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ORIGINAL PAPER

Migration Decisions of Dual-earner Families: An Application of Multilevel Modeling

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Abstract A comprehensive framework for guiding analyses of internal migration is lacking. This study contributes to the family migration literature in three important ways. We develop a multilevel theoretical framework emphasizing an integration of individual-, family-, and neighborhood-level effects; introduce multilevel statistical modeling; and explicitly assess how effects of economic-based explanatory variables vary by gender. Our data are from the Panel Study of Income Dynamics (PSID). We find that the likelihood of a family migrating is affected by economic and non-economic factors, some of which vary by gender. We add to the dual-earner migration literature by finding that wives are not likely to be tied-movers, but husbands are likely to be tied-stayers. Neighborhood factors also are important to the decision to migrate.

Keywords Dual-earner families · Internal migration · Migration · Multilevel modeling · Panel Study of Income Dynamics

Introduction

More than 39 million United States residents moved in 2005 (U. S. Census Bureau, 2006). The South and West are experiencing net gains in population; the Northeast and Midwest are experiencing net losses (Schachter, 2004). Migration rates vary not only by regions, but also by the characteristics of movers. Young adults have the highest relocation rates. Non-Hispanic Whites are less likely to move compared to other races and Hispanic-origin groups; married adults are less mobile than those

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who are separated, divorced or never married. The likelihood of moving also increases with education, decreases with family income, and is greater for renters versus home-owners.

The theoretical and empirical study of internal migration has a long history, yet a comprehensive framework for guiding analyses is still lacking. Disagreement exists regarding whether migration is best understood in individual or structural terms—whether migration is viewed appropriately as an aggregate outcome of individual decisions or whether it is the product of powerful structural changes in society that supersede individual actions. In an attempt to bridge these perspectives in the early 1990s, researchers began to explore how links among individual, household, and community characteristics jointly determine migration using a multilevel migration theoretical framework advocated by Massey (1990).

This study continues the exploration of interrelationships between levels and contributes to the family migration literature in two important ways. First, following Massey's (1990) theoretical work, we develop a multilevel theoretical framework of human migration decision-making emphasizing an integration of individual-, family-, and neighborhood-level effects. Second, we introduce multilevel statistical modeling to the study of family migration. Multilevel statistical modeling, which is being used widely in other areas (Goldstein, 1987, 1995; Guo & Zhao, 2000), has not been used in the study of migration. We also add to the migration literature by explicitly assessing how the effects of economic-based explanatory variables on the likelihood of a move by dual-earner families vary by gender. We focus on whether husbands or wives are *tied-movers* or *tied-stayers*. A tied-mover experiences personal economic losses because of a family migration, even though the overall well being of the family is enhanced by the move. A tied-stayer would gain from a relocation opportunity, but forgoing the move maximizes family well being. We find that wives are not likely to be tied-movers, but husbands are likely to be tied-stayers. Neighborhood factors also are important to the decision to migrate.

Next, we briefly review the debate surrounding the appropriate level at which migration should be studied. This critique of the migration literature leads to the development of a multilevel theoretical framework. The paper then continues with a discussion of our methodology that includes the data from the Panel Study of Income Dynamics (PSID) to be analyzed and our approach for estimating a multilevel model. Results and conclusions complete the text.

Literature Review

The Macroeconomic Perspective

Over two decades ago, White (1980) recognized a philosophical dichotomy in migration research between macro and micro approaches. From the macro perspective, migration was regarded solely as an empirical event; a largely preordained response to the stimulus of potentially higher income at some other residential location. Researchers did not focus attention on the potential migrants themselves. Emphasis was given to the search for 'laws of migration' by which social, economic, and political forces directly and indirectly affect the demand for labor and the associated forms of labor recruitment and remuneration, and the characteristics of the potential origins and destinations.

In regional economics, the relationship between migration and employment change continues to be of fundamental interest. Migration is viewed as an equilibrating mechanism in regional economic development (Lyson & Falk, 1993). In areas where labor demand is high, wages rise to increase the supply of workers. These higher wages attract individuals from other areas where wages are lower, increasing the supply of labor and putting downward pressure on wages. In sending areas, out-migration decreases the labor supply putting upward pressure on wages, bringing the labor markets into equilibrium. Empirical studies have found that migration and employment growth are mutually dependent; however, employment growth affects net migration more strongly than net migration affects employment (Chun, 1996; Greenwood, 1981). Nord (1998) argued that the poor and nonpoor move in response to real economic opportunity, but the migration patterns of the two groups differ because the opportunities that attract them are mixed in varying proportions in different places.

The Microeconomic Perspective

Human capital theory emphasizes that migration is a process involving rational actors guided by principles of utility maximization. Migration is the outcome of a rational evaluation of the costs and benefits of movement. This perspective is probably the most influential and widely used micro-level approach to the study of human migration. It was adumbrated first by Sjaastad (1962) and given its classic form by Todaro (Harris & Todaro, 1970; Todaro, 1969), whose model since has been elaborated and refined in a variety of ways. According to the Todaro (1969) formulation, migration is an investment in human productivity, which, like all forms of investment, has costs and returns. Rational actors anticipate these costs and benefits in deciding whether and where to migrate. Under the assumptions of neoclassic macroeconomic theory that spatial inequities in economic opportunities exist, this perspective generates unidirectional migration flows—persons migrate from low-opportunity regions to high-opportunity regions after pondering all the available alternatives.

Emphasis on migration as a family decision rather than as an individual's decision began in the 1970s (DaVanzo, 1972; Kaluzny, 1975; Sandell, 1977). Mincer (1978) established a theoretical framework for family migration offering that spouses maximize family well being, and in doing so may forgo opportunities that are optimal from a personal calculation. Thus, if the family sought to maximize family income, for example, the family would relocate if one spouse's gains in earnings in the new location exceeded the other spouse's losses (net of the cost of the move). The spouse incurring losses in this circumstance is, according to Mincer's definition, a *tied-mover*, since his/her move is tied to family circumstances that run counter to his/her private calculus. Conversely, if one spouse is faced with net gains from a relocation opportunity, but the other's net losses are of greater magnitude, then forgoing the relocation maximizes family well being. In this situation, the spouse gaining from relocating is a *tied-stayer*, capitalizing upon his/her personal gains would make the family worse off. Mincer further extended this model by introducing the possibility of opportunities at more than one alternative location. For example, the location that maximizes the wife's gains need not be the same as the one that maximizes the husband's gains. Yet a third location could maximize family gains, and the move there would lead to forgone private opportunities for both spouses. In

short, both spouses compromise for the sake of maximizing family well being, although one spouse is likely to compromise more than the other.

Mincer's theoretical framework has led to many empirical tests that suggest that migration has become a joint decision for many two-earner families (Bielby & Bielby, 1992; Holt, 1997; Shihadeh, 1991; Smits, Mulder, & Hooimeijer, 2003), especially with the growth of women's employment and wages (Ciscel, Sharp, & Heath, 2000). Holt (1997) found that the increased labor force participation of married women is strongly interrelated with decreased family migration**.** Shields and Shields (1993) found that both husband's and wife's employment and earnings at their current location were related to deciding not to move. Bielby and Bielby (1992) and Nivalainen (2004) suggest that the tied-stayer phenomenon affected men and women more equally in the 1990s than two decades earlier. Other empirical evidence suggests that men are increasingly more likely to be tied-stayers (Bielby & Bielby, 1992; Nivalainen, 2004) and women are more likely to be tied-movers (Cooke, 2003; Shihadeh, 1991).

Toward a Sociological and Contextual View

Obviously, economic reasons are not the only motivations for migration. Many families do not weigh the (dis)advantages of moving in strictly economic terms (Duncan & Perrucci, 1976; Lichter, 1983). Jacobsen and Levin (2000) found expected economic gains do not have a significant positive influence on the family migration decision after controlling for variables that attempt to proxy for the costs of migration. Their findings indicate that family migration is not simply an investment to increase family labor earnings.

Although it may be true that rational decisions are made to maximize expected returns to migration, these decisions are within the context of specific local conditions. Lee (1966) found that the characteristics of the places a person lives and moves, *pushes* and *pulls*, are equally important in determining migration. The work of Roseman (1983) and Roseman and Williams (1980) has been influential in demonstrating that migrants frequently give quite different reasons for deciding to leave a place and for choosing a destination. People tend to be pulled to areas of prosperity and pushed from areas of decline (DaVanzo, 1981; Mimura & Mauldin, 2005). The study of local contextual effects has become an important topic in family migration. It reflects increased recognition of the larger social context, including neighborhood, that frames and shapes the family migration decision-making process.

In sum, migration research has found significant direct effects of individual-, family-, and contextual-level indicators on individual or family migration. No study to date, however, has explored explicitly neighborhood contextual effects on family migration decision-making using panel data from a nationally representative data set. It is possible that the findings from previous micro–macro integrative studies are not generalizable and instead are reflections of the unique characteristics of the settings from which the studied populations were taken. In addition, analyses of panel data avoid the problems of unobserved variable bias associated with cross-sectional analyses. If, indeed, other findings are not accurate or generalizable, then examining panel data from a nationally representative data set is necessary to understanding contextual effects across very different neighborhoods.

Multilevel Theoretical Framework

Human Ecology Theory

Human ecology focuses on the interaction and interdependence of humans (individuals, families, groups, and societies) with their environment. Humans interact with their natural (physical and biological), social–cultural, and human-built environments to comprise a human ecosystem. For example, a family ecosystem consists of a family interacting with its environment, where environment in migration studies is defined both spatially and socially. Migration decisions (to move or not to move) are shaped by where one lives, with whom one works and plays, and where and with whom one interacts socially. Environmental features influencing migration include economic structures, social or group phenomena, and physical features.

The spatial area encompassed by these contexts can be viewed as a hierarchy of systems at multiple levels moving from the most proximal to the most remote. In practice, the individual or family environment can be viewed from near to distal, such as from a neighborhood in urban areas or a community in rural areas, to a county, and to a state. Factors from a lower-level environment system (e.g., neighborhood) have stronger effects on individual or family migration decisions than do those from a higher-level (e.g., state). The neighborhood or community shapes individual life experiences and serves as both the social and physical setting for many life events (Rossi, 1972). It also can influence the behavior, attitudes, and opportunities of the individuals who live in them (Wilson, 1987). Distal environments influence migration decisions usually through governmental policies, which can affect substantially individuals' and families' access to and opportunities for employment, education, goods, and services.

Interaction of Families with their Environment

The development of a multilevel contextual model of migration does not involve simply adding neighborhood or community characteristics to a model of individual or family determinants. Contextual factors must be incorporated to reflect the social or economic processes, settings and contexts influencing individual or family behavior (Blalock & Wilken, 1979). Findley (1987) described an interactive process in which the context changes the pattern of the relationship between individual or family characteristics and migration. In some settings, individuals or families with specified characteristics are more likely to move than others from a different setting. For example, local unemployment rates affect interactively the relationship between individual employment status and migration. The unemployed have a higher probability of migration in areas with higher unemployment rates than in areas with lower unemployment rates.

As Massey (1990) suggested, a complete account of migration requires theories and data that link larger social structures with individual and family migration decisions, and connect micro- and macro-levels of analysis. Empirical studies consistently support the interactive model of how context influences individual or family behavior (DaVanzo, 1978; Findley, 1987; Wilson-Figueroa, Berry & Toney, 1991). Therefore, an interactive process of contextual influences on migration is adopted in this study. The neighborhood or community will be the level of contextual analysis.

Studying neighborhoods or communities maximizes the chance for between-unit differences while minimizing the chance of unobserved contextual effects at a lower level of aggregation.

Methodology

Analysis Plan

Our aim is to understand how individual-, family-, and neighborhood-level factors jointly affect family migration. Families in the Panel Study of Income Dynamics (PSID) are clustered nonrandomly across neighborhood types. Therefore, it is not appropriate to employ conventional least squares multiple regression or logistic regression models. These conventional models assume independent disturbances across observations, which is not appropriate for data sampled from populations with a grouped structure. Disaggregating all higher-level variables and performing a single-level analysis implies unacceptable simplification, as well. It would lead to inefficient parameter estimates, downwardly biased precision estimates, and spurious findings of statistical significance for the aggregate factors of interest. Therefore, the hierarchical nature of the multilevel data under study—with individuals and families clustered nonrandomly into neighborhoods, communities, counties and states—calls for nontraditional modeling methods that avoid violating important assumptions of traditional regression procedures.

This investigation advances the statistical methodology used to study family migration by employing advanced multilevel models designed especially to contend with hierarchical data structures and to yield more accurate statistical conclusions. Multilevel linear models make it possible to combine variables of different levels quite naturally, and model within-group correlations between observations in a straightforward way (Hanushek, 1974). Our approach has two steps. First, we employ a two-level hierarchical logistic regression to model the probability that a family migrates. Second, we incorporate a latent variable conceptualization to estimate coefficients that can be transformed into easily interpreted odds ratios.

Assume y_{ij}, a binary indicator of having migrated or not, is an observation of the i th family in the j th neighborhood. $X_{1ij}, X_{2ij}, \ldots, X_{qij}$ are explanatory variables at the individual/family-level and $W_{1j}, W_{2j}, \ldots, W_{rj}$ are explanatory variables at the neighborhood level. Define the probability of migrating (the binary indicator equaling one) as $p_{ij} = \Pr(y_{ij} = 1)$. Let p_{ij} be modeled using a logistic function.

This basic model has two parts. First, we have $Q + 1$ ($q = 0, 1, \ldots, Q$) predictors at level one (individual/family-level) such that

$$\log\left[\frac{p_{ij}}{1 - p_{ij}}\right] = \beta_{0j} + \beta_{1j}X_{1ij} + \cdots + \beta_{qj}X_{qij}. \tag{2}$$

Second, we have $R + 1$ ($r = 0, 1, \ldots, R$) predictors at level two (neighborhood-level) such that

$$\beta_{qj} = \theta_{q0} + \theta_{q1}W_{1j} + \cdots + \theta_{qr}W_{rj} + \mu_{qj} \tag{3}$$

where $\mu_{gj} \sim N(0, \sigma_u^2)$. Note also that each regression coefficient (β_{qj}) has a fixed and a random part, where the random part has random components for both levels.

By substituting Eq. 3 into Eq. 2, the two-level model can be written as

$$\log\left[\frac{p_{ij}}{1-p_{ij}}\right] = \beta_0 + \beta_1 X_{1ij} + \cdots + \beta_q X_{qij} + \beta_{q+1} W_{1j} + \cdots + \beta_{q+r} W_{rj} + \beta_{q+r+1} X_{1ij} W_{1j} + \cdots + \beta_{q+r+q+r} X_{qij} W_{rj} + \mu_{1j} X_{1ij} + \cdots + \mu_{qj} X_{qij} + \mu_{0j} \quad (4)$$

where μ_{0j} is the random effect at level 2, and μ_{1j}, μ_{2j}, ..., μ_{qj} are the random coefficients for the explanatory variables at level 1. Conditional on μ_{0j}, μ_{1j}, μ_{2j}, ... , μ_{qj}, the outcome variables (y_{ij}'s) are assumed to be independent. μ_{0j}, μ_{1j}, μ_{2j}, ... , μ_{qj} are assumed to be normally distributed, with expected value 0 and variance $\sigma^2_{u_q}$, where $q = 0, 1, \ldots, Q$. This model assumes that the family-level regression intercept(s) and slope(s) are functions of the means of their neighborhood-level intercept(s) and the slopes.

The multilevel model for binary outcomes also can be derived through a latent variable conceptualization that builds on Eq. 4. We can assume that there exists a latent continuous variable y^*_{ij} underlying y_{ij}. We observe only the binary response variable y_{ij}, not y^*_{ij}, but know that

$$y_{ij} = 1 \text{ if } y^*_{ij} > 0$$

and

$$y_{ij} = 0 \text{ if } y^*_{ij} <= 0.$$

With these assumptions, a multilevel model for y^*_{ij} equivalent to Eq. 4 can be written as

$$y^*_{ij} = \beta_0 + \beta_1 X_{1ij} + \cdots + \beta_q X_{qij} + \beta_{q+1} W_{1j} + \cdots + \beta_{q+r} W_{rj} + \beta_{q+r+1} X_{1ij} W_{1j} + \cdots + \beta_{q+r+q+r} X_{qij} W_{rj} + \mu_{1j} X_{1ij} + \cdots + \mu_{qj} X_{qij} + \mu_{0j} + \varepsilon_{ij} \quad (5)$$

where $\varepsilon_{ij} \sim N(0, \sigma_e^2)$. The parameters of observed variables can be interpreted much the same way as those from the standard logit model. The coefficients may be transformed into odds, thus providing an indication of whether the independent variable increases or decreases the likelihood of migration. Odds greater than one indicate an increased likelihood of migration; odds less than one indicate a decreased likelihood.

Panel Study of Income Dynamics and US Decennial Census

Few data sets provide information on at least two levels (e.g., individual/family and neighborhood/community) which is required for testing multilevel theoretical models. Our data are derived from the Panel Study of Income Dynamics (PSID). The PSID is a longitudinal survey of a representative sample of US individuals and

the families in which they reside (Hill, 1992). Since 1968, the PSID has traced individuals from approximately 4,800 families, whether or not they are living in the same dwelling or with the same people. The PSID Geocode Match files include identification codes (i.e. Zip code, census tract/Block Numbering Area [BNA], county Federal Information Processing Standard [FIPS] code, Standard Metropolitan Statistical Area [SMSA] designation, and state FIPS code) to allow us to link PSID files to Census Bureau data regarding the characteristics of the geographic area in which these individuals and families live.

We merged the PSID family-individual data to the 1990 PSID Geocode Match file to obtain family geographic identification codes, which were used to link the family-individual data to the 1990 decennial census data. Following most prior research, we used census tracts/BNAs as a geographical representation of neighborhoods. Because census tracts and Block Numbering Areas are small population units that are designed to be homogeneous with respect to population characteristics, economic status, and living conditions, they are drawn in such a way as to correspond roughly to what is normally thought of as a small neighborhood (White, 1987).

Analytic Sample and Data Set

The objective of this study is to examine the migration decisions of dual-earner families. We use the 1990 and 1994 interview years to define whether or not a family migration occurred in order to observe a reasonably large sample of migrated families, and yet reduce the likelihood of multiple migrations including those that resulted in a return to the 1990 labor market (i.e., a return migration).[1] Per the purpose of this study, we focus on married couples and require them to be stable during the study period (i.e., they were married both in 1990 and 1994). Families with husbands older than 55 years in 1990 are removed to minimize the incidence of retirement migration.[2]

After all data management procedures were completed, the analytic sample consists of 2,510 married couple families that lived in 1,998 census tracts or Block Numbering Areas (BNAs) in 1990. Because 1,710 of these tracts/BNAs contain only one family, it is not possible to perform analyses at the tract/BNA level. To conduct our analyses, we combine tracts/BNAs into neighborhood types to insure a reasonably large number of families in each type of neighborhood. Studies of neighborhood effects have recognized that election into a neighborhood is based jointly on socioeconomic status and race (Quillian, 1999; Sucoff & Upchurch, 1998). Following this research, we use (1) the percentage of families in the tract below the federal poverty threshold and (2) the percentage of the tract population that is African American to collapse tracts/BNAs into neighborhood types. More specifically, we created six income categories and 10 racial tract types to form 60 cells.

As can be seen in Table 1, the number of families in neighborhood types with a relatively higher percentage of African Americans and a lower percentage of families living in poverty continues to be too small to support our analyses. As a result, we further collapse the 60 cells into 51 cells that will be used for our neighborhood-level modeling. (See Table 2.)

[1] In preliminary analyses not reported here, we found few families moved from and returned to their 1990 location during the four-year study period.

[2] The PSID provides only age and race information of the husband.

Table 1 Sixty neighborhood-type cells before collapsing

	Poverty categories					
	≤1%	>1% to <3%	≥3% to <5%	≥5% to <10%	≥10% to <20%	≥0%
Race categories (% of African Americans)						
= 0%	17, 17	41, 49[a]	26, 27	48, 61	43, 54	11, 21
>0% to <0.5%	19, 20	56, 62	42, 47	68, 91	38, 60	16, 28
≥0.5% to <1%	20, 22	48, 50	33, 34	48, 60	26, 49	16, 27
≥1% to <2%	27, 28	67, 72	49, 52	39, 54	35, 39	14, 33
≥2% to <4%	28, 29	66, 78	38, 43	56, 67	36, 63	14, 23
≥4% to <10%	23, 23	49, 52	66, 78	67, 84	57, 89	33, 45
≥10% to <20%	4, 5	25, 26	27, 27	55, 66	49, 67	29, 53
≥20% to <30%	1, 1	5, 6	8, 9	33, 36	24, 44	23, 27
≥30% to <70%	1, 1	8, 8	11, 17	20, 30	56, 63	71, 95
≥70%	1, 1	2, 2	3, 3	13, 14	42, 48	107, 130
Total				1998, 2510		

[a] Read cells values as follows: this cell has 41 Tracts/BNAs and 49 families

Table 2 Fifty-one neighborhood-type cells after collapsing

	Poverty categories					
	≤1%	>1% to <3%	≥3% to <5%	≥5% to <10%	≥10% to <20%	≥20%
Race categories (% of African Americans)						
= 0%	17, 17	41, 49[a]	26, 27	48, 61	43, 54	11, 21
>0% to <0.5%	19, 20	56, 62	42, 47	68, 91	38, 60	16, 28
≥0.5% to <1%	20, 22	48, 50	33, 34	48, 60	26, 49	16, 27
≥1% to <2%	27, 28	67, 72	49, 52	39, 54	35, 39	14, 33
≥2% to <4%	28, 29	66, 78	38, 43	56, 67	36, 63	14, 23
≥4% to <10%	23, 23	49, 52	66, 78	67, 84	57, 89	33, 45
≥10% to <20%		29, 31[b]	27, 27	55, 66	49, 67	29, 53
≥20% to <30%		14, 16[c]		33, 36	24, 44	23, 27
≥30% to <70%			40, 56[d]		56, 63	71, 95
≥70%			19, 20[e]		42, 48	107, 130
Total				1998, 2510		

[a] Read cells values as follows: this cell has 41 Tracts/BNAs and 49 families

[b] Two cells were collapsed to create this ''larger'' cell, (4 + 25) = 29 and (5 + 26) = 31

[c] Three cells were collapsed to create this ''larger'' cell, (1 + 5 + 8) = 14 and (1 + 6 + 9) = 16

[d] Four cells were collapsed to create this ''larger'' cell, (1 + 8 + 11 + 20) = 40 and (1 + 8 + 17 +30) = 56

[e] Four cells were collapsed to create this ''larger'' cell, (1 + 2 + 3 + 13) = 19 and (1 + 2 + 3 + 14)= 20

Each neighborhood type across the 51 cells has on average 39 tracts/BNAs and 49 families. The range of the number of tracts/BNAs in a cell is 11 to 107; the range of families in a cell is 16 to 130. Table 3 provides unweighted family migration rates for the 51 neighborhood types. The migration rate for the full sample is about 10%. Rates range across cells from zero to 28% with migration rates generally decreasing for families residing in neighborhoods with a higher percentage of African Americans or with a higher percentage of families living in poverty. For our analyses, we develop family-level weights to adjust for sampling fluctuations caused by unequal selection probabilities in the PSID across these neighborhood types.

Table 3 Number and percentage of family migrations by neighborhood-type, unweighted

	Poverty categories					
	≤1%	>1% to <3%	≥3% to <5%	≥5% to <10%	≥10% to <20%	≥20%
Race categories (% of African Americans)						
= 0%	0 / 17[a] (0.0%)	7 / 49 (14.3%)	4 / 27 (14.8%)	2 / 61 (3.3%)	4 / 54 (7.4%)	2 / 21 (9.5%)
>0% to <0.5%	3 / 20 (15.0%)	7 / 62 (11.3%)	5 / 47 (10.6%)	8 / 91 (8.8%)	8 / 60 (13.3%)	2 / 28 (7.1%)
≥0.5% to <1%	3 / 22 (13.6%)	6 / 50 (12.0%)	8 / 34 (23.5%)	7 / 60 (11.7%)	1 / 49 (2.0%)	2 / 27 (7.4%)
≥1% to <2%	7 / 28 (25.0%)	13 / 72 (18.1%)	0 / 52 (0.0%)	1 / 54 (1.9%)	11 / 39 (28.2%)	0 / 33 (0.0%)
≥2% to <4%	5 / 29 (17.2%)	9 / 78 (11.5%)	5 / 43 (11.6%)	6 / 67 (9.0%)	6 / 63 (9.5%)	0 / 23 (0.0%)
≥4% to <10%	6 / 23 (26.1%)	9 / 52 (17.3%)	13 / 78 (16.7%)	7 / 84 (8.3%)	4 / 89 (4.5%)	6 / 45 (13.3%)
≥10% to <20%	3 / 31 (9.7%)		7 / 27 (25.9%)	6 / 66 (9.1%)	3 / 67 (4.5%)	6 / 53 (11.3%)
≥20% to <30%		1 / 16 (6.3%)		8 / 36 (22.2%)	2 / 44 (4.6%)	2 / 27 (7.4%)
≥30% to <70%			0 / 56 (0.0%)		4 / 63 (6.4%)	11 / 95 (11.6%)
≥70%			1 / 20 (5.0%)		1 / 48 (2.1%)	4 / 130 (3.1%)
Total			246 / 2510 (9.8%)			

[a]Read cell values as follows: 0 of the 17 families migrated. This equals a migration rate of 0.0%

Dependent Variable

Consistent with other research (Detang-Dessendre & Molho, 2000; Gabriel & Schmitz, 1994), we define a migration as a move to another labor market. We employ governmental definitions to make this determination. The Census Bureau and Federal Office of Management and Budget define a Standard Metropolitan Statistical Area (SMSA) as having a core area containing a substantial population nucleus, together with adjacent communities having a high degree of economic and social integration with that core (Spotila, 2000). To insure that a move entails changing labor market areas, we require families living in an SMSA in 1990 to be living in another SMSA or in a non-SMSA county in 1994. Families residing in a non-SMSA county in 1990 must change their county of residence in 1994. This approach likely provides a conservative estimate of the number of migrations as multiple labor markets may exist in a county or an SMSA.

Individual- and Family-level Independent Variables

We estimate two models of the migration decision based on the operationalization of the explanatory factors discussed below. The first model assumes that factor effects are gender neutral. The second model allows for an estimation of how effects differ by gender.

Family Income

Higher family income at the current location, *ceteris paribus*, makes the current location more attractive and reduces the probability the family will move (Shields & Shields, 1993). Consistent with the model of family migration for survival (DaVanzo, 1981), we expect families with low incomes to be more likely to migrate than higher income families as they seek additional income sources or jobs elsewhere. This variable is calculated as the pooled annual money income of the husband and wife in 1990.

Home Ownership

Because of greater financial investments in the current dwelling and the greater costs of moving, we anticipate a negative relationship between home ownership and family migration. This term is operationalized as an indicator variable equaling (1) if the family owned a home in 1990, and equaling (0) otherwise.

Number of Children

Having a larger number of children deters a family from moving (Holt, 1997), perhaps because children increase social ties for the family and increase the family's investment in their neighborhood. We hypothesize that having more children increases both the financial and intrinsic cost of moving, and therefore reduces the likelihood of family migration. Empirically, we define this measure as the number of children under age 18 reported to live in the household in 1990.

Educational Attainment

People with more education have been found to be more likely to move than those with less education (Gurak & Kritz, 2000; White & Woods, 1980). Those with higher education are more aware of opportunities in other locations; their employment market is larger in scope. Thus, we hypothesize that the level of the husband's and wife's education to have a positive relationship with family migration.

We test this hypothesis in two ways to explore differences in effects by gender. In Model 1, we include two indicator variables. An indicator is set to (1) if the highest educated spouse has less than a high school education and has not obtain a GED, and (0) otherwise. Another indicator equals (1) if the highest educated spouse has a high school diploma or GED and no additional education, and (0) otherwise. Each of these two indicators is estimated relative to the omitted category of having greater than a high school education or GED. In Model 2, these measures are replaced by similar indicators for the educational attainment of each spouse to explore whether there are separate effects of education on migration for husbands and wives. All values for educational attainment are measured in 1990.

Earnings Differential

Mincer (1978) theorized that potential gains and losses for both spouses are part of the decision calculus as families ponder a move. Research has found that greater labor force participation and earnings of wives have a dampening effect on family migration (Holt, 1997; Nivalainen, 2004). The opportunity cost of a family move increases as the contribution of the wife's employment to the family's economic well being increases. At the same time, if either spouse were employed at a well-paying job, he or she would be less likely to initiate a move for job-related reasons in that it would be more difficult to duplicate or exceed their pre-migration earnings elsewhere. We expect that as the earnings differential between husbands and wives decreases (their earnings are more equal), families will be less likely to migrate as each spouse will be less willing to be a tied-mover and will be more likely to be a tied-stayer. We calculate the difference in 1990 earnings in two ways. In Model 1, we include the absolute value of the difference in earnings. In Model 2, we use the husband's earnings minus the wife's earnings to investigate differences in effects of this measure by gender.

Labor Force Participation

Consistent with the effects of earnings on migration, we expect greater labor force participation by either spouse to reduce the likelihood that the family will migrate. We include labor force participation effects in our model in two ways. In Model 1, we include a variable equal to the sum of hours worked in 1990 by the husband and wife. We also calculate the absolute value of the difference in hours worked for the husband and wife. These measures are replaced in Model 2 by the hours worked by the husband minus the hours worked by the wife.

Family Demographics

Abundant research documents the importance of individual characteristics such as age and race on the likelihood of migrating (Greenwood, 1975, 1985; Long, 1988, 1992). Migration rates tend to peak in the young adult years as individuals leave the parental home, attend college, get jobs, marry, and experience other life-course transitions that necessitate a change in residence (Garasky, 2002; Garasky, Haurin, & Haurin, 2001; Gurak & Kritz, 2000; White & Woods, 1980). The age profile of migration begins to decline sharply at about age 30, generally flattening out or declining only modestly after age 50 (Long, 1988). Regarding race, Whites tend to move more than non-Whites (Lewis, 1982).

The PSID provides only age and race information for the husband. We expect the coefficient of husband's age to be negative as the likelihood of migrating declines with age. We set an indicator variable equal to (1) if the husband is White, and (0) if he is non-White. We expect the sign of this coefficient to be positive.

Neighborhood-level Independent Variables

There are a number of reasons to expect neighborhood characteristics to affect the likelihood that a family should migrate to another area. Both tangible (e.g., schools and parks) and intangible (e.g., social systems) amenities accrue from the location in which one resides. Families have been found to be less likely to leave neighborhoods with relatively higher median incomes and higher percentages of persons employed in professional and managerial occupations. We included two neighborhood characteristics at the family's original (1990) location—median household income and the percentage of the neighborhood that is African American.

Estimation Method

A proper first step in doing a multilevel analysis is an assessment of within- and between-group variations in the dependent variable (Bryk & Raudenbush, 1992; Muthen, 1994). If a large proportion of variance in the dependent variable can be attributed to between group-variation, as indicated by a larger intraclass correlation coefficient, a multilevel analysis at both the individual-level and the group-level is necessary. But ''if all intraclass correlation coefficients are close to zero, ... it might not be worthwhile to go further'' (Muthen, 1994, p. 388) and an individual-level analysis will be sufficient. A one-way random-effects ANOVA can assess the degree of within- and between-group variation in observations of the dependent variable and provide this estimate of interclass correlation (Bryk & Raudenbush, 1992). Our one-way random-effects ANOVA tests, and other more extensive investigations, indicate that a significant amount of between-group variation exists in our data.[3] Therefore, we continue by estimating our multilevel logit model of family migration.

Results

Table 4 reports descriptive statistics for the variables used in the multivariate analysis. Ten percent of the families in our analytic sample migrated between 1990

[3] For brevity, we do not report these results. They are available from the authors by request.

Table 4 Descriptive statistics for variables used in mulitvariate analyses

Variables: individual and family level	Mean	Standard deviation	Minimum	Maximum
Family migrated (yes = 1)	0.10	0.30	0	1
Family income (1990 dollars)	48,265.80	38,713.16	1	671,000
Earnings differential: absolute value (1990 dollars)	21,238.31	27,894.35	0	605,000
Earnings differential: husband minus wife (1990 dollars)	18,230.40	29,947.63	–106,000	605,000
Hours worked: sum of husband and wife (1990)	3,411.58	1,158.76	0	7,704
Hours worked differential: absolute value (1990)	1,104.12	922.61	0	5,460
Hours worked differential: husband minus wife (1990)	903.33	1,120.02	–3,380	5,460
Homeownership (yes = 1)	0.66	0.47	0	1
Highest education: less than high school (yes = 1)	0.11	0.31	0	1
Highest education: high school graduate or GED only (yes = 1)	0.19	0.39	0	1
Husband's education: less than high school (yes = 1)	0.19	0.39	0	1
Husband's education: high school graduate or GED only (yes = 1)	0.34	0.47	0	1
Wife's education: less than high school (yes = 1)	0.18	0.38	0	1
Wife's education: high school graduate or GED only (yes = 1)	0.39	0.49	0	1
Number of children	1.54	1.27	0	9
Husband's age (years, 1990)	36.95	7.88	19	54
Husband's race (white = 1)	0.74	0.44	0	1
Cases (unweighted)	2,510	2,510	2,510	2,510
Variables: neighborhood level				
Median household income (1990 dollars)	38,021.23	14,200.57	18,453	66,181
Race: percent African American (%, 1990)	12.65	22.52	0	91
Cases (unweighted)	51	51	51	51

and 1994. Average household income of all families—those who migrated and those who did not—was about $48,000 in 1990. The difference in earnings between spouses averaged about $21,000; husbands averaged earning over $18,000 more than their wives. Regarding labor force participation, the combined hours worked by the couples in our sample averaged about two full-time jobs (3,412 h annually). On average, one spouse worked about 1,100 more hours than the other spouse. Typically, husbands worked more hours, averaging about 900 more hours than their wives. About two-thirds of the sample were homeowners.

Most (89%) of the families have at least one spouse who either graduated from high school or received their GED. Seventy percent of the families had at least one spouse with some education beyond high school. Husbands in the sample were slightly more educated than wives. On average, each family had between one and two children. The average age of the husbands was 37 years; about three-fourths of the husbands were White.

Two neighborhood level variables are included in the analysis. Neighborhood types varied considerably across these two measures. The average of the median

Table 5 Estimated coefficients for family migration equations

Variable	Model 1				Model 2			
	Coefficient	Standard Error	b/St. Er	Odds Ratio	Coefficent	Standard Error	b/St.Er	Odds Ratio
Constant	–1.55120**	0.572600	–2.71	0.212	–0.459000	0.548700	–0.84	0.632
Family income	–0.00001**	0.000004	–3.17	0.951[a]	–0.000008*	0.000004	–2.23	0.961[a]
Earn diff: absolute value	0.000018**	0.000005	3.68	1.094[a]				
Hrs wrk diff: husband–wife					0.000010*	0.000004	2.40	1.051[a]
Hrs wrk: sum	0.000178*	0.000074	2.42	1.195[b]				
Hrs wrk diff: absolute value	0.000045	0.000088	0.51	1.046[b]				
Hrs wrk diff: husband – wife					0.000018	0.000080	0.22	1.018[b]
Homeowner	–1.30670**	0.152300	–8.58	0.271	–1.377400**	0.161000	–8.56	0.252
High Ed: less than HS	–0.484200***	0.283500	–1.71	0.616				
High Ed: HS or GED	–0.381400*	0.187800	–2.03	0.683				
Husb. Ed: less than HS					–1.000300**	0.275800	–3.63	0.368
Husb. Ed: HS or GED					–0.584100**	0.177900	–3.28	0.558
Wife Ed: less than HS					–0.019250	0.262900	0.07	0.981
Wife Ed: HS or GED					–0.114100	0.169400	–0.67	0.892
Number of children	–0.11430***	0.060990	–1.87	0.892	–0.102700	0.064000	–1.61	0.902
Husband age	–0.043710**	0.009783	–4.47	0.957	–0.042800**	0.010270	–4.17	0.958
Husband White	0.617400**	0.226800	2.72	1.854	0.595000*	0.234800	2.53	1.813
Median hh income	0.000027**	0.000008	3.35	1.145[a]	0.000021*	0.000008	2.51	1.111[a]
% African American	–0.004650	0.005942	–0.78	0.995	–0.005610	0.006100	–0.92	0.994
Test of model fit[c]	Scaled Deviance = 1,514				Scaled Deviance = 1,409			

[+] $p < .10$; * $p < .05$; ** $p < .01$

[a] A change of $5,000

[b] A change of 1,000 hours

[c] The scaled deviance is approximately distributed χ^2 with (2510–12) degrees of freedom for Model 1 and (2510–13) degrees of freedom for Model 2. Both models are statistically significant at beyond the .01 level

household incomes was $38,000. Neighborhood median incomes ranged from $18,453 to $66,181. On average, about 13%of the residents of each neighborhood were African American. As with median incomes, the racial composition of the neighborhoods varied greatly from 0% African American to nearly completely (91%) African American.

The results of our empirical analysis are reported in Table 5. We find that the likelihood of a family migrating is affected by many economic and non-economic factors. Focusing on economic factors first, families are less likely to move as their income increases. Specifically, the odds of migrating fall by 4–5% with each $5,000 increase in family income (see Models 1 and 2). Differences in spousal earnings are important to the migration decision, as well. Counter to the effect of increased income, families are more likely to move as the absolute value of the difference in earnings between spouses increases. The likelihood of moving increases by almost 10% with each $5,000 increase in the difference in earnings (Model 1). This is after controlling for total family income. Combining these two effects, we see that a $5,000 increase in family income generated by equal increases in spousal earnings would result in a greater likelihood of staying. The same increase in family income generated by a gain in earnings by only one spouse, however, increases the likelihood of moving.

The effect of the earnings differential is not the same for the husband and wife (Model 2). As the husband earns more relative to his wife, the increased likelihood of migrating generated from this increase in the couple's earnings differential is completely offset by the reduced likelihood of moving resulting from the increase in total family income. In other words, a change in family income resulting from a change in the husband's earnings does not increase or decrease the likelihood that the family will relocate. As a wife earns more relative to her husband, however, the family is more likely to stay. The effect of this change in the earnings differential reinforces the effect of the increase in family income. In short, wives are not found to be tied-movers, but husbands are likely to be tied-stayers.

Increased labor force participation, as measured by the sum of the annual hours worked by a couple, increases the likelihood of moving (Model 1). This is after controlling for income and earnings. Families also are more likely to move as one spouse works more hours relative to the other spouse. The effects of labor force participation are more gender neutral compared to the effects of earnings (Model 2). Families are slightly more likely to move as the husband works more hours relative to his wife. Overall, the effects of the difference in hours worked, both the absolute difference and the difference by gender, are small in magnitude and statistically insignificant. Finally, as expected, homeownership impacts migration considerably, reducing the likelihood of moving by nearly 75% (Models 1 and 2).

Non-economic factors also impact the probability of relocating. The likelihood of migrating increases with educational attainment. Compared to at least one spouse having an education beyond high school, families with neither spouses graduating from high school or receiving their GED are almost 40% less likely to move (Model 1). Educational attainment effects vary by gender, as well (Model 2). The effect of the wife's educational attainment is much weaker than the effect of her husband's education ($p < .01$). A family with a husband with less than a high school diploma or GED is 63% less likely to move compared to a family with a husband with more than a high school education. The estimated coefficients for the wife's education are statistically insignificant.

Among other non-economic factors, children reduce the probability of moving, although the statistical significance of this effect is weak. The chance of relocating falls by about 10% with each additional child (Model 1). In addition, families are less likely to move as the husband ages. The odds of moving decrease by about 4% for every year of age (Models 1 and 2). Families with White husbands are over 80% more likely to move compared to those with non-White husbands (Models 1 and 2).

Neighborhood factors also are important to the decision to migrate. The likelihood of moving is higher for families from relatively higher income areas. The odds of migrating increase between 11% and 14% for every additional $5,000 increase in neighborhood median household income (Models 1 and 2). The racial composition of the area has a statistically weaker effect on the migration decision.

Discussion

The study of individual and family migration has evolved on two levels that emphasize the role of economic forces. Micro-level studies focus on human capital theory such that individuals and families migrate to enhance their economic well being. Macro-level studies view migration from a regional perspective and examine its ability to equilibrate economic factors such as the supply and demand for labor and wages across regions.

This investigation contributes to the migration literature in three important ways. First, it employs a human ecology theoretical framework that recognizes that individual, household and community level characteristics are all important to a family's migration decision. Second, multilevel modeling is used for the empirical analyses of panel data. While multilevel modeling is well established in other fields, we are not aware of any other migration studies that use this advanced statistical technique. Our statistical approach addresses many of the biases found in other migration analyses. Third, we explicitly examine the role of gender in assessing the effects of economic-based explanatory variables on the likelihood of a move by dual-earner families.

Our results support the conclusion that a family's decision to move is affected by many economic and noneconomic factors. Opportunity and transaction costs are important as families are less likely to move as their income at the current location increases or if they are homeowners. Similarly, families with more children are less likely to migrate as their social network may be larger with more children. The likelihood of moving increases with educational attainment. This outcome may reflect the geographically broader job market of those persons with a higher education or their greater ability to identify opportunities elsewhere. At the neighborhood level, the likelihood of moving increases as the local median income increases. This may relate to families being able to take advantage of better community resources that are offered in relatively wealthier neighborhoods. For example, public libraries with advance facilities can enhance efforts to learn about opportunities elsewhere. Differences in the racial composition of the neighborhood as measured by the percent of residents that are African American do not affect the likelihood of migrating after controlling for other factors.

We find that the effects of some economic factors are not equal for husbands and wives. Consistent with recognizing that more women are contributing substantially to family incomes, we do not find that wives are tied-movers. Rather, we find that husbands are more likely to be tied-stayers. Effects of educational attainment on

migrating differ for spouses, as well. Our results indicate that the effect of the husband's education level (being more likely to move if he is college educated) is much stronger than that of the wife's education. If educational attainment translates into earnings potential, this result may demonstrate that couples still consider the husband's career to be of primary importance.

This research applies multilevel statistical modeling to the study of family migration. This approach is an improvement over studies that have employed a traditional logistical framework. Comparing the results reported here to estimates of Models 1 and 2 generated using a traditional logistical model (not reported for the sake of brevity), we detect biases in coefficient and standard error estimates using the traditional approach. While our important conclusions do not differ across frameworks, we find that the traditional logistic model yields biased estimates for 9 of the 12 estimated coefficients for Model 1; 5 of the coefficients are underestimated and 4 are overestimated. Similarly for Model 2, 6 coefficients are underestimated and 4 are overestimated. Using the traditional framework, standard errors are underestimated for both Models 1 and 2.

Future research should build on this study. Analyses that examine panel data within a multilevel model framework are encouraged. This study examines data from the Panel Study of Income Dynamics. Several other national data sets also provide an opportunity to match panel data with geocoded data. Cross-sectional analyses of migration are no longer necessary as readily available panel data can avoid many of the shortcomings that are inherent to cross-sectional studies. Also, this study recognizes that the decision of a family to move is not made by a single individual. As gender differences in employment have diminished over time, it is clear that studies of the determinants and consequences of family migration must consider both spouses.

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