JOURNAL OF URBAN ECONOMICS **14**, 263–279 (1983)

Migration and Job Change: A Multinomial Logit Approach

PETER LINNEMAN

Department of Finance, Wharton School, University of Pennsylvania, Philadelphia, Pennsylvania 19107

AND

PHILIP E. GRAVES[1]

Department of Economics, University of Colorado, Boulder, Colorado 80309

Received August 6, 1981; revised July 13, 1982

A multinomial logit model of residence and job change is developed and estimated. Both housing demand and job search characteristics are found to be significant determinants of the decision to migrate. It is also found that both equilibrium and disequilibrium forces induce migration and job change. Finally, the data do not appear to be ordered with respect to job and residence change contingencies with the exception of changing neither job nor residence relative to all other contingencies.

I. INTRODUCTION

Following Sjaastad [27], economists have modeled household migration decisions as the outcome of job-related search activities, with moves occurring when the location of a new job differs significantly from the original job location. A major limitation of this job-search model of migration is that it ignores many observed migration decisions. For example, the implicit presumption is that the determinants of interurban movements differ from those of intraurban migration. This dichotomy is expressed by Schwartz [26, p. 712]:

> a migrant is someone who switches jobs (or intends to do so) and in the process crosses a regional boundary. Therefore, the set of migrants is a subset of job switchers.

[1]The authors are at the Wharton School, University of Pennsylvania, and the Department of Economics, University of Colorado. Useful comments on an earlier draft of this paper were provided by John Abowd, David Crawford, Shelby D. Gerking, Janice Madden, Robert Pollak, and members of the Urban Economics Workshop at the University of Chicago and Labor Economics Workshop at the University of Pennsylvania. Useful suggestions were provided by a referee. Research assistance was provided by Daniel Hayes.

0094-1190/83 $3.00

This perspective is limited by two observations (1) many families change residences without changing jobs; and (2) many movers are not in the labor market.

This paper stresses that migration decisions, regardless of their nature with respect to regional and political boundaries, are caused not only by factors inducing job changes but also by forces which change supplies and demands for residential site characteristics. The contribution of this paper is that the determinants of the household's joint decision to change job, residence, and geographic region are parameterized in a manner consistent with this view of migration. Section II provides an intuitive description of the interactions of the disequilibrium and equilibrium motivations for job change and household migration. The multinomial logit results reported in Section III clearly indicate the importance of both job search and residential demand factors in understanding household migration and job change decisions.

II. GENERALIZED MODEL OF MIGRATION

If all jobs and residences were identical then there would be no incentive to change job or residence, since to do so imposes monetary and psychic costs without offsetting benefits. Since jobs and residences are heterogeneous, movements occur which are motivated by spatial variations in utility in either the labor or housing markets. As depicted in Table 1, these spatial variations in utility can be either disequilibrium or equilibrium in nature.

Consider first the labor market where the cost of complete search leads to incomplete information about the wages and nonpecuniary payments available across jobs. In the presence of a nondegenerate compensation distribution the opportunity exists to improve one's utility by changing jobs if the discounted benefits exceed adjustment costs. This insight is the essence of Sjaastad's [27] model of migration when it is noted that a subset of these labor market arbitragers and improved job match seekers will have to change their residence to optimally coordinate job and residence sites.

TABLE 1
Migration Inducement Taxonomy

	Utility associated with job traits	Utility associated with residence site traits
Disequilibrium influences	Job search (arbitrage)	Residence site search (arbitrage)
Equilibrium influences	Life cycle/job amenity (income and price effects)	Life cycle/residence site amenities (income and price effects)

Migration of this sort is represented by the upper left cell of Table 1. In addition to movement cost variables, this view indicates that migration will be a function of the dispersion of labor market information and the ability of people to process market information.

An equilibrium labor market mobility inducement, represented in the lower left cell of Table 1, may also be developed using Sjaastad's human capital model of job change. For example, one might change location in order to obtain a more training-intensive position or to receive a promotion. Similarly, retirement may be viewed as an equilibrium change in one's job status from market to self-employment. The equilibrium model of job change and residence choice suggests that economic and life-cycle variables, such as family income, the age of the head of the household, and job tenure, will prove useful in explaining migration and job change decisions.[2]

Just as all jobs are not identical, so too all residential sites are not identical. In a full information equilibrium, annualized housing payments between alternative sites would reflect the value of the differences in structural characteristics and location specific amenities. However, incomplete information provides arbitrage opportunities in the housing market as noted in the upper right cell of Table 1. The movement induced by housing market disequilibrium may lead some households to change jobs to optimally coordinate job and residence sites. Housing market arbitrage movements will be a function of movement costs, the dispersion of the housing market information, and the ability of households to adjust to disequilibrium in the housing market. This extension of the popular labor market disequilibrium model of job change and migration has received little attention.

The fourth migration inducement, displayed in the lower right cell of Table 1, is the housing market equilibrium adjustment model detailed in this journal by the authors [12]. This migration inducement suggests that the choice of a residence is determined by families equating supplies and demands for residence site characteristics. The demands for location site characteristics are a function of family income, tastes, and relative prices. As these demand variables (or their supply counterparts) change so too will the optimal combination of site-specific characteristics. These changes may be satisfied either by rehabilitation or by moving to the site most closely matching the newly desired bundle of locational traits.[3] A unique implication of this model, developed in Duffy [7] and Graves and Linneman [12], is that housing market equilibrium-induced migrations will be a function of

[2] For instance, working in an air-conditioned office may be a superior trait and hence, as one's real income possibilities rise, they may choose to move from a job without an air-conditioned office to one with air conditioning.

[3] Migration occurs if the most effective way to satisfy the modified demands, given the costs of migration and rehabilitation, is to move to a site providing the newly desired location traits.

both increases and decreases in the variables which determine demands and supplies of location-specific amenities.

Observed migration is the result of the simultaneous interaction of the equilibrium and disequilibrium influences in the job and residence site markets. For example, a household may decide to move its residence both because the birth of a new child has altered its site-specific demands and because the head of the household has recently completed a job-training program which offers a promotion opportunity. This taxonomy of the inducements to migration has not been previously developed. Rather, some authors (Blanco [3], Bowles [4], Denton [6], Greenwood [13], Kaluzny [17], Liu [19], Orsagh and Mooney [23], Schwartz [25, 26], and Vanderkamp [30]) have concentrated on the labor market disequilibrium inducement for migration while others (Duffy [7], Graves [8–11] and Graves and Linneman [12]) have given greater emphasis to the residence site equilibrium motivation for migration. Only Bartel [2] has attempted to empirically determine the interaction between job change and residence change. However, Bartel's methodology employs a narrow measure of migration and does not fully model the residence site inducements for migration. Further, as Amemiya (p. 1526, [1]) notes, "Bartel ignored the multivariate nature (as well as the multi-response nature) of the data and estimated each of the... probabilities...separately by the univariate, dichotomous logit maximum likelihood estimator." Although Bartel's method is computationally convenient it ignores the basic correlation structure among the various choice options and may result in the sum of the estimated probability impacts exceeding unity. This paper adopts Amemiya's [1] suggestion of using the more appropriate multiresponse logit specification to examine the migration/job change decision process.

III. PARAMETER ESTIMATES OF THE JOINT DECISION TO CHANGE RESIDENCE, COUNTY, AND JOB

Table 2 presents the contingency table of residence site and job change categories used in this study.[4] In the 12 months between the survey dates in 1971 and 1972, 13% of the sample households changed their residential address while 9% of the heads changed their job.[5] One third of all job

[4]The data employed in this study are a 1937 observation sample drawn from the "Michigan Panel Study of Income Dynamics." To be included in this sample the household must have been in the random portion of the full panel, had the same head of the household in 1970 through 1972, and provided useful answers in all 3 years to all questions relevant to this study. For example, a household whose head had an unspecified sex or age were deleted from the sample. The sample selection procedure appears to generate a sample which underrepresents the true proportion of residence site and job changers. This is presumably attributable to the fact that residence changers are difficult to track longitudinally.

[5]As might be expected some intrafirm job changes of job are not classified as job changes in this sample. The magnitude of this undercounting is not known.

TABLE 2

Residence Site and Job Change Proportional Contingency Table, 1971–1972[a]

	Head of household changed job between 1971 and 1972	Head of household did not change job between 1971 and 1972
Head of family changed residence site and county of residence between 1971 and 1972	0.01	0.01
Head of family changed residence site but not county of residence between 1971 and 1972	0.02	0.10
Head of family did not change residence site between 1971 and 1972	0.06	0.80

[a]1937 observations.

changes also involved changes in residence site, although only a third of these families moved to a new country. Further, only a third of the families which changed their county of residence also had a head who experienced a change in job.[6] These figures indicate residence site inducements are important determinants of observed migration patterns. Since less than a quarter of all residence site changes are changes of one's county of residence, defining migration as the crossing of state or county boundaries artificially reduces the scope of the economic decision being analyzed. The unique perspective adopted here is that the decision calculus is the same for all movements with the data parameterizing the distinction between varieties of migration.

Table 3 displays the definitions and means of the independent variables used in this study. The variables are grouped into the general categories of movement inducements displayed in Table 1, plus moving costs.[7] The first category is comprised of variables which reflect the psychic and monetary costs of changing one's job or residence. As these costs rise the probability of changing one's job or residence is expected to fall. The number of children currently in school and the regularity of church attendance proxy the psychic costs associated with moving due to the severing of one's social ties and responsibilities. Mincer [21] argues that a household with two adult

[6]The presence of lags between changing residence and obtaining employment means these figures may somewhat undermeasure the importance of job change inducements for migration.

[7]This is not to suggest that a variable necessarily belongs only to a single category. Rather, the groupings are an attempt to indicate what the authors feel is the source of each variable's primary influence.

TABLE 3

Independent Variables and Sample Means[a]

Variable definition	Mean	Variable name
Moving cost variables		
Number of children in school in 1971	0.98	KIDS
1 If the family attends church regularly in 1971	0.74	CHURCH
Hourly wage rate of household head in 1971	3.18	WAGE
1 If head of household is married in 1971	0.75	MARRIED
Disequilibrium labor and housing market variables		
1 If the head of household is white	0.90	WHITE
1 If the head of household is female	0.19	FEMALE
Number of states previously lived in, 1971	2.10	STATES
Number of years of education, head, 1971	11.32	EDUCATION
Equilibrium labor market variables		
Age of the household head in 1971	48.80	AGE
Number of years the head of household has had current job, 1971	7.20	JOB
Equilibrium housing market variables		
Increase (if family size rises) in family size between 1971 and 1972	0.10	+SIZE
Decrease (if family size falls) in family size between 1971 and 1972	0.12	−SIZE
Increase (if income rises) in real family income between 1971 and 1972	1023.90	+INCOME
Decrease (if income falls) in real family income between 1971 and 1972	835.27	−INCOME
Increase (if illness rises) in annual hours of head illness between 1971 and 1972	40.50	+ILL
Decrease (if illness falls) in annual hours of head illness between 1971 and 1972	43.57	−ILL
Increase (if unemployment rises) in head hours of unemployment between 1971 and 1972	30.00	+OUT
Decrease (if unemployment falls) in head hours of unemployment between 1971 and 1972	27.29	−OUT
Increase (if wage rises) in head real average hourly wage between 1971 and 1972	0.43	+HOURLY
Decrease (if wage falls) in head real average hourly wage between 1971 and 1972	0.45	−HOURLY

[a] 1937 observations.

members, indicated by the marital status variable, faces a smaller opportunity set available through the joint utility maximization process than two single utility maximization processes. The head's wage rate reflects the opportunity cost of time spent searching for more attractive job opportunities and residential locations. This variable also captures the relative time costs involved in the physical act of migration.

The second broad category of variables are associated with the disequilibrium motivations for job change and migration (the first row of Table 1). Since the key variables for both disequilibrium motivations are measures of the ability to adjust to arbitrage opportunities the same variables are relevant for both motives. As the number of states previously lived in increases, the information and experience set of the household also tends to increase. If, as expected, families with more experience adjust more rapidly to spatial disequilibrium one expects the number of states previously lived in to be positively correlated with both job change and residential mobility. Similarly, following Schultz's [24] argument, as the head's educational achievement rises so too will the likelihood of the family's adjusting to market disequilibria. Finally, if there is discrimination in either the labor or housing market, female and nonwhite heads will face reduced opportunity sets and hence reduced arbitrage opportunities. Therefore, one expects less job and residence mobility for these types of families.

Equilibrium labor market variables represent a third broad category of variables employed in this paper. As previously noted, the age of the head of the household is a proxy for life-cycle-related labor market movements. The number of years of current job tenure is a standard measure of one's commitment and job match with the current position (Jovanovic [15, 16]) and hence the longer one's job tenure, the lower should be the probability of any labor or housing market adjustment.

The final set of variables capture is the equilibrium residence site inducements to change. As developed in Graves and Linneman [12] and Duffy [7], these variables measure increases and decreases in the determinants of the demand for housing. Specifically, measures of the increases and decreases in family size, real family income, health, head's hours of unemployment, and head's wage rate are used to proxy changes in housing demand. The changes in health and unemployment variables are an attempt to measure changes in expected lifetime income.[8] The changes in family size are dynamic counterparts to the site demand influences of family size found by Linneman [20] and Straszheim [28]. Movements in family income and head's hourly wage rate are designed to capture income effects on the demand for site-specific traits. Two variables are included for each demand shifter as both increases and decreases are expected to alter residence site demands and hence increase movement probabilities.[9]

[8] Changes in health may also change the full costs of consuming some locational traits. For example, increased illness may make caring for one's lawn more expensive. Further, changes in health may also increase one's uncertainty about optimal future consumption.

[9] Graves and Linneman [12] hypothesized, but failed to test, that migration responds symmetrically to positive and negative changes. In this study the separate effects of positive and negative changes in these variables are included to test symmetry of job change and migration decisions with respect to these equilibrium housing market variables.

TABLE 4
Minimum, Maximum, and Mean Values of $(\partial P_j)/(\partial X_i)$

		$\Delta R, \Delta C, \Delta J$	$\Delta R, \not\Delta C, \Delta J$	$\not\Delta R, \Delta J$	$\Delta R, \Delta C, \not\Delta j$	$\Delta R, \not\Delta C, \not\Delta J$	$\not\Delta R, \not\Delta J$
Moving cost variables							
KIDS	Min to max	−0.15 to 0	−0.07 to 0.08	0 to 0.15	−0.08 to 0.07	−0.06 to 0.09	−0.04 to 0.12
	Mean	−0.013	−0.006	0.009	−0.008	−0.008	0.026
CHURCH	Min to max	0 to 0.31	−0.24 to 0.07	−0.31 to 0	−0.28 to 0.03	−0.02 to 0.29	−0.23 to 0.08
	Mean	0.028	−0.002	−0.017	−0.013	0.008	−0.004
WAGE	Min to max	−0.10 to 0	−0.03 to 0.07	−0.06 to 0.04	0 to 0.10	−0.04 to 0.06	−0.02 to 0.08
	Mean	−0.010	−0.001	−0.007	0.005	−0.007	0.019
	Min to max	−0.26 to 0.16	−0.42 to 0	−0.02 to 0.40	−0.02 to 0.40	−0.29 to 0.13	0 to 0.42
MARRIED	Mean	−0.023	−0.071	0.009	0.009	−0.101	0.178
Disequilibrium labor and housing market variable							
WHITE	Min to max	−1.95 to 0	−1.83 to 0.12	−1.70 to 0.25	0 to 1.95	−1.76 to 0.19	−1.80 to 0.15
	Mean	−0.032	−0.017	−0.002	0.406	−0.033	−0.311
FEMALE	Min to max	−0.29 to 0.07	−0.26 to 0.10	−0.03 to 0.33	−0.36 to 0	−0.17 to 0.19	0 to 0.36
	Mean	−0.028	−0.039	0.006	−0.072	−0.045	0.177
STATES	Min to max	0 to 0.15	−0.12 to 0.03	−0.14 to 0.01	−0.08 to 0.07	−0.11 to 0.05	−0.16 to 0
	Mean	0.017	0.003	0.001	0.016	0.016	−0.054
EDUCATION	Min to max	0 to 0.06	−0.03 to 0.03	−0.02 to 0.04	−0.05 to 0.01	−0.06 to 0	−0.05 to 0.01
	Mean	0.005	0.003	0.004	−0.002	−0.006	−0.004
Equilibrium labor market variable							
AGE	Min to max	−0.03 to 0	−0.03 to 0	−0.01 to 0.02	−0.02 to 0.01	−0.02 to 0.01	0 to 0.03
	Mean	−0.003	−0.005	−0.002	−0.002	−0.004	0.016
JOB	Min to max	−0.02 to 0	−0.01 to 0.01	−0.02 to 0	−0.02 to 0	−0.01 to 0.01	0 to 0.02
	Mean	−0.002	−0.001	−0.003	−0.003	−0.003	0.011

Equilibrium housing market variable							
+SIZE	Min to max	0 to 0.11	−0.09 to 0.02	−0.11 to 0	−0.08 to 0.03	−0.01 to 0.10	−0.10 to 0.01
	Mean	0.011	0.001	−0.004	0.001	0.034	−0.031
−SIZE	Min to max	−0.02 to 0.23	0 to 0.25	−0.18 to 0.07	−0.25 to 0	−0.11 to 0.14	−0.23 to 0.02
	Mean	0.022	0.039	0.004	−0.012	0.038	−0.091
+INCOME	Min to max	0 to 0.75	−0.12 to 0.63	−0.75 to 0	−0.55 to 0.20	−0.47 to 0.29	−0.53 to 0.22
	Mean	0.060	0.076	−0.050	−0.012	0.015	−0.089
−INCOME	Min to max	−0.44 to 0.32	0 to 0.76	−0.41 to 0.35	−0.70 to 0.06	−0.66 to 0.10	−0.76 to 0
	Mean	0.029	0.135	0.053	−0.005	0.007	−0.219
+ILL	Min to max	−0.04 to 0.13	−0.04 to 0.13	0 to 0.17	−0.17 to 0	−0.01 to 0.16	−0.01 to 0.16
	Mean	−0.002	−0.004	0.004	−0.037	0.006	0.028
−ILL	Min to max	−0.23 to 0	−0.12 to 0.11	0 to 0.23	−0.04 to 0.19	−0.02 to 0.21	−0.01 to 0.22
	Mean	−0.024	−0.019	0.005	−0.005	−0.001	0.044
+OUT	Min to max	−0.03 to 0.05	−0.01 to 0.07	0 to 0.08	−0.06 to 0.02	−0.05 to 0.03	−0.08 to 0
	Mean	0.004	0.011	0.013	−0.001	0.004	−0.035
−OUT	Min to max	0 to 0.06	−0.05 to 0.01	−0.02 to 0.04	−0.03 to 0.03	−0.03 to 0.03	−0.06 to 0
	Mean	0.006	−0.000	0.006	0.004	0.008	−0.025
+HOURLY	Min to max	0 to 0.06	−0.04 to 0.02	−0.03 to 0.03	−0.02 to 0.04	−0.06 to 0	−0.04 to 0.02
	Mean	0.004	−0.000	0.002	0.003	−0.009	−0.001
−HOURLY	Min to max	0 to 0.10	−0.09 to 0.01	−0.09 to 0.01	−0.10 to 0	−0.05 to 0.05	−0.09 to 0.01
	Mean	0.009	−0.002	−0.002	−0.005	0.011	−0.018

Table 4 reports the minimum, maximum, and mean values of $\partial P_j / \partial X_i$ for the six-cell logit characterization of the decision to change job, residence, and county of residence.[10] Full logit estimation results are reported in the Appendix. The notation convention used in Table 4 is that "Δ" refers to a change in status while "$\not\Delta$" identifies an unchanged status. Thus, for example, ΔR indicates a change in residence, $\not\Delta C$ indicates no change in county of residence, and ΔJ indicates a change in one's job. This six-cell specification allows one to identify both residence changes primarily in the same urban area (ΔR, $\not\Delta C$), as well as interurban residence changes (ΔR, ΔC) along with the interaction of these residence change factors with job change factors.[11]

The test statistics (reported in the Appendix) reveal that the multinominal specification provides significant explanatory insights into the complex phenomena of job and residence change. Further, each of the variable categories shown in Table 1, along with the moving cost variables, significantly improve the model's explanatory power. The only individual variables which fail to significantly improve the model's explanatory power at the 90% level are regular church attendence, race of the head, sex of the head, increase in family size, changes in the head's annual hours of illness, and changes in the head's hourly wage rate.

In general, increases in the moving cost variables encourage families to do nothing to change either their job or residence status. This is particularly

[10] Crawford and Pollak [5] discuss the properties of the derivatives of the multinomial logit specification. They demonstrate that

$$0.25(B_{ij} - B_{i\text{MAX}}) \leq \frac{\partial P_j}{\partial X_i} \leq 0.25(B_{ij} - B_{i\text{MIN}})$$

where B_{ij} is the logit coefficient for variable i with respect to event j, $B_{i\text{MAX}}$ is the largest logit coefficient for variable i across all possible events, and $B_{i\text{MIN}}$ is the smallest logit coefficient for variable i across all possible events. They also demonstrate that

$$\frac{\partial P_j}{\partial X_i} = P_j\left(B_{ij} - \sum_{j=1}^{M} P_j B_{ij}\right)$$

where M is the number of possible events. The mean values of $\partial P_j / \partial X_i$ are evaluated at

$$P(\Delta R, \Delta C, \Delta J) = 0.03$$
$$P(\Delta R, \not\Delta C, \Delta J) = 0.05$$
$$P(\not\Delta R, \Delta J) = 0.05$$
$$P(\Delta R, \Delta C, \not\Delta J) = 0.06$$
$$P(\Delta R, \not\Delta C, \not\Delta J) = 0.11$$
$$P(\not\Delta R, \not\Delta J) = 0.70.$$

[11] Not all changes in county require changing one's urban area, however; intercounty moves will tend to represent interurban moves. For expository purposes this paper will refer to changes in county as changes in urban area.

Unlike Bartel [2], this study does not distinguish job changes due to quits versus layoffs. This is because Jovanovic [15, 16] demonstrates that if real wages are flexible there is no meaningful difference between these two categories.

true with respect to changing job and making an intraurban residence change. High-wage families are particularly discouraged from changing jobs due to both the high opportunity costs of search and the potential losses of losing a relatively good job match. A novel insight provided by this multinomial contingency analysis is that these high-wage families are also relatively likely to make interurban moves that do not require changing jobs.[12] A similarly unique insight provided by this multinomial specification is that the likelihood of changing jobs but not residence increases with the number of children in school, although the probability of changing neither residence nor job also tends to rise with this family trait. This suggests that the primary influence of school-aged children on mobility operates by directly discouraging residence change, for example, to avoid disrupting the education of the children.

The results of the disequilibrium adjustment variables are as expected with more educated and more experienced (in terms of states resided in) making more changes in their status. An important result obtained from this analysis is that the primary impact of education appears to occur in the job market. Specifically, absent any job change more educated individuals are less likely to move; however, more educated are relatively likely to make residence changes (especially interurban changes) when they also change jobs. This is consistent with both Schwartz [26] and Schultz [24]. Those families who have lived in more states are more likely to adjust both job and residence status. It is unclear whether this result reflects their increased knowledge of the relevent opportunity set, or an unmeasured individual movement propensity, or simply an intertemporally correlated error structure.

Female-headed households move less often but change jobs more often so long as no residence change also occurs. This negative impact on residence change may reflect some housing market discrimination or alternatively, the existence of female-specific benefit programs which subsidize immobility (such as AFDC residency requirements).[13] White households are less likely to adjust either job or residence status with the notable exception of interurban residence changes which do not entail job changes.

The impacts of the traditionally important variables representing labor market equilibrium incentives to move exhibit the expected effects. As the head's job tenure (a variable whose effect is seldom isolated from age of the

[12] One explanation of this result is that relatively high-wage workers are employed by national firms and obtain information about these distant job and residence opportunities through the company "grapevine" and various company visits. These information sources permit these workers to obtain information cheaply in spite of their value of time while the national nature of their employer allows them to change area of residence without sacrificing good job matches.

[13] This hypothesis was suggested by Janice Madden.

head) increases, all changes in residence and job are discouraged. This reflects that those workers who stay on the job tend to be parties to relatively good job matches. Further, high-tenure workers with either implicit or explicit incentive compatible life-cycle contracts tend to realize payments in excess of their spot market value marginal product.[14] The negative impacts of the age of the head of the household reflect the shorter time period over which to realize any adjustment benefits as well as any matching effects associated with residence site choice.

In general, the results of the equilibrium housing market variables support the symmetry hypothesis proposed by Graves and Linneman [12] and Duffy [7].[15] Both increases and decreases in these demand shift variables, with the exception of weak health change effects, encourage changing residence or job. Also, except for health changes, any demand shift (up or down) increases the probability of interurban job changes. Increases in family size increase the tendency to change residence and also induce job changes linked to residence change. This suggests that the primary influence of this variable is through directly encouraging residence change. Reductions in family size appear to exert a direct job adjustment effect in addition to a residence site effect as the probability of changing jobs is increased while the likelihood of residence change increases unless the residence change is interurban and nonjob related. A similar pattern exists for declines in real family income.

Table 5 displays two summary measures of the orderings of the six job change/residence change events examined in this section in terms of mean probability change impacts. An examination of the first column reveals that for 85% of the independent variables, changing neither job nor residence was an extreme value in the ordering of mean probability impacts. This is consistent with the intuition that any change in status tends to systematically be ranked above (after normalization) changing nothing. However, the other five options fail to reveal any ordering pattern across the independent variables.[16] Alternatively stated, doing nothing appears to represent a consistent base point for comparison of independent variable impacts, but no consistent pattern of the impacts on the other five categories appears to exist.

The second column of Table 5 reports the mean ordinal rank of the categories (in terms of mean independent variable impacts) when either job or residence status is changed relative to the base case of changing neither job nor residence. An ordinal scoring was employed where the option closest to doing nothing for a particular independent variable was assigned

[14] See Lazear [18] for a more complete discussion of this type of life cycle contract.

[15] The estimates, however, fail to support the extreme version of the symmetry hypothesis imposed by these authors in an earlier paper (1979).

[16] See Amemiya [1] and Crawford and Pollak [5] for more detailed discussions of ordering.

TABLE 5

Mean $(\partial P_j)/(\partial X_i)$ Summary

	% of Possible extrema[a]	Mean ordinal rank relative to $\not\Delta R, \not\Delta J$ when $\not\Delta R, \not\Delta J$ is an extrema[b]
$\Delta R, \Delta C, \Delta J$	35	4.4
$\Delta R, \not\Delta C, \Delta J$	20	4.2
$\not\Delta R, \Delta J$	15	3.4
$\Delta R, \Delta C, \not\Delta J$	15	3.6
$\Delta R, \not\Delta C, \not\Delta J$	30	4.4
$\not\Delta R, \not\Delta J$	85	—

[a]This is equal to the number of times that the option has either the largest or smallest mean $\partial P_j/\partial X_i$ divided by 20. The column sums to 200% because the option may be at either the upper or lower extrema.

[b]The $\not\Delta R$, $\not\Delta J$ option occurred as an extrema for 17 of the 20 variables. This column is calculated by assigning a 2 to the option with the mean $\partial P_j/\partial X_i$ closest to that for $\not\Delta R$, $\not\Delta J$, a 3 for the next closest $\partial P_j/\partial X_i$, etc., and dividing by 17.

a two,[17] the next closest option was assigned a three, etc. The mean ordinal rankings indicate that not changing residence but changing job is the "closest" option to "doing nothing." The interurban job and residence change option along with the nonjob-oriented intraurban residence change option tend to be the "farthest" options from doing nothing. However, care must be used in interpreting these rankings as they only reflect average ordinal tendencies.

IV. SUMMARY

The analysis presented in this paper has emphasized that the job search and residence decisions are intimately intertwined over both long and short distances. Moreover, the job search literature, with its emphasis on labor disequilibrium-induced movements, fails to consider other job and residence adjustments. This paper demonstrates that both disequilibrium and equilibrium residence site variables are important determinants of the decisions to change job and residence. The empirical analysis indicates that the migration and job change decisions are interrelated and more complicated than previously recognized. The six-cell joint probability analysis presented in Section 3 represents a significant improvement over the previously used binomial analysis in understanding the determinants of job change and residence adjustment as it explicitly incorporates the theoretical interactions.

[17]That is, it is the second option in the ordering for that variable.

APPENDIX: MULTINOMIAL LOGIT REGRESSIONS

	Probability of changing job, residence, and county	Probability of changing job and residence while not changing county	Probability of changing job while not changing residence or county	Probability of not changing job while changing residence and county	Probability of not changing job while changing residence and not county	Chi-squared[a]
Moving cost variables						
KIDS	−0.4717	−0.1545	0.1446	−0.1729	−0.1054	157.47
CHURCH	0.9264	−0.0292	−0.3273	−0.2125	0.0777	4.90
WAGE	−0.3541	−0.0381	−0.1593	0.0620	−0.0894	16.31
MARRIED	−1.0314	−1.6890	−0.0772	−0.0973	−1.1740	22.72
Disequilibrium labor and housing market variables						
WHITE	−0.6113	−0.1097	0.4097	7.2042	0.1446	2.59
FEMALE	−1.1930	−1.0368	−0.1228	−1.4499	−0.6607	7.65
STATES	0.6597	0.1404	0.1059	0.3511	0.2232	21.42
EDUCATION	0.1802	0.0664	0.0822	−0.0344	−0.0460	11.15
Equilibrium labor market variables						
AGE	−0.1285	−0.1161	−0.0550	−0.0621	−0.0601	157.47
JOB	−0.0736	−0.0409	−0.0737	−0.0627	−0.0390	21.72

Equilibrium housing market variables						
+ SIZE	0.4065	0.0649	−0.0435	0.0690	0.3568	6.53
− SIZE	0.8485	0.9159	0.2086	−0.0642	0.4790	17.48
+ INCOME	0.0002	0.002	−0.0001	−0.0000	−0.0000	11.88
− INCOME	0.0001	0.0003	0.0001	0.0000	0.0000	19.65
+ ILL	−0.0010	−0.0012	0.0004	−0.0065	0.0001	2.90
− ILL	−0.0087	−0.0045	0.0003	−0.0014	−0.0007	5.07
+ OUT	0.0018	0.0027	0.0030	0.0004	0.0009	46.65
− OUT	0.0023	0.0003	0.0016	0.0010	0.0011	10.66
+ HOURLY	0.1504	−0.0035	0.0464	0.0593	−0.0781	3.15
− HOURLY	0.3411	−0.0316	−0.0071	−0.0507	0.1217	5.54
Constant	−1.5038	2.1685	−1.0952	7.1473	1.7000	

[a] The chi-squared values reported are for the null hypothesis that the joint probability structure is not affected by the variable. The critical chi-squared values for 5 degrees of freedom are: 9.24 for 90% level; 11.07 for the 95% level; 12.83 for the 97.5% level; and 15.09 for the 99% level. The critical values for 100 degrees of freedom are: 124.42 for the 90% level; 130.02 for the 95% level; 134.50 for the 97.5% level; and 135.81 for the 99% level. The five degrees of freedom statistic is relevant for the test for a single variable's impact on the joint structure while the 100 degrees of freedom statistic relates to the overall performance of the model.

Chi-squared for equation = 575.54.

REFERENCES

1. T. Amemiya, Qualitative response models: A survey, *J. Econ. Lit.* **19**, 1483–1536 (1981).
2. A. Bartel, The migration decision: What role does job mobility play? *Amer. Econ. Rev.* **69**, 775–786 (1979).
3. C. Blanco, Prospective unemployment and interstate population movements, *Rev. Econ. Statistics*, **46**, 221–222 (1964).
4. S. Bowles, Migration as investment: Empirical tests of the human investment approach to geographical mobility, *Rev. Econ. Statistics*, **52**, 356–362 (1970).
5. D. Crawford and R. Pollak, "Interpretation and Inference in Qualitative Choice Models," mimeo, University of Pennsylvania (1981).
6. F. T. Denton, Prospective unemployment and interstate population movements: A comment, *Rev. Econ. Statistics*, **47**, 449–450 (1965).
7. M. K. Duffy, "Intra-Urban Migration: Household Residence Relocation," unpublished Ph.D. thesis, University of Chicago (1979).
8. P. E. Graves, A reexamination of migration, economic opportunity, and the quality of life, *J. Regional Sci.*, **16**, 107–112 (1976).
9. P. E. Graves, A life-cycle empirical analysis of migration and climate, by race, *J. Urban Econ.* **6**, 135–147 (1979).
10. P. E. Graves, Income and migration reconsidered, *J. Human Resources*, **14**, 112–121 (1979).
11. P. E. Graves, Migration and climate, *J. Regional Sci.* **20**, 227–237 (1980).
12. P. E. Graves and P. Linneman, Household migration: Theoretical and empirical results, *J. Urban Econ.* **6**, 383–404 (1979).
13. M. J. Greenwood, An analysis of the determinants of geographic labor mobility in the United States, *Rev. Econ. Statistics*, **51**, 189–194 (1969).
14. M. J. Greenwood, Research on internal migration in the United States: A survey, *J. Econ. Lit.*, **13**, 397–433 (1975).
15. B. Jovanovic, Firm-specific capital and turnover, *J. Political Econ.* **87**, 1246–1260 (1979).
16. B. Jovanovic, Job matching and the theory of turnover, *J. Political Econ.*, **87**, 972–990 (1979).
17. R. L. Kaluzny, Determinants of household migration: A comparative study by race and poverty level, *Rev. Econ. Statistics* **57**, 269–274 (1975).
18. E. Lazear, Why is there mandatory retirement?, *J. Political Econ.* **87**, 1261–1285 (1979).
19. Ben-chieh Liu, Differential net migration rates and the quality of life, *Rev. Econ. Statistics*, **57**, 329–337 (1975).
20. P. Linneman, An analysis of the demand for residence site characteristics, *J. Urban Econ.* **9**, 129–148 (1981).
21. J. Mincer, Family migration decision, *J. Political Econ.* **86**, 749–773 (1978).
22. J. P. Nelson, Residential choice, hedonic prices, and the demand for urban air quality, *J. Urban Econ.* **5**, 357–369 (1978).
23. T. V. Orsagh and P. J. Mooney, A model for the dispersion of the migrant labor force and some results for the United States, 1880–1920, *Rev. Econ. Statistics* **52**, 306–312 (1970).
24. T. W. Schultz, The value of the ability to deal with disequilibria, *J. Econ. Lit.* XIII, **13**, 827–846 (1975).
25. A. Schwartz, Interpreting the effect of distance on migration, *J. Political Econ.* **81**, 1153–1169 (1973).
26. A. Schwartz, Migration, Age, and Education, *J. Political Econ.* **84**, 701–719 (1976).
27. L. A. Sjaastad, The costs and returns of human migration, *J. Political Econ.* **70**, 80–93 (1962).

28. M. R. Straszheim, "An Econometric Analysis of the Urban Housing Market," National Bureau of Economic Research, Columbia Univ. Press (1975).
29. G. Tolley and D. Diamond (ed.), "Amenities and the Residence Site Choice," Academic Press, New York (1982).
30. J. Vanderkamp, Migration flows, their determinants and the effects of return migration, *J. Political Econ.* **79**, 1012–1031 (1971).