the new jobs in counties with positive job growth, which suggests that a positive difference in the county of origin job growth rate from the destination county job growth rate reflects a pull factor in the migration decision (Renkow 2003). In addition to local labor market characteristics, *environmental amenities* have been shown to influence migration. The Economic Research Service of the U.S. Department of Agriculture provides a publicly available amenity index by county that may be used as an explanatory variable.

Many of the determinants of migration are also determinants of income and poverty status. For example, according to human capital theory, *education* is an investment that makes the worker more productive and thus earn more, all else equal (Becker 1993). An alternative view is that education may be a signal to employers of a potential employee's ability (Spence 1973). Both views expect a positive relationship between education and income.[6] *Age* and *age squared*, as a proxy for experience in the labor market, along with education have been shown to influence income as well (Mincer 1974). *Marriage* is a key determinant of income and poverty, reflecting the potential of two earners to contribute to household income, while a larger *family size* increases the cost of living and hence the risk of being poor. *Sex* and *race* may also affect income and

[6] Psacharopoulos and Patrinos (2004) provide empirical evidence of the returns to education.

poverty. Local labor market characteristics, such as the *unemployment rate* and *job growth* reflect the availability of employment and economic health of a locale.

3. Data

Data for this research comes from five sources. Individual and household characteristics come from the Panel Study of Income Dynamics (PSID), a longitudinal sample of households in the United States. Confidential geographic identifiers obtained from the PSID indicate the county of residence for each household, which is then used to obtain county-specific characteristics for each household. Of primary interest in this study are labor market characteristics and natural amenities. Total employment figures come from the Bureau of Economic Analysis' Regional Economic Information System (BEA-REIS), unemployment rates come from the Bureau of Labor Statistics (BLS), and an index of natural amenities provided by the U.S. Department of Agriculture - Economic Research Service is used to measure the effects of climate and topography on migration and economic outcomes.

Since this research is concerned with migration and economic outcomes, only those household heads that are working-age, between twenty-five and sixty-four years of age, were selected. This choice minimizes two potential problems. First, people younger than twenty-five years of age are more likely to be in school or college, perhaps moving between nonmetropolitan and metropolitan counties. These young people are not likely to be making location decisions expecting immediate economic benefits. Second, older people entering retirement age after sixty-four are also not likely to be making location decisions based on the expectation of increasing income or reducing poverty risk.

Figure 1 shows how three periods of rural working-age household heads were constructed. Each sample is a cross-section of the PSID that includes working-age (between the ages of 25 and 64 from $t = 1$ to $t = 2$) household heads who live in nonmetropolitan counties when $t = 1$. Sex and race is observed during the first period. In addition, a variable indicating the size of the location where the household head grew up is observed. Other variables, such as age, family size, and years of education are

observed in both the beginning and ending periods. Income and a needs threshold provided by the U.S. Census bureau is used to determine the economic outcomes of interest: income and poverty status. County of residence indicators are observed in all periods. These indicators help to identify labor market characteristics, the FMR index, and the ERS amenity index for the household head's county of residence. Two additional variables are constructed from the county identifiers for migrants: the number of years they have lived in a metropolitan county and the road distance travelled from the centroids of their origin and destination counties.

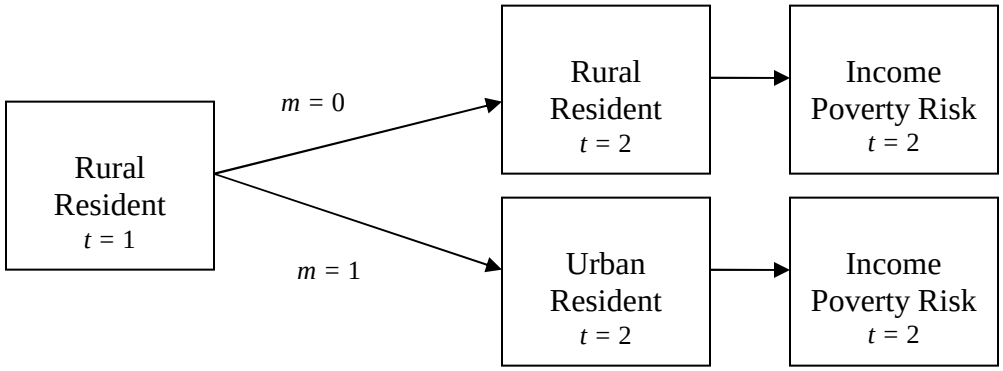

Figure 1

Tables 1 through 6 give summary statistics for variables used in the empirical section of this paper for three time periods: 1979 to 1985, 1985 to 1991, and 1991 to 1997. *Age* is measured at the start and end of each six-year period. Average ages are roughly 38 years at the beginning of the period and 44 years at the end of the period. Since each period only includes household heads in every year from the beginning of the period to the end, the vast majority of household heads in each period is male. A variable in the PSID that asks each household head his or her race is used to create a dummy variable for white household heads.

The educational attainment of each household head is determined from a variable recording the last grade attained. Indicator variables are constructed for those with 11 years or less of education (*less than high school diploma*), 12 years of education (*high*

school diploma), 13 years to 16 years of education (*college*), and 17 years or more of education (*postgraduate*). Education is observed at the beginning and end of each period, as is marital status, which is used to code an indicator variable indicating a *married* household head, and *family size*. The family size variable includes the total number of persons within the family unit. Two additional indicator variables are measured at the beginning of each period. The first, *home ownership*, indicates that the household head owns his or her home. The second, *grew up rural*, is used as the instrumental variable in this research. It takes the value one if the household head grew up on a farm, in a small town, or in a rural area.

Average total household income is observed at the beginning and end of each period. Average incomes are roughly $40,000 in each sample. Poverty rates for each period are also shown. For each period, household income at the end of the period is compared with 150% of the U.S. Census Bureau determined need for each household to determine whether or not the household head is poor. Labor market characteristics are captured by the unemployment rate and percentage change in total wage and salary employment facing each household head in a given year. Averages of the unemployment rate and various periods for which to calculate percentage changes in total employment are used to capture any persistent labor market characteristics.

4. Results

Empirical results from the strategy outlined in section 3 follow. The first sets of results come from probit models of the migration decision in each period. These models yield insights about the primary drivers of the decision to leave a rural county. The second set of results model the migration decision and poverty risk, and the third set of results model migration and income.

4.1 Migration Model

Tables 7, 8 and 9 present models of the decision to leave a nonmetropolitan county during three time periods, 1979-1985, 1985-1991 and 1991-1997, respectively, by

household heads between the ages of 25 and 64 during the entire period. The dependent variable, migration, is an indicator variable that is equal to one if the respondent moved to a metropolitan county during each six year interval. The first column of results shows estimated coefficients from the probit model with accompanying *p* values. The second column of results shows estimated marginal effects of each explanatory variable on the probability of migration with heteroskedasticity-robust standard errors.

Among the statistically significant explanatory variables, two family characteristics are estimated to have an effect on the probability of out-migration. During the late 1980s, changes in marital status between 1985 and 1991 are estimated to have a positive effect on the probability of migration. Marriage or divorce during this time period increased the probability of migrating by 4.6 percent relative to household heads that remained married or single, all else equal. This effect provides some evidence that life-cycle changes influence the decision to migrate. Between 1991 and 1997, family size was statistically significant at the 90% confidence level. Each additional family member was estimated to decrease the probability of moving by 1.3 percent, all else equal. This result also confirms the hypothesis that larger families are likely to have a higher cost of moving and are therefore less likely to do so.

Another variable that may reflect a higher cost to moving is home ownership. Households that own their homes have made an investment in the communities that they live in. Homeowners are likely to face higher costs of moving relative to renters because of the need to sell their home and perhaps find a new one in the destination location. Across all three time periods, home ownership had a negative effect on the probability of nonmetropolitan out-migration. Home ownership decreased the probability of out-migration by 6.5 percent between 1979 and 1985, 5.4 percent between 1985 and 1991, and 5.6 percent between 1991 and 1997.

Perhaps the most interesting findings regarding the effect of individual and household characteristics on migration are the affects of educational attainment. During the 1980s, educational attainment had highly statistically significant effects on migration. For the 1979 to 1985 time period, the marginal effect of a high school diploma was

estimated to be 0.049 and, for some college or a college degree, 0.103. All household heads with postgraduate education during this period migrated to metropolitan counties. For the 1985 to 1991 period, the marginal effects of a high school diploma, college and postgraduate education on the probability of migration were estimated to be 0.037, 0.141 and 0.231. While the effect of a high school diploma decreased during the late 1980s relative to the early 1980s, the effect of a college education increased. In contrast, educational attainment during the 1990s seems to have had little to no effect on the probability of migrating.

Finally, the instrumental variable indicating whether or not the household head grew up in a rural area is statistically significant at the 90% level in the 1979 to 1985 period and the 1991 to 1997 period and at the 95% level in the 1985 to 1991 period. All three estimated coefficients are negative in sign, indicating that growing up in a rural area decreases the probability of moving to a metropolitan county by roughly 3 percent in every period, all else equal.

Three key regional characteristics are considered in this study. Two variables reflect characteristics of local labor markets, a potential driver of the migration decision. The first of these variables is the percentage change in total wage and salary employment in the county of origin. The second labor market variable is average unemployment in the county of origin. Values from an index of natural amenities by county are also included as an explanatory variable to measure the effects of the landscape and climate on the migration decision.

During the early 1980s, the measured characteristics of place appeared to have little statistically significant effect on the probability of migrating. In contrast, during the late 1980s, labor market characteristics played an important role in determining the probability of nonmetropolitan out-migration. Household heads who resided in counties with high unemployment rates were estimated to be more likely to move to a metropolitan county. Higher unemployment rates indicate that a particular county has an excess supply of labor. It is not surprising, then, to find that household heads would leave to find employment elsewhere. What is surprising, however, is that during this

same time period household heads from counties with higher percentage changes in total employment *also* had a higher probability of out-migration, all else equal. Higher growth in employment should reflect labor markets with a high demand for labor. Presumably, people from these counties should not have to leave to find employment. During the 1990s, the effects of these labor market characteristics lose their explanatory power as in the early 1980s.

Natural amenities were estimated to have a positive and statistically significant effect on the probability of migrating to a metropolitan area only in the 1990s. An increase in the natural amenities index by 1.0 was estimated to increase the probability of migrating to a metropolitan county by 1.3 percent, all else equal. Since natural amenities are assumed to be positively related to utility, it is surprising to find that people living in high amenity nonmetropolitan counties were more likely to leave for metropolitan counties during the 1990s.

4.2 Migration and Poverty Results

Tables 10 through 12 present the migration and poverty bivariate probit models. Many of the individual and household determinants take expected signs in the estimated models. Race, accounted for by the 'white' indicator variable, indicates a strong and statistically significant effect for white household heads on poverty. Being white reduced the probability of being poor by roughly 22 percentage points in the 1979 to 1985 period, 24 percentage points in the 1985 to 1991 period, and 22 percentage points in the 1991 to 1997 period, all else equal. Being a male household head was estimated to have a statistically significant effect on poverty in the 1985 to 1991 and 1991 to 1997 periods, all else equal, reducing the probability of being poor by 17 and 11 percentage points, respectively.

Disability was estimated to increase the probability of being poor in all three periods. Being disabled was estimated to increase the probability of poverty by 16, 7 and 14 percentage points in the 1979 to 1985, 1985 to 1991 and 1991 to 1997 periods, respectively. The traditional empirical finding that marital status is negatively related to

poverty risk is also found in this study. Having a married household head was estimated to reduce the probability of being poor by 10 percentage points in the 1979 to 1985 period, 10 percentage points in the 1985 to 1991 period, and 7 percentage points in the 1991 to 1997 period, all else equal.

Education was estimated to have a strong effect on reducing the probability of being poor. Having a high school diploma, some college or college degree, and postgraduate education were estimated to reduce the probability of being poor by 15, 23 and 21 percentage points, respectively, in the 1979 to 1985 period. However, these effects were estimated to be lower in other time periods. In the 1985 to 1991 period, for example, the effects of schooling decreased to 14, 24, and 20, all else equal. The 1991 to 1997 period showed the lowest estimated effects of a high school diploma, some college or college degree, and postgraduate education. These levels of schooling were estimated to decrease the probability of being poor by 6, 16 and 14 percentage points, all else equal.

There is sufficient empirical evidence for an effect of out-migration only in the 1979 to 1985 period. The effect of migration was estimated to be equal to 0.163 in this period, indicating that all else equal, migrating out of a nonmetropolitan county to a metropolitan county increased the probability of being poor by 16 percentage points.

Among all three periods, labor market characteristics seem to play a role only in the 1979 to 1985 period. In this period, an increase in the percentage change in total employment from 1984 to 1985 by one percentage point reduced the probability of being poor in 1985 by 1.7 percentage points, all else equal. Similarly, an increase in the average unemployment rate between 1983 and 1985 by one percentage point increased the probability of being poor in 1985 by 0.4 percentage points, all else equal. Labor market variables in the 1985 to 1991 and 1991 to 1997 periods did not carry sufficient statistical evidence to indicate that they were different from zero. This was also true for all three time periods with respect to natural amenities.

Finding good instrumental variables is a difficult task. The two conditions for good instrumental variables are as follows. First, the proposed instrumental variable must be correlated with the suspected endogenous explanatory variable. Some evidence

for this criterion comes from the migration model: the instrumental variable should be statistically significant. Second, this instrumental variable must also be uncorrelated with the error term in the poverty model.

Table 13 shows the estimated coefficients and associated *p* values of the proposed instrumental variables in the probit poverty model. To satisfy the second condition of a well-performing instrumental variable, these results should indicate that the proposed instrumental variable is not a statistically significant determinant of poverty. This criterion was met for every period, with varying degrees of confidence. The instrumental variable *grew up in a city* is the weakest case, with a *p*-value of 0.148 in the poverty model

Estimation of a bivariate probit model provides a useful tool for testing the endogeneity of an explanatory variable. In the process of estimating the coefficients associated with each explanatory variable, the maximum-likelihood estimation method also estimates the correlation coefficient between the error terms in the two equations. For example, in this research, estimation of the migration and poverty probit models simultaneously yields an estimate of ρ, a measure of the correlation between the error terms in the migration and poverty models. If migration is endogenous with poverty, then $\rho \neq 0$. If migration is not endogenous with poverty, then $\rho = 0$ and the two models may be estimated separately without the use of an instrumental variable.

Table 14 shows estimates of ρ for the poverty model in each period. Accompanying these estimates of ρ are the associated robust standard errors. The next column presents Wald statistics with associated *p*-values to test the null hypothesis that $\rho = 0$. There are two instances where the null hypothesis is rejected in favor of the alternative at the 90% level of confidence. In the 1979 to 1985 period, migration appears to be endogenous with poverty. For the instances where migration is not determined to be endogenous with poverty, both the bivariate probit model and separate estimations of the migration decision and poverty via an ordinary probit model will yield consistent estimates.

4.3 Migration and Income Results

Tables 15 through 17 present the income models. Many of the individual and household characteristics in the second stage income models have expected signs and are statistically significant. As theory would suggest, age, acting as a proxy for experience in the labor market, has a positive effect on total household income in two of three periods (Mincer 1974). This positive effect is tempered by a negative age squared effect, implying that the positive effect of age on income decreases in magnitude over time. The effect of age increases between the 1979 to 1985 period and the 1985 to 1991 period. In the 1991 to 1997 period, age and age squared have the opposite signs that theory suggests, although these coefficients are not deemed to be significantly different from zero at the 90% level of confidence.

Race has a statistically significant effect on income. The marginal effect of being white or Caucasian was roughly equal to $8,172 in the 1979 to 1985 period, $10,103 in the 1985 to 1991 period, and $13,026 in the 1991 to 1997 period. This may reflect discrimination in the labor market against household heads of other races or ethnicities (Schiller 2004, pp. 190-207). Disability also was found to decrease income. All else equal, household heads who are disabled had much lower incomes. For example, being disabled in the 1979 to 1985 period reduced income by $10,772. This effect was reduced in the 1985 to 1991 period to $6,740, but increased to $13,619 in the 1991 to 1997 period. Perhaps reflecting the possibility of an additional earner, household heads that were married had significantly higher incomes. All else equal, marriage increased income by $18,356, $16,114, and $19,703, for each period, chronologically. Sex was only statistically significant in the second period. Male household heads in the 1985 to 1991 period earned roughly $8,000 more than female household heads, all else equal.

The effect of human capital, reflected by educational attainment in all three periods had expected effects. In economic theory, education is theorized as an investment that either increases productivity (Becker 1993), acts as a signal in the labor market of ability (Spence 1973), or both. In comparison to the reference group, household heads without a high school diploma, those with a high school diploma, some

college or college degree, or postgraduate education, had substantially higher incomes, all else equal. Having some college education or a college degree in the 1979 to 1985 sample was the exception to the rule. In that case, the effect was not statistically different from zero at the 90% confidence level. The effect of a high school diploma, all else being equal, was estimated to be $7,747 in the 1979 to 1985 period, $6,474 in the 1985 to 1991 period, and $9,125 in the 1991 to 1997 period. Postgraduate education was estimated to have very large effects on total household income. All else equal, the marginal effect of postgraduate education on total household income was estimated at $20,076, $38,117 and $40,864, chronologically.

Of central interest in this study is the effect of the migration decision on income. If the instrumental variables selected in the first stage of estimation are good instrumental variables, then the estimated effect of migration on income should be unbiased. In all three periods, the estimated coefficients for migration have associated *p*-values that indicate that if the instrumental variables selected are working properly, then the decision to migrate from a nonmetropolitan county to a metropolitan county has no discernable effect on income.

Regional characteristics included as explanatory variables in the 2SLS income models percentage changes in total wage and salary employment, county unemployment rates averaged over time, and natural amenities. As in the poverty models, the particular length of time chosen for the employment and unemployment figures are based on which combination provides the best fit, measured by adjusted R^2. Percentage changes in total wage and salary employment and unemployment rates were found to be statistically insignificant in all three periods.

Natural amenities were estimated to have some explanatory power in the 1979 to 1985 period. In this period, an increase in the natural amenities scale by one was estimated to decrease income by $1,577, all else equal. In contrast, the natural amenities scale was estimated to be statistically insignificant in the 1985 to 1991 and the 1991 to 1997 periods.

Establishing the validity of instrumental variables used in a 2SLS model is a difficult task (Murray 2006). There is no single, definitive approach to establish the validity of an instrumental variable. However, in addition to arguments based on economic theory and intuition, there are some ways to empirically assess the suitability of proposed instrumental variables.

Similar to the case with the poverty models, there is at least one instrumental variable in each period that is statistically significant in the migration model. Empirical evidence relating to the second condition, that the instrumental variable be uncorrelated with the error term, is provided by including the potential instrumental variables in the income equation. Table 18 provides these estimated coefficients and associated *p*-values. Note that each instrumental variable is statistically insignificant in each income equation by period at the 90% level of confidence.

More evidence is provided by way of a popular test in the applied economics literature. Tests of over-identifying restrictions, attributed to Sargan (1958), tests whether any of the proposed instrumental variables are invalid, while assuming that at least one of the instrumental variables used is valid to identify the second stage equation exactly. This test is well-suited for a plethora of proposed instrumental variables with varying degrees of validity, since each additional instrumental variable yields an additional over-identifying restriction that in turn reduces the increase in standard errors that comes from using a two-stage approach versus a single equation (Murphy 2006). The Sargan test statistic is equal to nR^2, where R^2 comes from a regression of the 2SLS residuals on all the proposed instrumental variables. It follows a chi-squared distribution with degrees of freedom equal to the degree of over-identification. The null hypothesis is that at least one of the instrumental variables is valid. Table 19 presents values of the Sargan statistic for each period. In all cases there is not sufficient evidence to reject the null hypothesis that at least one of the instrumental variables used in each model is valid.

The 2SLS models may also be used to test for the exogeneity of the migration decision with respect to income. Results for the Durbin-Wu-Hausman test are shown in the last column of Table 5.15 for the income models. In the 1979 to 1985 period, the

income model shows a statistically significant value for the Durbin-Wu-Hausman test statistic at the 90% level of confidence. The null hypothesis is rejected in favor of the alternative in this case, indicating that there is sufficient statistical evidence that the observed migration decision in this period is endogenous with income. In contrast, both income models for the 1985 to 1991 and 1991 to 1997 periods have statistically insignificant values for the Durbin-Wu-Hausman test. This implies that the differences between the 2SLS and OLS estimates are not significantly different from zero. In these cases, the observed migration decision does not appear to be endogenous with income.

5. Conclusions and Implications

Migration is complex – an individual or household decision made with many factors at play. The empirical research on the causes of migration has, on balance, found evidence that economic incentives play a role in determining where people move from and to. In the cases where the link between migration and economic incentives is weak or nonexistent, it is not clear whether this lack of evidence reflects reality, or rather reflects the limitations of the data and/or methods used (Greenwood 1997). This study has attempted to use a national sample of rural people to draw broad conclusions about the forces that push and pull people from rural to urban communities and what effects this move might have on poverty and income while controlling for all other relevant or observable factors.

In terms of data limitations, it will be important to check these findings using a similar method with another longitudinal data set such as NLSY79. In a study that included estimating the effects of rural out-migration, Glaeser and Maré (2001) compare estimates from the PSID and NLYS79. Estimates from the PSID are smaller in magnitude and have less statistical significance than in NLSY79. Combined with Fisher's (2007) finding of little to no effect of rural out-migration using PSID data, it will be necessary to determine whether the results presented here are robust to data source.

Turning to the empirical results, there are some common themes in all three periods. First, it is clear that educational attainment plays a critical role in determining

whether or not a working-age rural household head will stay or leave their rural community. This may be due to expected higher returns to educational attainment in urban areas and related to the lack of jobs that match the skills of those with college or postgraduate education (Domina 2006, Borjas, Bronars, and Trejo 1992). Second, another strong determinant of rural to urban migration is home ownership. In all three periods, household heads who owned their home were much more likely to stay in rural communities. This is a finding that warrants further study. Is the promotion of rural home ownership a way to prevent out-migration from rural communities? Third, although the effects of labor markets on migration behavior were estimated to be weak and nonexistent in some cases, economic theory clearly indicates that labor market characteristics should matter. The mixed evidence found in this study with respect to labor market characteristics may be due to a lack of precision, i.e., finding the relevant point in time in which to measure labor market characteristics for each individual.

Turning next to the income results, many explanatory variables had the expected sign and significance. Educational attainment, in particular, was a strong determinant of income. Perhaps the most striking finding was that, all else equal, migration out of a rural area had no discernable effect on income. Indeed, the evidence found in this study suggests that observed migration was exogenous with income in all three periods. During this time it appears that the most powerful predictor of one's household income was the level of one's human capital, regardless of where that capital was used.

For poverty risk, educational attainment was yet again a key factor. Household heads with higher levels of educational attainment had significantly lower risk of being poor, all else equal. The relationship between rural out-migration and poverty was less straightforward. Migration was tested to be endogenous with poverty in one period only: 1979 to 1985. In this period, rural out-migration increased the probability of being poor. In the more recent periods, rural out-migration had no discernable effect on the probability of being poor, mirroring income. Clearly, time is critically important when evaluating the efficacy of rural out-migration. Additional analysis of the underlying trends in the rural economy during this period would be fruitful.

Table 1. Descriptive Statistics, 1979 to 1985 Period (1 of 2)

Variable	*Mean or Frequency*	*Std. Dev.*	*Min*	*Max*
Age (1979)	38.31	10.10	25	59
Age (1985)	44.32	10.09	25	64
Male (%)	86.54		0	1
White (%)	73.21		0	1
Education (1979, %)				
Less than High School Diploma	38.29		0	1
High School Diploma	35.34		0	1
College	26.37		0	1
Postgraduate	0		0	0
Education (1985, %)				
Less than High School Diploma	36.47		0	1
High School Diploma	33.66		0	1
College	22.72		0	1
Postgraduate	7.15		0	1
Married (1979, %)	78.12		0	1
Married (1985, %)	75.60		0	1
Family Size (1979)	3.56		1	12
Family Size (1985)	3.29		1	9
Home Ownership (1979, %)	69.56		0	1
Grew Up Rural (1979)	51.61		0	1
Income (1979, 1997 $)	44,860.12	31,993.05	2.21	374,374.00
Income (1985, 1997 $)	42,337.12	31,715.51	1.49	324,291.10
Poor (1985, %)	23.98		0	1
Migrants (1979 to 1985, %)	8.27		0	1

Source: Panel Study of Income Dynamics

Table 2. Descriptive Statistics, 1979 to 1985 Period (2 of 2)

Variable	*Mean or Frequency*	*Std. Dev.*	*Min*	*Max*
Unemployment Rate 1979	6.09	2.25	1.3	14.90
Average 1977 to 1979	6.18	2.21	1.57	20.60
Average 1974 to 1979	---	---	---	---
Unemployment Rate 1985	8.57	3.20	2.10	20.60
Average 1983 to 1985	9.40	3.35	2.27	23.73
Average 1980 to 1985	9.27	3.11	2.50	19.82
% Chg Employment 1978 - 79	2.80	3.76	-12.28	47.54
% Chg 1977 to 1979	6.78	6.37	-12.67	75.66
% Chg 1974 to 1979	14.11	11.73	-25.86	92.65
% Chg Employment 1984 - 85	0.98	3.69	-22.15	15.09
% Chg 1983 to 1985	4.59	6.61	-23.17	33.47
% Chg 1980 to 1985	3.01	9.43	-49.74	35.40

Source: Panel Study of Income Dynamics

Table 3. Descriptive Statistics, 1985 to 1991 Period (1 of 2)

Variable	*Mean or Frequency*	*Std. Dev.*	*Min*	*Max*
Age (1985)	38.35	9.34	25	58
Age (1991)	44.36	9.40	30	64
Male (%)	84.72		0	1
White (%)	69.96		0	1
Education (1985, %)				
Less than High School Diploma	29.40		0	1
High School Diploma	38.25		0	1
College	24.78		0	1
Postgraduate	7.57		0	1
Education (1991, %)				
Less than High School Diploma	29.40		0	1
High School Diploma	38.25		0	1
College	24.78		0	1
Postgraduate	7.57		0	1
Married (1985, %)	72.02		0	1
Married (1991, %)	72.14		0	1
Family Size (1985)	3.32	1.49	1	9
Family Size (1991)	3.19	1.49	1	11
Home Ownership (1985, %)	66.75		0	1
Grew Up Rural (1985)	45.83		0	1
Income (1985, 1997 $)	40,158.26	28,286.90	1.49	324,291.10
Income (1991, 1997 $)	43,565.43	33,014.39	1.18	372,753.80
Poor (1991, %)	23.62		0	1
Migrants (1985 to 1991, %)	6.93		0	1

Source: Panel Study of Income Dynamics

Table 4. Descriptive Statistics, 1985 to 1991 Period (2 of 2)

Variable	*Mean or Frequency*	*Std. Dev.*	*Min*	*Max*
Unemployment Rate 1985	8.74	3.38	2.80	34
Average 1983 to 1985	9.61	3.52	3.13	34.87
Average 1980 to 1985	9.43	3.24	2.63	30.52
Unemployment Rate 1991	7.34	2.74	1.5	26.10
Average 1989 to 1991	6.56	2.47	1.63	24.57
Average 1986 to 1991	7.01	2.75	2.47	23.37
% Chg Employment 1984 – 85	0.60	3.53	-22.15	17.72
% Chg 1983 to 1985	4.01	6.02	-23.17	33.47
% Chg 1980 to 1985	2.75	9.95	-49.74	42.17
% Chg Employment 1990 – 91	-0.29	3.48	-13.23	17.32
% Chg 1989 to 1991	1.78	4.94	-10.96	31.92
% Chg 1986 to 1991	9.74	9.90	-12.07	60.81

Source: Panel Study of Income Dynamics

Table 5. Descriptive Statistics, 1991 to 1997 Period (1 of 2)

Variable	*Mean or Frequency*	*Std. Dev.*	*Min*	*Max*
Age (1991)	38.79	8.90	25	59
Age (1997)	44.64	8.86	29	64
Male (%)	87.27		0	1
White (%)	79.46		0	1
Education (1991, %)				
Less than High School Diploma	17.83		0	1
High School Diploma	46.69		0	1
College	29.03		0	1
Postgraduate	6.45		0	1
Education (1997, %)				
Less than High School Diploma	18.00		0	1
High School Diploma	46.18		0	1
College	29.37		0	1
Postgraduate	6.45		0	1
Married (1991, %)	73.68		0	1
Married (1997, %)	72.33		0	1
Family Size (1991)	3.28	1.42	1	9
Family Size (1997)	3.07	1.44	1	9
Home Ownership (1991, %)	71.31		0	1
Grew Up Rural (1991)	38.71		0	1
Income (1991, 1997 $)	44,473.89	32,096.99	1.18	372,753.80
Income (1997, 1997 $)	46,742.85	50,226.47	0	1,000,000
Poor (1997, %)	17.15		0	1
Migrants (1991 to 1997, %)	6.96		0	1

Source: Panel Study of Income Dynamics

Table 6. Descriptive Statistics, 1991 to 1997 Period (2 of 2)

Variable	*Mean or Frequency*	*Std. Dev.*	*Min*	*Max*
Unemployment Rate in 1991	7.42	2.73	1.5	16.5
Average 1989 to 1991	6.70	2.42	1.63	16.53
Average 1986 to 1991	7.11	2.61	2.47	19.18
Unemployment Rate in 1997	5.47	2.65	1.7	13.8
Average 1995 to 1997	5.73	2.62	1.67	14.5
Average 1992 to 1997	6.25	2.58	1.73	15.23
% Chg Employment 1990 – 91	-0.29	3.30	-13.23	11.72
% Chg 1989 to 1991	1.48	4.86	-10.52	25.84
% Chg 1986 to 1991	9.46	10.22	-19.21	65.87
% Chg Employment 1996 – 97	1.24	2.45	-4.57	11.33
% Chg 1995 to 1997	2.44	4.36	-9.84	18.41
% Chg 1992 to 1997	11.71	10.16	-18.76	66.16

Source: Panel Study of Income Dynamics

Table 7. Probit Migration Model Results: 1979-1985[1]

Variable[2]	*Est. Coefficient* (*p-value*)	*Marg. Effect* (*S.E.*)[3]
Age	0.031 (0.679)	0.004 (0.009)
Age Squared	-0.001 (0.562)	-0.000 (0.000)
White	0.171 (0.398)	0.019 (0.021)
Male	-0.077 (0.810)	-0.010 (0.042)
Family Size	0.081 (0.178)	0.010 (0.007)
Married	-0.005 (0.987)	-0.006 (0.035)
Change Marital Status	0.290 (0.203)	0.042 (0.039)
Home Owner	-0.472 (0.006)	-0.065 (0.027)
High School Diploma	0.372 (0.081)	0.049 (0.030)
College	0.672 (0.003)	0.103 (0.042)
Postgraduate[4]	---	---
Grew Up Rural	-0.272 (0.072)	-0.033 (0.019)
Natural Amenities	0.035 (0.300)	0.004 (0.004)
% Δ in Total Employment, 1977 to 1979[5]	0.013 (0.138)	0.002 (0.001)
Average Unemployment Rate, 1977 to 1979	0.041 (0.231)	0.005 (0.004)
Constant	-2.428 (0.087)	---

Source: Panel Study of Income Dynamics

Notes:

[1]Period includes 713 working-age (25 - 64) household heads that lived in a nonmetropolitan county in 1979. The pseudo R^2 for this model is 0.11 and the Wald statistic ($\sim \chi^2_{14}$) is 45.66.

[2]All variables except *change marital status* are observed in 1979. The variable *change marital status* takes the value 1 if the household head was married, divorced or separated between 1979 and 1985.

[3]Marginal effects (Marg. Effect) are calculated as (dy/dx)/Pr(Migration), where for indicator variables dy/dx is for a discrete change from 0 to 1. Standard errors (S.E.) are Huber-White heteroskedasticity-robust.

[4]Postgraduate education perfectly predicts migration in this sample and is therefore dropped as an explanatory variable.

[5]Total wage and salary employment

Table 8. Probit Migration Model Results: 1985 - 1991[1]

Variable[2]	*Est. Coefficient* (*p-value*)	*Marg. Effect* (*S.E.*)[3]
Age	0.010 (0.910)	0.001 (0.007)
Age Squared	-0.000 (0.959)	-0.000 (0.000)
White	0.040 (0.825)	0.003 (0.014)
Male	0.150 (0.594)	0.011 (0.019)
Family Size	0.005 (0.948)	0.000 (0.006)
Married	-0.355 (0.185)	-0.036 (0.030)
Change Marital Status	0.419 (0.060)	0.046 (0.031)
Home Owner	-0.551 (0.001)	-0.054 (0.020)
High School Diploma	0.409 (0.097)	0.037 (0.025)
College	1.054 (0.000)	0.141 (0.045)
Postgraduate	1.236 (0.000)	0.231 (0.082)
Grew Up Rural	-0.379 (0.035)	-0.030 (0.014)
Natural Amenities	0.012 (0.763)	0.001 (0.003)
% Δ in Total Employment, 1983 to 1985[5]	0.026 (0.070)	0.002 (0.001)
Average Unemployment Rate, 1984 to 1985	0.049 (0.037)	0.004 (0.002)
Constant	-2.522 (0.129)	---

Source: Panel Study of Income Dynamics
Notes:
[1]Period includes 779 working-age (25 - 64) household heads that lived in a nonmetropolitan county in 1985. The pseudo R^2 for this model is 0.19 and the Wald statistic ($\sim \chi^2_{15}$) is 68.03.
[2]All variables except *change marital status* are observed in 1985. The variable *change marital status* takes the value 1 if the household head was married, divorced or separated between 1985 and 1991.
[3]Marginal effects (Marg. Effect) are calculated as (dy/dx)/Pr(Migration), where for indicator variables dy/dx is for a discrete change from 0 to 1. Standard errors (S.E.) are Huber-White heteroskedasticity-robust.
[4]Total wage and salary employment

Table 9. Probit Migration Model Results: 1991-1997[1]

Variable[2]	*Est. Coefficient* (*p-value*)	*Marg. Effect* (*S.E.*)[3]
Age	-0.095 (0.237)	-0.010 (0.008)
Age Squared	0.001 (0.231)	0.000 (0.000)
White	0.162 (0.524)	0.015 (0.022)
Male	0.133 (0.688)	0.012 (0.029)
Family Size	-0.124 (0.091)	-0.013 (0.008)
Married	0.108 (0.692)	0.011 (0.025)
Change Marital Status	0.166 (0.538)	0.019 (0.034)
Home Owner	-0.461 (0.018)	-0.056 (0.027)
High School Diploma	-0.027 (0.912)	-0.003 (0.025)
College	0.121 (0.646)	0.013 (0.029)
Postgraduate	-0.097 (0.814)	-0.009 (0.037)
Grew Up Rural	-0.317 (0.098)	-0.031 (0.018)
Natural Amenities	0.128 (0.000)	0.013 (0.003)
% Δ in Total Employment, 1989 to 1991[4]	0.011 (0.466)	0.001 (0.002)
Average Unemployment Rate, 1989 to 1991	-0.013 (0.667)	-0.001 (0.003)
Constant	0.771 (0.632)	---

Source: Panel Study of Income Dynamics

Notes:

[1]Period includes 589 working-age (25 - 64) household heads that lived in a nonmetropolitan county in 1991. The pseudo R^2 for this model is 0.13 and the Wald statistic ($\sim \chi^2_{15}$) is 41.09.

[2]All variables except *change marital status* are observed in 1991. The variable *change marital status* takes the value 1 if the household head was married, divorced or separated between 1991 and 1997.

[3]Marginal effects (Marg. Effect) are calculated as (dy/dx)/Pr(Migration), where for indicator variables dy/dx is for a discrete change from 0 to 1. Standard errors (S.E.) are Huber-White heteroskedasticity-robust.

[4]Total wage and salary employment

Table 10. Bivariate Probit Model of Poverty: 1979-1985[1]

	Migration	*Poverty*	
Variable[2]	*Est. Coeff. (p-value)*[3]	*Est. Coeff. (p-value)*[3]	*M.E.*
Age	0.039 (0.571)	-0.073 (0.262)	-0.021
Age Squared	-0.001 (0.463)	0.001 (0.244)	0.000
White	0.278 (0.167)	-0.686 (0.000)	-0.219
Male	0.003 (0.991)	-0.214 (0.295)	-0.065
Family Size	0.116 (0.036)	---	---
Disabled	---	0.512 (0.000)	0.163
Married	-0.096 (0.699)	-0.316 (0.053)	-0.096
Change Marital Status	0.320 (0.116)	---	---
Home Owner	-0.486 (0.002)	---	---
High School Diploma	0.374 (0.065)	-0.569 (0.000)	-0.150
College	0.630 (0.003)	-1.058 (0.000)	-0.232
Postgraduate	---	-1.176 (0.000)	-0.205
Natural Amenities	0.039 (0.215)	-0.006 (0.815)	-0.002
% Δ in Total Employment, 1977 to 1979[4]	0.009 (0.227)	---	---
% Δ in Total Employment, 1984 to 1985[4]	---	-0.059 (0.000)	-0.017
Average Unemployment Rate, 1977 to 1979	0.034 (0.287)	---	---
Average Unemployment Rate, 1983 to 1985	---	0.015 (0.401)	0.004
Constant	-2.718 (0.053)	1.870 (0.223)	---
Grew Up Rural	-0.292 (0.030)	---	---
Migration	---	2.144 (0.002)	0.715

Source: Panel Study of Income Dynamics

Notes:

[1]Period includes 713 working-age (25 - 64) household heads that lived in a nonmetropolitan county in 1979. The Wald statistic for this model ($\sim\chi^2_{27}$) is 236.40. The log pseudo-likelihood is equal to -475.07. Correlation between the poverty and migration models is estimated to be $\rho =$ -0.83, with robust standard error equal to 0.23.

[2]All explanatory variables in the migration model except *changed marital status* are measured in 1979. All explanatory variables in the poverty model are measured in 1985.

[3]This model is estimated with Huber-White heterosckedasticity-robust standard errors.

[4]Total wage and salary employment

Table 11. Bivariate Probit Model of Poverty: 1985-1991[1]

	Migration	*Poverty*	
Variable[2]	*Est. Coeff. (p-value)*[3]	*Est. Coeff. (p-value)*[3]	*M.E.*
Age	-0.014 (0.876)	-0.089 (0.150)	-0.023
Age Squared	0.000 (0.799)	0.001 (0.174)	0.000
White	0.102 (0.581)	-0.797 (0.000)	-0.235
Male	0.288 (0.297)	-0.568 (0.003)	-0.173
Family Size	0.045 (0.543)	---	---
Disabled	---	0.255 (0.069)	0.071
Married	-0.483 (0.053)	-0.364 (0.026)	-0.102
Change Marital Status	0.356 (0.104)	---	---
Home Owner	-0.601 (0.001)	---	---
High School Diploma	0.405 (0.097)	-0.588 (0.000)	-0.144
College	1.017 (0.000)	-1.220 (0.000)	-0.235
Postgraduate	1.212 (0.000)	-1.588 (0.000)	-0.203
Natural Amenities	0.006 (0.868)	0.018 (0.543)	0.005
% Δ in Total Employment, 1983 to 1985[4]	0.024 (0.099)	---	---
% Δ in Total Employment, 1986 to 1991[4]	---	-0.005 (0.396)	-0.001
Average Unemployment Rate, 1984 to 1985	0.053 (0.025)	---	---
Unemployment Rate, 1991	---	-0.027 (0.258)	-0.007
Constant	-2.538 (0.131)	3.261 (0.024)	---
Grew Up City	0.713 (0.000)	---	---
Migration	---	1.167 (0.165)	0.407

Source: Panel Study of Income Dynamics

Notes:

[1]Period includes 779 working-age (25 - 64) household heads that lived in a nonmetropolitan county in 1985. The Wald statistic for this model ($\sim\chi^2_{28}$) is 278.83. The log pseudo-likelihood is equal to -463.05. Correlation between the poverty and migration models is estimated to be $\rho =$ -0.534, with robust standard error equal to 0.480.

[2]All explanatory variables in the migration model except *changed marital status* are measured in 1985. All explanatory variables in the poverty model are measured in 1991.

[3]This model is estimated with Huber-White heterosckedasticity-robust standard errors.

[4]Total wage and salary employment

Table 12. Bivariate Probit Model of Poverty: 1991-1997[1]

Variable[2]	*Migration* *Est. Coeff. (p-value)*[3]	*Poverty* *Est. Coeff. (p-value)*[3]	*M.E.*
Age	-0.095 (0.222)	-0.056 (0.516)	-0.012
Age Squared	0.001 (0.244)	0.000 (0.613)	0.000
White	0.100 (0.750)	-0.818 (0.007)	-0.222
Male	0.117 (0.714)	-0.425 (0.061)	-0.107
Family Size	-0.167 (0.032)	---	---
Disabled	---	0.543 (0.047)	0.141
Married	0.071 (0.812)	-0.315 (0.065)	-0.073
Change Marital Status	0.262 (0.347)	---	---
Home Owner	-0.179 (0.772)	---	---
High School Diploma	-0.098 (0.704)	-0.290 (0.077)	-0.062
College	0.008 (0.982)	-0.929 (0.026)	-0.162
Postgraduate	-0.193 (0.691)	-1.236 (0.025)	-0.139
Natural Amenities	0.128 (0.000)	0.067 (0.256)	0.014
% Δ in Total Employment, 1989 to 1991[4]	0.016 (0.336)	---	---
% Δ in Total Employment, 1992 to 1997[4]	---	-0.011 (0.177)	-0.002
Average Unemployment Rate, 1989 to 1991	-0.016 (0.597)	---	---
Average Unemployment Rate, 1996 to 1997	---	-0.039 (0.258)	-0.008
Constant	1.033 (0.538)	2.528 (0.170)	---
Grew Up Rural	-0.344 (0.066)	---	---
Migration	---	-1.566 (0.193)	-0.153

Source: Panel Study of Income Dynamics

Notes:

[1]Period includes 589 working-age (25 - 64) household heads that lived in a nonmetropolitan county in 1991. The Wald statistic for this model ($\sim\chi^2_{28}$) is 183.72. The log pseudo-likelihood is equal to -333.65. Correlation between the poverty and migration models is estimated to be $\rho =$ 0.726, with robust standard error equal to 0.739.

[2]All explanatory variables in the migration model except *changed marital status* are measured in 1991. All explanatory variables in the poverty model are measured in 1997.

[3]This model is estimated with Huber-White heterosckedasticity-robust standard errors.

[4]Total wage and salary employment

Table 13. Instrumental Variables in the Poverty Models

	Poverty *Est. Coeff.* (*p-value*)
Period: 1979 – 1985	
Grew Up Rural	0.028 (0.817)
Period: 1985 – 1991	
Grew Up City	0.285 (0.148)
Period: 1991 – 1997	
Grew Up Rural	0.043 (0.777)

Table 14. Test of Exogeneity

	Est. Correlation Coefficient (S.E.)	*Wald Statistic (p-value)*
Poverty		
1979 – 1985	-0.826 (0.227)	2.704 (0.100)
1985 – 1991	-0.535 (0.342)	1.548 (0.213)
1991 – 1997	0.726 (0.739)	0.346 (0.556)

Table 15. 2SLS Real Income Model: 1979-1985[1]

Variable[2]	*Stage* I: *Migration* *Est. Coeff.* (*p-value*)[3]	*Stage* II: *Income* *Est. Coeff.* (*p-value*)[3]
Age	-0.002 (0.858)	3,681.00 (0.003)
Age Squared	0.000 (0.983)	-37.56 (0.004)
White	0.005 (0.843)	8,172.15 (0.001)
Male	-0.014 (0.714)	5,535.47 (0.190)
Married	-0.003 (0.918)	18,357.66 (0.000)
Disabled	0.023 (0.372)	-10,771.99 (0.000)
High School Diploma	0.043 (0.095)	7,746.66 (0.030)
College	0.096 (0.001)	9,093.18 (0.130)
Postgraduate	0.174 (0.000)	20,075.85 (0.035)
Grew Up		
Rural	0.077 (0.245)	---
Small Town, Suburb	0.092 (0.162)	---
City	0.132 (0.065)	---
Natural Amenities	0.010 (0.036)	-1,577.01 (0.053)
% Δ in Total Employment, 1983 to 1985[4]	0.006 (0.000)	-1.017 (0.998)
Average Unemployment Rate, 1977 to 1979	0.011 (0.064)	---
Unemployment Rate, 1985	-0.014 (0.000)	761.47 (0.189)
Constant	0.066 (0.803)	-83,670.17 (0.005)
Migration	---	58,241.02 (0.190)

Source: Panel Study of Income Dynamics

Notes:

[1]Period includes 713 working-age (25 - 64) household heads that lived in a nonmetropolitan county in 1979. The adjusted R^2 for this model is 0.12 and the $F_{16, 696}$ statistic is 6.91. Income is in 1997 dollars.

[2]All variables are observed in 1979.

[3]Standard errors (S.E.) are Huber-White heteroskedasticity-robust.

[4]Total wage and salary employment

Table 16. 2SLS Real Income Model: 1985-1991[1]

Variable[2]	*Stage* I: *Migration* *Est. Coeff.* (*p-value*)[3]	*Stage* II: *Real Income* *Est. Coeff.* (*p-value*)[3]
Age	-0.006 (0.523)	4,264.83 (0.000)
Age Squared	0.000 (0.589)	-43.18 (0.000)
White	-0.012 (0.575)	10,103.25 (0.000)
Male	0.041 (0.218)	7,954.10 (0.006)
Married	-0.081 (0.002)	16,113.90 (0.000)
Disabled	-0.034 (0.133)	-6,740.01 (0.004)
High School Diploma	0.007 (0.757)	6,473.94 (0.002)
College	0.083 (0.002)	23,132.30 (0.000)
Postgraduate	0.132 (0.000)	38,117.42 (0.000)
Grew Up		
Rural	-0.153 (0.000)	---
Small Town, Suburb	-0.130 (0.000)	---
Natural Amenities	0.007 (0.137)	-344.67 (0.510)
% Δ in Total Employment, 1990 to 1991[4]	-0.003 (0.207)	472.78 (0.106)
Unemployment Rate, 1991	-0.011 (0.000)	780.81 (0.128)
Constant	0.445 (0.055)	-97,379.99 (0.000)
Migration	---	-4,694.34 (0.828)

Source: Panel Study of Income Dynamics

Notes:

[1]Period includes 779 working-age (25 - 64) household heads that lived in a nonmetropolitan county in 1985. The adjusted R^2 for this model is 0.09 and the $F_{14, 764}$ statistic is 6.67. Income is in 1997 dollars.

[2]All variables are observed in 1985.

[3]Standard errors (S.E.) are Huber-White heteroskedasticity-robust.

[4]Total wage and salary employment

Table 17. 2SLS Real Income Model: 1991-1997[1]

Variable[2]	*Stage* I: *Migration* *Est. Coeff.* (*p-value*)[3]	*Stage* II: *Income* *Est. Coeff.* (*p-value*)[3]
Age	-0.022 (0.059)	-2,514.66 (0.659)
Age Squared	0.000 (0.064)	32.49 (0.622)
White	-0.041 (0.175)	13,025.53 (0.001)
Male	0.047 (0.232)	3,994.32 (0.460)
Married	-0.071 (0.015)	19,703.18 (0.000)
Disabled	-0.013 (0.644)	-13,619.33 (0.005)
High School Diploma	-0.006 (0.838)	9,125.22 (0.010)
College	0.025 (0.423)	24,232.90 (0.008)
Postgraduate	-0.004 (0.934)	40,863.77 (0.000)
Grew Up City	0.0849 (0.013)	---
Natural Amenities	0.020 (0.000)	1,287.16 (0.482)
% Δ in Total Employment, 1996 to 1997[4]	0.008 (0.096)	-1,071.08 (0.133)
Average Unemployment Rate, 1989 to 1991	0.018 (0.003)	---
Average Unemployment Rate, 1995 to 1997	-0.029 (0.000)	-330.17 (0.814)
Constant	0.649 (0.016)	55,040.13 (0.665)
Migration	---	6,588.68 (0.894)

Source: Panel Study of Income Dynamics

Notes:

[1]Period includes 589 working-age (25 - 64) household heads that lived in a nonmetropolitan county in 1991. The adjusted R^2 for this model is 0.11 and the $F_{14, 574}$ statistic is 6.04. Income is in 1997 dollars.

[2]All variables are observed in 1991.

[3]Standard errors (S.E.) are Huber-White heteroskedasticity-robust.

[4]Total wage and salary employment

Table 18. Instrumental Variables in the Income Models

	Income *Est. Coeff.* (*p-value*)
Period: 1979 – 1985	
Grew Up	
Rural	5,456.71 (0.432)
Small Town, Suburb	10,778.85 (0.131)
City	5,474.51 (0.467)
Average Unemployment Rate, 1977 to 1979	791.65 (0.209)
Period: 1985 – 1991	
Grew Up	
Rural	1,005.90 (0.762)
Small Town, Suburb	-584.15 (0.859)
Period: 1991 – 1997	
Grew Up	
City	2,541.02 (0.619)
Average Unemployment Rate, 1989 to 1991	-162.89 (0.839)

Table 19. Tests of Instruments and Exogeneity

	Sargan Statistic (*p-value*)	*Durbin-Wu-Hausman* (*p-value*)
Income		
1979 – 1985	4.419 (0.220)	2.760 (0.097)
1985 – 1991	0.489 (0.484)	0.142 (0.706)
1991 – 1997	0.153 (0.695)	0.021 (0.885)

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