Race and Class in Neighborhood Mobility:
A Conditional Logit Model of Neighborhood Migration

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A basic question in understanding the causes of racial residential segregation is the role of race in residential mobility decisions. While clear racial differences in flows of population across neighborhoods are well established, there remains an extensive debate about why migration flows remain so strongly race-specific. Two possible hypotheses are usually considered: one hypothesis suggests neighborhood racial composition directly affects residential decisions, the other that neighborhood racial composition is related to residential decisions because it is a proxy for correlated non-racial neighborhood characteristics.

The hypothesis that racial composition directly guides neighborhood relocation decisions could reflect mobility decisions grounded in prejudice or a preference for own-race neighbors. It could also reflect the fact that individuals use race to judge neighborhood qualities, a process Ellen (2000) calls "neighborhood stereotyping." Such processes may be especially likely to contribute to neighborhood racial segregation if stereotypic depictions are incorrect or exaggerated (Quillian and Pager 2001). In either case, this suggests a direct influence of neighborhood racial composition on migration that contributes to residential segregation.

The hypothesis that race acts as a proxy suggests race only appears important because of lack of correct control for correlated conditions. Economic class level of neighbors, crime rates, or school conditions are all plausible conditions correlated with racial composition. This view implies that reductions in inequality and changes in social problems and conditions could then produce reductions in racial residential segregation. Harris (1999) and Taub, Taylor, and Dunham (1984) provide defenses of this view.

Past Studies

Three approaches have been employed to examine these ideas about why racial composition affects neighborhood migration: vignette studies, hedonic models of housing prices, and mobility data.

Vignette studies ask respondents to rate the desirability of hypothetical neighborhoods with given racial compositions (Farley et al. 1978; Farley et al. 1994; Charles 2006) or the desirability of a neighborhood described in a vignette (Emerson, Yancey, and Chai 2001). Vignette studies have generally found that race is an important influence on rating of residential areas even when the vignettes attempt to hold constant proxy factors (for instance, by describing the neighborhood economic level to be similar across varying racial compositions). But it is not clear how well responses to hypothetical behaviors accurately represent what might happen in a real decision context; some evidence suggests vignettes provide poor proxies for parallel behaviors (Pager and Quillian 2005).

Hedonic models rely on the prediction of economic theory that in a well-functioning market, housing prices reflect marginal preferences for housing and neighborhood characteristics. Analyses of housing market prices as a function of housing and neighborhood characteristics can then be used to assess preferences for

neighborhood characteristics, including race and race-correlated conditions. Harris (1999) is the best sociological example of this approach. The weakness of hedonic modeling that it requires strong assumptions about an efficient and well-functioning housing market in equilibrium for the marginal-preferences interpretation to be correct. In addition, the fact that these models only capture the preference of the marginal housing consumer, rather than describing the distribution of preferences in the population, makes it difficult to understand the implications for racial segregation overall.

Mobility studies use data on actual migration among neighborhoods types to understand factors guiding mobility decisions. Most often, the outcome is modeled using multinomial logit with the outcome a category representing the type of destination (e.g. mostly white, mixed, or mostly black). The independent variables include individual characteristics, family characteristics, characteristics of the origin residential census tract (often the tract one year prior to when the outcome tract is observed), and sometimes characteristics of the metropolitan area as a whole (South and Crowder 1998; Ellen 2000; Rosenbaum and Friedman 2001; South, Crowder, and Chavez 2005).

The weakness of mobility studies is in how they categorize potential destinations. Destination studies categorize destinations along one dimension, such as share black or Hispanic (or in other studies percentage poor or average income ranges). Using the methods employed in these studies, it is not possible to simultaneously control for other characteristics of destinations, making it possible that the single dimension employed (e.g. racial composition) may well be capturing several other distinct but correlated dimensions.

Methods

We use mobility data along the lines of the mobility study approach, but we employ an improved statistical model that allows for a richer model of mobility including simultaneous control for multiple characteristics of destinations. Following an approach suggested in McFadden (1973) and elaborated in the case of residential mobility by Bruch and Mare (2009), we use a conditional logit model (CLM; for further description, see Ben-Akiva and Lerman 1985, Hoffman and Duncan 1998). In the CLM, movement is treated as a function of multiple characteristics of the potential destination neighborhoods. In this case, alternatives denote specific neighborhoods (Census tracts) in an urban area, which can be described by features such as local race/ethnic and economic population composition, quality of local neighborhood schools, housing costs, crime rates, etc. The models incorporate characteristics of chooser as they interact with characteristics of alternatives.

We now sketch the basic conditional logit model, following Bruch and Mare (2009). Denote by U_{ijt} the attractiveness that the *i*th individual attaches to the *j*th neighborhood at time *t*. Let p_{ijt} denote the probability that the *i*th individual moves to the *j*th neighborhood at time *t*. The attractiveness of a neighborhood for an individual depends on characteristics of both individuals and neighborhoods and on the individual's own characteristics. Denote by Z_{jt} the observed characteristics of the *j*th neighborhood at time *t* (in our application, these include the race-ethnic makeup of the neighborhood, the prices of available housing units, and income level of residents). Let X_{it} denote observed characteristics of the *i*th individual at time *t* (in our application, these include the race and income of an individual, and family size and composition). Let η_{jt} denote unobserved features of neighborhood *j* that affect desirability, which are common to all individuals; and ε_{it} denote the individual-specific unobserved component. Then the attractiveness of neighborhoods is:

$$U_{ijt} = F(Z_{jt}, X_{it}, \eta_{jt}, \varepsilon_{it}) \quad (1)$$

If *F* is a linear function, then, for example, for a single observed neighborhood and personal characteristic (*Z* and *X* respectively), the basic model is then:

$$U_{ijt} = \beta Z_{jt} + \gamma X_{it} + \delta Z_{jt} X_{it} + \eta_{jt} + \varepsilon_{ijt} + \alpha Z_{jt} \varepsilon_{it} + \theta X_{it} \eta_{jt} \quad (2)$$

where β, δ, γ, α, and θ are parameters to be estimated via maximum likelihood. When individuals choose where to live they implicitly compare neighborhoods in their choice set. Neighborhoods are chosen on the basis of differences in their relative desirability, which takes into account both measured and unmeasured neighborhood characteristics. The comparison between the j*th* and k*th* neighborhood is:

$$U_{ijt} - U_{ikt} = \beta_i^* (Z_{jt} - Z_{kt}) + \delta (Z_{jt} - Z_{kt}) X_{it} + \varphi_{jkt} \quad (3)$$

where $\beta_i^* = \beta + \alpha \varepsilon_{it}$ and $\varphi_{jkt} = \eta_{jt} - \eta_{kt}$. The characteristics of individuals do not affect the utility comparison because all comparisons are within individuals, but they may interact with neighborhood characteristics. For example, the effect of differences in the proportion of persons in a neighborhood in a given ethnic group on the relative attractiveness of the neighborhoods is likely to differ between individuals who are members of that ethnic group and those who are not. Thus, we can allow for interactions between neighborhood and individual characteristics.

Given data on the characteristics of individuals and neighborhoods, the behaviors or stated preferences of individuals for neighborhoods, and an assumed probability distribution of the unobserved characteristics of individuals and neighborhoods, one can estimate the parameters of a choice model. If the errors follow an extreme value distribution, we obtain the discrete choice conditional logit model:

$$p_{ijt}(Z_{jt}, X_{it}, C_{(i)}) = \frac{\exp(\beta Z_{jt} + \delta Z_{jt} X_{it} + \eta_{jt})}{\sum_{k=1}^{K} \exp(\beta Z_{kt} + \delta Z_{kt} X_{it} + \eta_{jt})} \quad (4)$$

where $C_{(i)}$ denotes the set of neighborhoods available ("choice set") for the *i*th individual. In this basic model, we assume that $Cor(\eta_{jt}, \eta_{kt}) = 0$ for $\forall j \neq k$. This is the "independence of irrelevant alternatives" (IIA) assumption, which essentially says that the ratio of probabilities associated with any two potential destinations is not affected by the addition or subtraction of other elements of the choice set.

Discrete choice models require an explicit definition of the universe of potential destinations to which individuals may move. For our paper, we focus exclusively on *within*-metropolitan area moves, where the choice set for each individual is composed of all neighborhoods (Census tracts) in their metro area. The large majority of household moves by metropolitan residents—more than 90% in the PSID—are within the same metropolitan area, and thus the within-metro model captures a large share of the moves of the national system of migration. (South and Crowder 1998 and other analysts also limit their analysis to their current choice set). To reduce the computational burden associated with large choice sets, we sample choices and weight in the estimation sample (Ben-Akiva and Lerman 1985; Bruch and Mare 2009).

In Equation 4 the respondent's current neighborhood is treated identically as the other choices. We can allow for respondents to evaluate their current location differently

from other potential destinations, by including a dummy variable D_{ijt}, that equals 1 when destination *j* is the neighborhood currently occupied by respondent *i,* and 0 otherwise. This dummy variable can then be interacted with other characteristics to capture the possibility that respondents evaluate their own neighborhood's qualities differently than they evaluate others. For example, people might be more willing to tolerate racial diversity in their current location because they are more familiar with the implications of that diversity.

The conditional logit model is closely related to the multinomial model that has been used in prior research. In fact, the multinomial logit model is a special case of the conditional logit model. If the neighborhood characteristics (Z_{jt}) in a conditional logit model are the neighborhood types used to categorize the dependent variable in a multinomial logit, and all individual characteristics (X_{it}) interact with the neighborhood characteristics (Z_{jt}), then the two models are equivalent. For example, if the neighborhood types of destination are white (less than 30% black), mixed (30% to 60% black), and black (60% + black), in an equivalent CLM the neighborhood characteristics would be three dummy variables representing these three neighborhood conditions.

The conditional logit model's strength is its ability to include other characteristics of neighborhoods guiding destination choice other than their characterization as one of the outcome types of multinomial logit. This means that in an analysis of how individual characteristics are related to the neighborhood racial type the respondent moves to, we can control for other characteristics of destination tract (such as economic composition) that affect destination neighborhood attractiveness.

Results [TO BE ADDED]

We will estimate basic conditional logit models of mobility among neighborhood types. We focus on racial composition as the main dimension of interest and examine how the racial composition effects change when correlated neighbor economic level and housing price conditions are controlled. Initial results suggest strong race effect on matching that persist under control for the proxy conditions of household income composition and housing price.

Conclusion [Very Preliminary]

We intend this paper to provide new evidence about an important substantive question: the role of race and race-correlated conditions as the basis for residential mobility decisions among neighborhoods. Our preliminary answer is that race remains important in destination choice after controlling for several other destination characterisics. Our early results thus provide more support for race as a factor directly influencing residential decisions than for the view that race acts as a proxy.

We also intend this paper to provide an example of a new method for modeling residential mobility among neighborhoods that has several significant advantages over current approaches. The conditional logit model improves significantly on current approaches in realism by incorporating multiple characteristics of destination neighborhoods.

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