WHITE RESIDENTIAL MOBILITY IN A RACIALLY CHANGING AREA

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Past research on neighborhood racial transition and residential mobility has generated few propositions about the impact of naturally-occurring change processes or proposed policy changes on the social composition of urban neighborhoods. A major difficulty in the development of policy-oriented models of neighborhood occupancy change is the assessment of the various situational factors that influence household mobility behavior. One of the major obstacles to systematic study of the relationships between the so-called "neighborhood" effects and residential mobility has been the absence of data sources that permit inferences about micro-level, short-run behavior.[1]

The development of disaggregated, longitudinal data files opens up several new possibilities for research on intrametropolitan migration, including the investigation of these "neighborhood" factors. The principal objective of this paper is to indicate how data from such files can be utilized in developing formal models of residential mobility. More specifically, we examine several models of white outmigration from selected intraurban areas using detailed characteristics of individual households and characteristics of blocks in which these households live.

1. Procedure

The research strategy employed in this study involves fitting a variety of models of white outmigration for two census tracts, one of which is currently undergoing white-to-black transition, the other remaining racially stable and predominantly white.[2] The justification for identifying two areas with similar population and housing stock characteristics is that this procedure facilitates not only the recognition of intertract differences in mobility rates but also the extent to which such differences are associated with block-level environmental factors.

The data base required for making such comparisons, then, must meet two specifications: first, it must contain detailed socioeconomic characteristics of individual households in suitable test-control areas; and second, it must include information about the mobility behavior of these separate households. (The decennial census clearly fails to satisfy these criteria, as it permits inferences only about net migration by various types of households within a particular area.) At present one of the strongest data sets that meets these two criteria is the Wichita-Sedgwick County (Kansas) Annual Enumeration of Households, a complete census of the Wichita metropolitan area that has been conducted for each of the past four years.

According to U.S. Census data five census tracts in Wichita had a marked increase in black households between 1960 and 1970. Of these five tracts, tract 18 best met the criteria of (1) recency and extent of black inmigration, (2) having a sufficiently large number of long-term white residents, and (3) being suitably matched to some all-white tract. Table 1 lists the indicators that were used in the matching process.

The all-white tract that matched tract 18 on the largest number of indicators was tract 28. Tract 18 lies about half a mile east of center city, whereas tract 28 lies about the same distance west of the center and across the Arkansas River. Table 1 indicates that the tracts are very similar with respect to household size, population composition and density, education levels, occupational and employment characteristics, and average rent. Both tracts had a large net outmigration of whites between 1960 and 1970, but only tract 18 had a sizeable increase in blacks. Aside from racial composition these tracts differ noticeably in four respects: median income ($4411 for tract 18, $5431 for tract 28); average value of single-family, owner-occupied units ($8300 for 18 as compared with $10,300 for tract 28); percent of year-round vacancies (19.2% versus 6.3%); and percent at same residence in 1965 (39.4% compared with 50.6%). The high vacancy portion of tract 18 is concentrated in the southwest corner of the tract and may be attributable to the "natural" growth of the center-city commercial district. The variable "percent at same residence in 1965" is highly correlated with the propensity to move for white households and hence was not used as a matching characteristic; it is listed in Table 1 merely for reference.

A convenient method for estimating mobility rates involves the use of the logit model, which specifies (for the case in which the dependent variable is the propensity to move) that the natural logarithm of the expected odds that a household moves during a given time period is a linear function of some set of independent (or predictor) variables.[3] Bishop (1969) has demonstrated that Dyke and Patterson's (1952) somewhat cumbersome method of logit estimation is analytically equivalent to an appropriately-chosen log-linear model, which can be estimated by several procedures.[4]

The method of iterative proportional fitting [see Goodman (op. cit.) and Fienberg (op. cit.)] is used in this paper to estimate the parameters of the logit model because of the flexibility of this approach and its efficiency in model specification and hypothesis testing. The data input for iterative proportional

fitting is an observed contingency table, and the output is a fitted table that is obtained by setting certain marginals in the fitted table equal to the corresponding marginals in the observed table. The likelihood-ratio chi-square statistic and degrees of freedom are computed for the models, and the significance of any k-way interaction is determined by comparing whether the difference in value of the likelihood-ratio statistic between this model and the same model with only (k-1)-way interactions compensates for the difference in degrees of freedom, where the critical points are based on the usual chi-square test. The significance level (or "p-value") of a chi-square test statistic is the probability that that statistic will exceed the observed value under the assumption that a random sample is taken from a population satisfying the hypothesized model. [See Fienberg (op. cit.) for a discussion of these test statistics.]

2. Findings

The first set of models that were tested examined the role of several block-level characteristics in the outmigration of white households from tract 18, the racially changing tract. It was hypothesized that such neighborhood factors as racial composition, vacancy rate, extent of substandard housing, and average rent would be related to white mobility rates. Three household characteristics--stage in life cycle, duration of residence, and tenure--were used as control variables in these models. Although there are undoubtedly many possible ways of defining life cycle variables, the approach taken by Goldstein (1973) is particularly well suited to research in residential mobility in that it is based on characteristics that in some sense relate to housing needs. Goldstein argues that life cycle variables should consisit of not only age of head of household but also marital status, size of household, and possibly other factors. His paper used data from the 1965 Bay Area Transportation Study Commission to estimate the effects of four variables on subsequent mobility --life cycle, education, years at current job, and previous tenure. His table 2.2 listing coefficients for each of the dummy variables is reproduced below for reference. The fifteen estimated regression coefficients in this table compare the propensity to move for difference types of households with the mobility of the reference group,which is single persons under thirty years of age. A negative coefficient for a particular cell means that households in that cell are less likely to move than are households in the reference group. The coefficients in this table fall conveniently into three groups (0.03 to -0.15, -0.16 to -0.25 and -0.26 to -0.40) and form the basis for our trichotomous life cycle variable. The levels of this variable are listed in Table 3, in which the row variable is "persons in household" rather than "marital status", which is not recorded in the 1971 Wichita enumeration.

The other two control variables, duration of residence and tenure, are less ambiguous than life cycle. A three-level variable was created for the former variable, with short duration being defined as two years or less and long duration as ten or more years at the same address. Tenure was dichotomized as own and rent. All the household characteristics are based on the 1971 enumeration except for mobility, which is based on the time period between the 1971 and 1972 censuses.

The four neighborhood characteristics that were investigated are described in Table 4. The break-points in this classification scheme were assigned so as to include approximately the same number of blocks in each category. For each of the four neighborhood characteristics a set of five-way contingency tables was made. Each of these tables was then analyzed by a stepwise logit procedure, which is similar to stepwise regression methods.

The results of this series of computations are given in Table 5. Eleven models are fitted for each of the four five-way tables. The numbers group together under the column "Fitted Marginals" specify which marginals in the fitted table are set equal to the corresponding marginals in the observed table. Variable five, move/stay, is treated as the "dependent" variable, and consequently each fitted logit model must agree with the observed table in the four-way marginal that includes all the independent variables [Bishop (1969)]. For example, model (1) in Table 5 specifies the logit model in which each of the four independent variables has a main effect on variable five, while model (6) indicates the logit model with a main effect for each independent variable and also an interaction effect for variables one and two on variable five. In the first contingency table (which is represented in the (a) columns of Table 5) the significance test for the main effect of the variable MPBL on the logit of a move is (70.75-53.17), or 17.58, with (30-29), or 1, degree of freedom, which is significant at the 1% level. We therefore conclude that MPBL is associated with the propensity to move for white households in tract 18. From the (b), (c), and (d) columns it can be seen that the main effects of MSUB and RENT are significant at the 1% and 10% levels, respectively, whereas the main effect of VAC is not significant even at the 10% level. The moderately low p-values found in most of the models suggests, however, that one or more key variables

may have been omitted. From the (a) columns it is clear that although the effect of the race variable MPBL on mobility is highly significant, none of the eleven models provides an adequate fit to the data under the 10% significance level criterion. In the (c) columns it is seen that the extent of substandard housing (MSUB) is strongly related to the propensity to move. The (d) columns indicate a possible relationship between average rent level (RENT) and mobility. The only interaction effect that is significant in all of the columns is the one between life cycle and tenure, which suggests that certain types of households (young renters, perhaps) are more sensitive to neighborhood factors than are other types.

The second set of models investigated in this study uses only household characteristics to explain subsequent mobility. The variables that are used in these models are sex of head of household, stage in life cycle, household income, duration of residence, tenure, census tract, and mobility behavior (i.e., move or stay). These models were originally fitted for tracts 18 and 28 separately and then were combined into one larger table.

The separate analyses for each tract, which are not presented here due to space limitations, yielded seven principal findings. First, an examination of the relationship between sex of head of household and the propensity to move failed to discover any differences between male- and female-headed households in either tract. Second, household characteristics explain a larger fraction of the variation in mobility rates for tract 28 than for tract 18. Third, tenure and life cycle have significant main effects in both tracts. Fourth, a comparison of several alternative life cycle indices indicates that the goodness of fit of the models is highly sensitive to the particular index chosen. Fifth, income appears to be related to mobility in tract 18, and the effect of this variable in tract 18 is somewhat less than the effects of tenure and life cycle. Sixth, although duration of residence is strongly related to mobility in tract 18, it is not clear whether or not there is any association between these two variables in tract 28. Finally, the most consistent interaction effect (on mobility rates) is between life cycle and tenure variables.

In the combined six-way table (in which tract is treated as a dichotomous predictor variable) all five independent variables (life cycle, income, duration, tenure, and tract) are significant at the 1% level except income, which is significant at 5%. The strongest main effect is from tenure, followed by tract, life cycle, duration of residence, and income.

3. Estimation of effects

In this section we estimate values for the main and interaction effects of the two best models in the six-way table that was described in the previous section. Letting X_{1ijklm} (X_{2ijklm}) be the observed number of movers (stayers) in categories i,j,k,l, and m of the five independent variables, we define the logit for a move (in the subsequent year) by households having this set of characteristics as

$$L_{ijklm} = \log (X_{1ijklm}/X_{2ijklm})$$

and write

$$L_{ijklm} = \alpha + \beta_i + \gamma_j + \delta_k + \epsilon_l + \mu_m$$

where we adopt Theil's (1970) parameterization:

$\beta_1 = \gamma_1 = \delta_1 = \epsilon_1 = \mu_1 = 0$

β_i = differential effect of i^{th} life cycle class

γ_j = differential effect of j^{th} income class

δ_k = differential effect of k^{th} duration-of-residence class

ϵ_l = differential effect of l^{th} tenure class

μ_m = differential effect of m^{th} census tract

The best logit model in the six-way table includes the main effects of the five independent variables plus an interaction between life cycle and tenure. Table 7 gives parameter estimates for this model, whereas Table 6 gives estimates for the logit model with only the five main effects. [In obtaining these estimates .5 has been added to each cell of the table to minimize the bias; cf. Gart and Zweifel (1967).]

Several interesting comparisons can be drawn from Table 6. First, the effects seem quite reasonable. In comparison with the reference group (young, low-income, short-duration owners in tract 18), the probability of a move during the subsequent year is greater for renters and high-income households and lower for older, longer-duration, and middle-income households. Furthermore, households in tract 28 are less likely to move than are those in tract 18, even after controlling for the effects of life cycle, income, duration of residence, and tenure. The curvilinear relationship between mobility and income may be the result of two opposing effects: household instability is associated with low income and high mobility, whereas the direct income effect on mobility is positive for households living in low- to moderate-priced dwellings. The intertract difference in propensity to move is attributable to both environmental ("neighborhood") factors and to recent commercial development in tract 18.

The interaction model (Table 7) yields two additional findings. First, the low mobility attributed to the second life cycle class (thirty to fifty-nine year-

old heads of household who do not live alone) in Table 6 is characteristic of owners only, as renters in this life cycle category are more highly mobile than are reference group households. Second, the lack of significance of $\hat{\beta}_{32}$ implies that households in the third life cycle category who rent have approximately the same propensity to move as do households in the reference group.

4. Conclusions

Five conclusions summarize the results of this study. First, at adequate model (in the sense of high significance level) of residential mobility can be constructed using life cycle, income, duration of residence, and tenure variables. Second, the larger unexplained variation in mobility rates in the racially changing tract suggests that neighborhood factors influence mobility decisions to a greater degree in that area than in the comparison area. Third, block-level housing stock and social characteristics seem to have some explanatory power. Three of the four block characteristics investigated--racial composition, extent of substandard housing, and average contract rent--were significantly related to subsequent mobility. Future study will investigate these factors and other environmental variables constructed at the street-front rather than block level. Fourth, the findings suggest that there are no significant differences in propensity to move between female- and male-headed households for whites. It would be desirable to examine the sex-mobility relationship for both whites and nonwhites in other areas. Finally, although sex seems to have no direct effect on mobility, attention should be given to the construction of life cycle variables that include age of head, size of household, and sex of head of household. The alternative life cycle variables considered in this study give rise to models that differ considerably in explanatory power.

Subsequent research in this project will extend the areal scope of the study in an attempt to overcome some of the major biases introduced by examining individual census tracts. On the basis of a social area analysis we hope to define two neighborhoods that will both increase the sample size and provide more meaningful units of analysis.

Footnotes

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[1]Two studies of "neighborhood" effects that would have been significantly improved with a more extensive data base are, for example, Rapkin and Grigsby (1960) and Molotch (1969).

[2]The mobility behavior of nonwhite households is not investigated in this study because of sample size limitations.

[3]For recent discussions of logit models see Goodman (1971 and 1972), Fienberg (no date), Theil (1971), and Speare (1971).

[4]See, for example, Goodman (1971 and 1972), Ku and Kullback (1968), and Grizzle, Starmer, and Koch (1969).

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Table 1: Comparison of Tracts 18 and 28

Characteristic		Tract 18	Tract 28
Percent nonwhite:	1960	10.9	0.02
	1970	20.1*	0.4*
Racial composition (black-white-other):	1960	578-4663-58	1-4624-16
	1970	718-2807-42*	17-4099-36*
Percent one-person households		25-40+	25-40+
Percent female-headed households		18.3*	14.3*
Average persons per household		2.38*	2.63*
Median income		$4411*	$5431*
Median years school completed		11.3*	12.2*
Percent of dwellings overcrowded		5.9*	5.3*
Percent civilian labor force unemployed		7.9*	8.7*
Percent single-family dwellings		50-74.9+	50-74.9+
Percent 2-4 family dwellings		30 or above+	15-29.9+
Percent 1-family, owner-occupied dwellings		70-84.9+	50-69.9+
Median value, 1-family owner-occupied dwellings		$8300*	$10,300*
Median rent		$71*	$74*
Percent dwellings vacant year-round		19.2*	6.3*
Percent dwellings substandard		17-39.9+	5-16.9+
Percent at same residence in 1965		39.4*	50.6*
Percent residing outside SMSA in 1965		19.5*	16.1*
Percent professional and kindred		12.9*	13.8*
Percent clerical and kindred		18.2*	18.8*
Percent nonfarm laborers		4.7*	2.3*
Percent families below poverty level		15.4*	10.5*

Sources: *U.S. Census of Population and Housing, Census Tract Reports, 1970.
+Wichita Profile 1970, Metropolitan Area Planning Department, Wichita, 1971.

Table 2.2: The Decision to Move*

Marital Status	Age of Head: Less than 30	30-44.9	45-59.9	60 and over
Single	Reference group	-0.2978 (-4.4472)	-0.3785 (-5.0034)	-0.2942 (-3.0912)
Married, no children	0.0300 (0.5676)	-0.2070 (-3.6855)	-0.2223 (-4.4359)	-0.2912 (-5.5666)
Married, with children	-0.0541 (-1.1414)	-0.1809 (-4.0595)	-0.2492 (-5.1970)	-0.3000 (-3.6559)
Other	-0.0310 (-0.4123)	-0.2043 (-3.5868)	-0.3992 (-7.2051)	-0.3831 (-6.6604)

Note: t-values are in parentheses. $N = 2246$, $R^2 = 0.3424$, $F = 64.4292$, $S_e = 0.3757$

*Adapted from Goldstein (1973).

Table 3: Definition of Life Cycle Variable

Persons in household	Age of Head of Household: Under 30 yrs.	30-44 yrs.	45-59 yrs.	60 and over
1	1	3	3	3
2	1	2	2	3
3 or more	1	2	2	3

Table 4: Definition of Neighborhood Characteristics*

Variable name	Description	Level 1	Level 2	Level 3
(a) MPBL	The maximum percent of the population that is black in a five-block area including the block on which the dwelling is located and the four adjacent blocks	0-9%	10-100%	--
(b) VAC	The percent of year-round dwellings on the block that are vacant	0-9%	10-100%	--
(c) MSUB	The maximum percent of substandard units on a five-block area including the block on which the dwelling is located and the adjacent blocks	0-4%	5-100%	--
(d) RENT	The average contract rent for the block	$0-69	$70-79	$80 and above

*Source: U. S. Census of Population and Housing, Census Tract Reports, 1970.

Table 5: Life Cycle by Block Characteristics by Duration by Tenure by Move/Stay (Tract 18)

Model Fitted Marginals	Degrees of Freedom: (a)-(c)	(d)	(a) MPBL L.R. χ^2	p-value	(b) VAC L.R. χ^2	p-value	(c) MSUB L.R. χ^2	p-value	(d) RENT L.R. χ^2	p-value
(1) 1234 15 25 35 45	29	46	53.17	.004	36.48	.160	35.98	.174	56.26	.143
(2) 1234 15 25 35	30	47	68.74#	.000	54.96#	.004	50.22#	.012	74.40#	.007
(3) 1234 15 25 45	31	48	92.82#	.000	76.57#	.000	75.59#	.000	98.22#	.000
(4) 1234 15 35 45	30	48	70.75#	.000	37.60	.161	46.98#	.025	61.83*	.087
(5) 1234 25 35 45	31	48	71.68#	.000	57.14#	.003	57.83#	.003	75.77#	.007
(6) 1234 35 45 125	27	42	40.79#	.043	30.52*	.291	34.35	.156	49.91	.188
(7) 1234 25 45 135	25	42	46.99	.005	29.62	.239	29.77	.233	50.12	.183
(8) 1234 25 35 145	27	44	46.59+	.011	30.46+	.294	29.48+	.338	50.93*	.220
(9) 1234 15 45 235	27	42	42.54#	.029	28.87+	.367	33.89	.169	54.13	.100
(10) 1234 15 35 245	28	44	45.59#	.019	36.46	.131	35.78	.148	53.95	.145
(11) 1234 15 25 345	27	44	49.60	.005	33.52	.181	32.86	.202	52.82	.170

Key: L.R. difference χ^2 significant at (*) 10% level, (+) at 5% level, or (#) at 1% level.

Table 6: Estimated Effects in the Logit Model Having Main Effects Only
($L_{ijklm} = \alpha + \beta_i + \gamma_j + \delta_k + \epsilon_l + \mu_m$)

parameter	interpretation	est. effect	std. error	parameter	interpretation	est. effect	std. error
α	constant	-0.070	0.382	δ_2	med. duration	-0.594	0.243
β_2	life cycle 2	-0.658	0.255	δ_3	long duration	-1.032	0.259
β_3	life cycle 3	-1.058	0.269	ϵ_2	renter	1.168	0.181
γ_2	med. income	-0.308	0.236	μ_2	tract 28	-0.600	0.181
γ_3	high income	0.368	0.262				

Table 7: Estimated Effects in Logit Model with Life Cycle-Tenure Interaction
($L_{ijklm} = \alpha + \beta_{il} + \gamma_j + \delta_k \mu_m$)

parameter	interpretation	est. effect	std. error	parameter	interpretation	est. effect	std. error
α	constant	-0.066	0.384	γ_2	med. income	-0.282	0.238
β_{21}	l.c. 2, owner	-1.012	0.367	γ_3	high income	0.432	0.263
β_{31}	l.c. 3, owner	-0.730	0.381	δ_2	med. duration	-0.610	0.243
β_{12}	l.c. 1, renter	1.160	0.341	δ_3	long duration	-1.096	0.261
β_{22}	l.c. 2, renter	0.712	0.389	μ_2	tract 28	-0.620	0.181
β_{32}	l.c. 3, renter	-0.054	0.422				