

**Trends in Minority Suburbanization in
American Metropolitan Areas, 1970 to 2000***

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Abstract

In this paper we examine trends from 1970 to 2000 in rates of minority suburbanization in American metropolitan areas (MAs). We use data from the National Change Database (NCDB) and Hierarchical Linear Modeling (HLM) techniques to estimate levels and determinants of suburbanization for non-Hispanic blacks and Asians and Hispanics of all races in 2000, as well as change from 1970 to 2000. We test two hypotheses regarding the causes of variation in minority suburbanization: that variation is related to the socioeconomic characteristics of minorities, and that variation is related to the supply of housing in suburbs relative to central cities. Our findings indicate that minority suburbanization has been driven largely by changes in the U.S. housing market—principally the rapid increase in suburban housing stock during the period under consideration. However, we also find that rates of minority suburbanization in 2000 and rates of change from 1970 to 2000 are strongly related to levels of suburbanization in 1970.

In this paper we examine trends from 1970 to 2000 in rates of minority suburbanization in American metropolitan areas (MAs). Suburbanization has been noted by numerous authors as a key indicator of spatial assimilation of racial and ethnic minorities (Massey and Denton 1987; Alba and Logan 1991, 1993). Much sociological and demographic research has focused on cross-sectional and between-census variation in rates of minority suburbanization (Stahura 1987; Massey and Denton 1988; Fitzpatrick and Hwang 1990; Logan and Alba 1995; Logan et al. 1996). However, this research is now between 10 and 20 years old, and few studies have examined data from the 2000 census (Lewis Mumford Center 2001; Fischer 2008). Furthermore, no research has examined recent trends in suburbanization beyond comparing changes between two censuses. We take a longer view by measuring temporal change not as the absolute or relative difference in suburbanization between pairs of censuses, but rather as growth trajectories fit to data from the 1970 to 2000 U.S. censuses.

In this paper we use data from the National Change Database (NCDB) and Hierarchical Linear Modeling (HLM) techniques to estimate levels and determinants of suburbanization for non-Hispanic blacks and Asians and Hispanics of all races in 2000, as well as change from 1970 to 2000. We test two hypotheses regarding the causes of variation in minority suburbanization: that variation is related to the socioeconomic characteristics of minorities, and that variation is related to the supply of housing in suburbs relative to central cities. Results from this analysis should provide an indication of whether minority suburbanization is being driven by changes in the SES of minority groups, or simply due to the fact that the vast majority of urban growth in recent decades has been in the suburbs. That is, when more of the population lives in the suburbs, it is likely that all groups will experience increasing rates of suburbanization, regardless of changes in the characteristics of these groups. If true, this would suggest that suburbanization is not necessarily the positive locational outcome of assimilation processes as presumed by spatial

assimilation theory. Rather, it may be the case that residential patterns of all groups are simply expanding outward as metropolitan areas expand. Thus, what was once considered a mark of middle- or upper-class distinction (Jackson 1987) may increasingly be seen simply as a spatial relocation of old and enduring racial/ethnic and class inequalities.

Theoretical Background

Historical Trends

The 20th century was marked by three major demographic trends that combined to produce variation across racial and ethnic groups in rates of suburbanization. First, from roughly 1910 to 1970, about 6.5 million African Americans moved from the rural South to the urban South and non-South. In 1900, about three-quarters of African Americans lived in the rural South. A century later, that percentage had declined to only 12 percent. In 1900, 77 percent of African Americans lived in rural areas; by 2000, about 87% of blacks were urban, split relatively evenly between southern and non-southern metropolitan areas. Thus the 20th century witnessed a massive shift in the regional and urban location of U.S. blacks, who were transformed from an almost exclusively rural southern population to an almost exclusively urban population, largely in MAs outside of the south.

Second, suburbs became the dominant living arrangement for Americans. As shown in Figure 1 below, on the eve of World War II, about 38 percent of residents of MAs lived in suburbs. By 1970, that rate had increased to 60 percent. Rapid suburbanization was experienced overwhelmingly by whites: in 1920, whites and blacks were equally suburbanized—about one-third of each group's metropolitan area residents lived in the suburbs.¹ By 1970, 63 percent of metropolitan whites lived in suburbs, compared to only 25 percent of blacks. The reasons for this

¹ Interestingly, in the 1900 and 1910 censuses, metropolitan blacks were more suburbanized than whites. This is likely due to the tendency of urban blacks to work as servants for wealthy white families in suburbs (Massey and Denton 1993).

divergence include high levels of migration of blacks from the rural South to work in factory jobs located in the central cities of the South and non-South. In addition, the redlining policies of mortgage lenders and federal government agencies such as the Federal Housing Administration and the Veteran's Administration produced rapid increases in the percentage of suburban whites. Thus, by the 1970s the U.S. could be characterized in both popular music and academic scholarship as a "chocolate city with vanilla suburbs" (Farley et al. 1978).

(Figure 1 about here)

Third, and most recently, changes in U.S. immigration law from country quotas to an emphasis on family reunification led to rapid increases in levels of the Asian and especially Hispanic population. In 1900, about 80 percent of the U.S. foreign-born were from Europe, with trivial proportions from Latin America and Asia, and the remainder from other regions (primarily Canada, itself a major destination for European emigrants). By 2000, only about 16 percent of the U.S. foreign-born were from Europe. Over half of all immigrants were from Latin America, over a quarter from Asia, and another six percent from other regions. Thus, although immigration continues to be a major component to overall U.S. population growth, the regional origin of this growth has shifted from predominantly European to predominantly Latin American and Asian.

As a result of these trends, the 1970 to 2000 period was marked by rapid demographic change in the racial and ethnic composition of American metropolitan areas. Furthermore, overall levels of suburbanization continued apace—in 1970 there was about eight-tenths of a housing unit in the suburbs for every one housing unit in the central city; by 2000, that ratio had flipped to 1.8, meaning that in the average MA there were nearly twice as many suburban housing units as central city units (authors' calculations).

These changes lead us to inquire about the extent to which racial and ethnic minorities have changed in their overall levels of suburbanization from 1970 to 2000, and to ask what MA-level factors may account for this change. In the sections below we review two major explanations for variation in 2000 levels of and 1970 to 2000 change in minority suburbanization.

Spatial Assimilation

Park and Burgess (1921) defined the sociological concept of assimilation generally as “a process of interpenetration and fusion in which persons and groups acquire the memories, sentiments, and attitudes of other persons and groups and, by sharing their experience and history, are incorporated with them in a common cultural life” (735). Building on the work of Park and Burgess, Gordon (1964) engaged in a more expansive treatment of the concept. In his formulation, assimilation occurs via an immigrant group’s passing through a series of seven stages of incorporation with native-born members of a host society. In the first stage, which Gordon termed “acculturation,” immigrants learn the language and adopt the cultural norms of the host society. Acculturation is relatively easy for an immigrant group to achieve; indeed, it is usually well underway by the second generation and completed by the third (Alba et al. 2002). The second stage, which Gordon labeled “structural assimilation,” does not automatically occur through the passage of time, either intra- or intergenerationally. Rather, structural assimilation occurs when migrants and their offspring form primary relationships with members of the host society. For Gordon, this is the key to assimilation overall, for once a group experiences structural assimilation, the remaining five steps automatically follow.

Drawing upon prior human ecological studies, Massey and Mullan (1984) argue that a necessary intervening step between acculturation and structural assimilation is a group’s residential contact with members of the host society, a process they label “spatial assimilation.”

In their words, “if a group is not physically integrated within a society, structural assimilation, and consequently the subsequent stages of assimilation, will be exceedingly difficult” (p. 837). Massey and Denton (1987) argue that suburban residence is a major indicator of spatial assimilation. Thus, we treat our dependent variables, the rate of minority suburbanization, as indicators of a general process of spatial assimilation.

Determinants of spatial assimilation. As suggested by Massey and Mullan’s (1984) claim that spatial assimilation is an intermediate step between acculturation and structural assimilation, traditional spatial assimilation theory posits that minority groups experience a process towards residential contact with a society’s majority group in part by adopting the language and cultural practices of that group (Massey 1985). Numerous empirical studies confirm that English language acquisition is positively associated with spatial assimilation, especially for Hispanics (Alba and Logan 1991; Logan, Alba, and Leung 1996; Logan et al. 1996; Massey and Denton 1987).

A second engine of spatial assimilation, according to spatial assimilation theory, is socioeconomic mobility. Immigrant ethnic groups tend to start at the bottom of the socioeconomic ladder, and therefore are only able to purchase residence in low-SES, and largely central city, neighborhoods. As these groups experience socioeconomic mobility, they convert increases in household SES into upward residential mobility, resulting in their occupying higher-status, suburban neighborhoods (Massey and Denton 1985). Empirical evidence from prior research provides some support for the spatial assimilation perspective. SES plays a moderate role in explaining access to suburbs for Hispanics and Asians, and less so for African Americans (Alba and Logan 1991, 1993; Logan and Alba 1993; Logan et al. 1996).

Changes in Suburban Housing Supply

The overall supply of and change in suburban housing stock should be associated with levels of and change in minority suburbanization. Put simply, in cities with large amounts of suburban housing, all groups ought to be more suburbanized than in cities with relatively small suburban rings. In addition, in quickly growing suburbs there ought to be more housing available for racial and ethnic minorities relative to cities with stagnant suburbs. Growing suburban housing supply could affect minority suburbanization patterns in one of two ways: first, minorities may move directly into areas where new housing is being built. Second, minorities may move into older housing stock abandoned by whites who seek newer housing and less dense land use in outlying suburbs. Either way, we hypothesize that minorities will be more suburbanized in MAs with large and growing suburban rings, relative to cities with smaller and less rapidly growing suburbs.

Ecological Context

A third set of predictors of minority residential patterns has been grouped under the rubric “ecological context.” These are typically characteristics of metropolitan areas that are thought to constrain or abet the operation of spatial assimilation and housing market processes, and to have effects on in their own right. For example, effects of geographic region and MA age have long been noted. In particular, older metropolitan areas of the Northeast and Midwest regions have more established residential patterns and often had histories that included restrictive covenants and strict land-use regulations (Farley and Frey 1994; South and Crowder 1997). Thus, these MAs may feature lower rates of minority suburbanization and less quickly growing levels of suburban housing supply, relative to newer MAs of the South and West, such as Phoenix, Denver, and Las Vegas. In addition, overall MA size, as well as size and growth of the

minority population may affect minority residential patterns (Farley and Frey 1994; Logan et al. 2004; South and Crowder 1997).

Finally, it is important to note that rates of minority suburbanization in 2000 ought to be positively correlated with those rates in 1970. That is, cities with long histories of minority suburbanization ought to feature higher rates in 2000 than MAs with relatively recent increases in minority suburbanization. This also leads us to suspect that 1970 to 2000 growth in minority suburbanization rates will be slower in MAs with higher levels of minorities in 1970.

Data

The data for this study come from the 1970 through 2000 U.S. Decennial Censuses, concatenated in the Neighborhood Change Database (NCDB). The NCDB was developed by the Urban Institute in collaboration with GeoLytics, Inc. A unique feature of the NCDB is that all census tracts from 1970 to 1990 are matched to consistent Census 2000 boundaries. The chief benefit of this geographical matching is that comparisons over time are not hampered by changing MA boundaries. Thus, the NCDB allows us to compare geographic apples to apples, both at the tract and metropolitan area levels. See Tatian (2003) for detailed information on the NCDB.

The units of analysis are the 256 metropolitan areas (MAs) that were defined in all four censuses under consideration (a list of these MAs is available from the authors upon request). The majority of these MAs are Metropolitan Statistical Areas, such as Battle Creek/Kalamazoo, MI and Columbus, OH. The remainder are Primary Metropolitan Statistical Areas, such as Chicago, IL and Kenosha, WI, nested within the Chicago, IL/Gary, IN/Kenosha, WI Consolidated Metropolitan Statistical Area. Because MAs are the unit of analysis, we use unweighted statistics to estimate effects of MA-level characteristics on levels of minority suburbanization (but cf. Logan et al. 2004, p. 6).

Measures

Dependent Variables

The dependent variables are the percentages of three minority groups—non-Hispanic blacks and Asians and Hispanics of all races—in each MA that are not in the central city. Thus, this variable represents the portion of the population that live in metropolitan counties, whether or not they live in census designated places, or what might be more commonly thought of as “suburbs.”

Independent Variables

Spatial assimilation theory. We test the two central propositions of spatial assimilation theory—that acculturation and socioeconomic mobility lead to minority spatial assimilation—by estimating effects of four metropolitan area-level variables on 2000 levels of and 1970 to 2000 change in minority suburbanization. We operationalized acculturation as the MA-level percentage of Asians and Hispanics that speak English at least somewhat well.² We measured socioeconomic mobility as the percentage of each of the three minority groups who have more than a high school degree, the average income of each group (inflated to constant 2000 thousands of dollars), and the percentage of each minority group owning their own homes.

Housing supply. We measured 2000 levels of and 1970 to 2000 changes in suburban housing supply by taking the ratio of the total number of housing units in the suburban rings of each MA to the total number of housing units in the central city. We reason that this ratio captures the extent to which the suburbs are more dominant than and growing more rapidly than central cities. For example, in 2000 San Antonio, TX had a score on this variable of .334, indicating that there were about three times as many housing units in the central city of San

² In 1980, there was a mismatch on the NCDB between the age categories of the numerator (age 5-17 and 18+) and the denominator (age 5-14, 15-59, 60-64, and 65+). Thus, this variable captures the percentage of all Asians and Hispanics age 5 or older who speak English at least somewhat well. While a child’s English language ability would not likely affect her family’s residential location decisions, we are limited by the NCDB in our ability to restrict this variable to adults only. However, because this variable is calculated in the same way for 1980, 1990, and 2000, we are not concerned about bias in the estimates of the effects of English language acquisition.

Antonio than in its suburbs. At the other end of this distribution, Atlanta, GA had a score of 7.56, indicating that there were nearly 8 times as many housing units in the suburbs of Atlanta than in its central city. Not surprisingly, the black suburbanization rates in 2000 were about 26 percent in San Antonio and about 80 percent in Atlanta.

Ecological context. Following the examples of much prior research, we assess the impact of ecological context on levels of and changes in minority suburbanization. First, we controlled for the natural log of population size and percentage of each minority group to account for two well-known ecological relationships—larger cities and cities with larger minority populations tend to be more segregated, and may therefore evince lower rates of suburbanization. We controlled for region and age effects by including dummy variables for the census region of the MA and the period in which the central city of the MA passed 50,000 in population. We also included a measure of the rate of suburbanization of each group in 1970.

Decadal rates of change. In models predicting change from 1970 to 2000, we included measures of MA-level decadal rates of change in the time-varying covariates described above. For each MA, these rates of change r follow one of the following two formulae:

$$r_{1970,2000} = \left(\frac{\left[\sum_{t=1970}^{2000} \ln \left(\frac{Z_{t+10}}{Z_t} \right) PY_{t,t+10} \right]}{PY_{1970,2000}} \right) 100 \quad (1a)$$

or

$$r_{1980,2000} = \left(\frac{\left[\sum_{t=1980}^{2000} \ln \left(\frac{Z_{t+10}}{Z_t} \right) PY_{t,t+10} \right]}{PY_{1980,2000}} \right) 100, \quad (1b)$$

where Z is a MA-level characteristic measured in census years t and $t + 10$, $PY_{t,t+10}$ are person-years lived between census years t and $t + 10$, and $PY_{1970,2000}$ and $PY_{1980,2000}$ are person-years lived between 1970 or 1980 and 2000, respectively (Preston, Heuveline, and Guillot 2001, p. 12). Equation (1a) is used for all MAs with valid data from 1970 to 2000 on all variables. Equation (1b) is used for variables that were not measured on the 1970 census, such as the percentage of homeowners for Asians. We estimated person-years with the following formula:

$$PY_{t,t+T} = \frac{(N_{t+T} - N_t)T}{\ln\left(\frac{N_{t+T}}{N_t}\right)}, \quad (2)$$

where T is the length of the intercensal period (10, 20 or 30 years), and N_t and N_{t+T} are the populations of each MA in census year t and $t + T$, respectively (Preston et al. 2001, p. 15). Equations (1a) and (1b) yield decadal rates of change in MA characteristic Z (in percent per decade), weighted by decade-specific rates of population growth to account for variations in the timing of that growth (i.e., early or late) over the 20- or 30-year period.

Methods

We use Hierarchical Linear Modeling (HLM) techniques to investigate change in MA-level minority suburbanization over time. The HLM linear growth model treats multiple observations of MAs as nested within MAs, yielding estimates of average decadal change in suburbanization rates from 1970 to 2000. We use the linear growth model because of the small number of observations (4) on each MA. With more time points, it would also be desirable to model non-linear change; however, as noted by Raudenbush and Bryk (2002, p. 163), the linear growth model “can provide a good approximation for more complex processes that cannot be fully modeled because of the sparse number of observations.” Furthermore, there is little evidence that

the average absolute change in minority suburbanization followed a non-linear trend (see data from 1970 to 2000 in Figure 1 above).

These growth models are one of many types of “intercepts- and slopes-as-outcomes” models, in which segregation in 2000 (intercepts) and MA-level change in suburbanization (slopes) are estimated for each MA using level-1 data (repeated observations of MAs). In this analysis the level-1 model is specified as

$$Y_{ij} = \beta_{0j} + \beta_{1j}(CENSUS)_{ij} + r_{ij}, \quad (3)$$

where Y_{ij} is the observed level of suburbanization for each group in census year t in MA j . We coded the *CENSUS* variable -3 for the 1970 census, -2 for the 1980 census, -1 for the 1990 census, and 0 for the 2000 census. In so doing, the intercepts (the β_{0j}) are interpreted as the predicted level of suburbanization for city j in 2000 and the *CENSUS* slopes (the β_{1j}) are interpreted as estimated growth from 1970 to 2000 in suburbanization per decade. For instance, if β_{0j} were 50.0 and β_{1j} were 5.0, it would mean that MA j had increased by an average of 5 points per decade from a predicted level of 35 in 1970 to a predicted level of 50 in 2000.

At level 2, the β_{0j} and β_{1j} from equation (7) become outcomes to be predicted by MA-level characteristics. That is, HLM regresses the intercepts (the predicted level of minority suburbanization in 2000, or β_{0j}) and the slopes (the predicted per-decade change in suburbanization, or β_{1j}) on MA-level covariates, as in the following examples:

$$\beta_{0j} = \gamma_{00} + \sum_{k=1}^K \gamma_{0k} (Z_{kj} - \bar{Z}_k) + u_{0j} \quad (4a)$$

$$\beta_{1j} = \gamma_{10} + \sum_{k=1}^K \gamma_{1k} (\Delta Z_{kj} - \overline{\Delta Z}_k) + u_{1j} \quad (4b)$$

By grand-mean centering the covariates (i.e., each MA-level covariate is centered around the overall sample average), γ_{00} is interpreted as the covariate-adjusted average level of

suburbanization in 2000 for the sample of MAs, the γ_{01} to γ_{0K} are effects of MA-level characteristics measured in 2000 on suburbanization in 2000, γ_{10} is the covariate-adjusted average decadal change in suburbanization from 1970 to 2000 for the sample of MAs, the γ_{11} to γ_{1K} are effects of change in MA-level characteristics from 1970 to 2000 (except for the time-invariant variables) on change in suburbanization from 1970 to 2000, and u_{0j} and u_{1j} are level-2 random effects. We model the intercepts as a function of static characteristics in MAs in 2000 and the slopes as a function of changing MA characteristics.

Findings

Descriptive Statistics

Dependent variables. Figure 2 presents average growth trajectories from 1970 to 2000 rates of suburbanization for the three racial/ethnic groups. The data for these figures come from random-coefficient models estimated in HLM (Raudenbush and Bryk 2002, pp. 75-80), in which the models depicted in equation (3) above are estimated. At level 2, models are fit without level-2 covariates, yielding estimates of γ_{00} and γ_{10} that are unadjusted by MA-level characteristics.

Figure 2 shows that, in the 256 MAs under analysis, minority suburbanization has increased for all three groups from 1970 to 2000. In 1970, the HLM estimate of the average black rate was 20 percent, compared to about 38 percent for both Asians and Hispanics (compare with observed percentages at the bottom of Table 1). Over the next three decades, blacks increased their rate of suburbanization by about 3.5 percent per decade, reaching an estimated average level of 31 percent by 2000. Asian suburbanization increased about 3.4 percent per decade, while Hispanic suburbanization increased about one percent per year less rapidly than blacks and Asians. By 2000, the average MA featured suburbanization rates of about 45 to 50 percent for Asians and Hispanics. Thus, although blacks increased their levels of suburbanization

at rates equal or greater to the other groups, the relatively low starting position for blacks in 1970 has led to a continuation of inequality between blacks and the other two major American minority groups in rates of suburbanization.

(Figure 2 about here)

Independent variables. Table 1 presents descriptive statistics of the independent variables used in the analysis, broken down by minority group when applicable. The figures in the left-hand panel are MA-level averages from Census 2000, while those in the right-hand panel are MA-level average decadal rates of change from 1970 to 2000 (see equations 1a and 1b). Regarding the assimilation variables, as of 2000 about 87 percent of Asians and 76 percent of Hispanics spoke English at least somewhat well. Those percentages had been increasing at an average rate of 13 percent per decade for Asians and decreasing by about 8 percent per decade for Hispanics. About 64 percent of Asians had greater than a high school degree in 2000, compared to 37 percent for Blacks and 31 percent for Hispanics. This percentage increased by an average of 8 percent per decade for Asians, compared to 73 percent for Blacks and 48 percent for Hispanics.

Asian family incomes averaged about \$58,000 in 2000, while incomes for blacks and Hispanics averaged \$36,000 and \$40,000, respectively. Asians also experienced the greatest increase in income over the 1970 to 2000 period (9 percent per decade), while incomes for blacks and Hispanics increased more slowly during this period (about 3.6 percent per decade). Finally, average rates of homeownership for the three minority groups in 2000 ranged from 42 percent for Blacks to 51 percent for Asians; however, these rates had been declining in the preceding decades, especially for Asians.

(Table 1 about here)

Our measure of housing supply, the ratio of suburban to central city housing stock, shows an average of 1.8 in 2000. Again, this means that for every 1 unit of central city housing, the average MA had nearly 2 units of suburban housing. That ratio increased an average of 22 percent per decade, from a 1970 average of 0.83. We hypothesize that the continued growth of suburban housing will provide a powerful explanation for the increasing rates of minority suburbanization shown in Figure 1.

Regarding the ecological context variables, note that the Asian population has grown at an astounding average rate of nearly 74 percent per decade from 1970 to 2000, over five times the average rate of increase in the MA population overall (14.4 percent per decade). By contrast, the black population has grown only slightly more quickly than overall MA population growth, averaging 17 percent per decade in the 256 MAs under consideration. Hispanic population growth has been intermediate, averaging about 39 percent per decade.

MA-level Effects

Interpretation of parameter estimates. The 2000 intercepts and 1970 to 2000 slopes shown in Figure 2 are averages across the 256 MAs in the analysis; however, there is variation around those intercepts and slopes. The models in Tables 2 and 3 below investigate the extent to which that variation is related systematically to spatial assimilation, housing supply, and ecological context variables. In each table, the left-hand panel presents findings from regressions of the β_{0j} from equation (3) on MA-level characteristics, as shown in equation (4a). The right-hand panel presents findings from HLM slopes-as-outcomes models, in which the β_{1j} from equation (3) are modeled as shown in equation (4b).

Because all covariates have been grand-mean centered, the intercepts are interpreted as covariate-adjusted averages for all MAs. The coefficients in the left-hand panel are interpreted as variation in MA-level minority suburbanization in 2000 associated with one-unit changes in the

independent variables. We computed the natural log of total MA population, so its coefficients are interpreted as effects of 1 percent changes in MA population. The coefficients on the time-varying variables in the right-hand panels are interpreted as effects of 1 percent per decade changes in the independent variables on average decadal change in minority suburbanization. Finally, the coefficients on the “region” and “age” dummy variables are interpreted as increments or decrements to the intercepts for the included regions and age categories relative to the excluded categories (the West region and older than 1900, respectively).

Interpretation of statistical significance. Because analysts using HLM typically have samples of level-1 and level-2 units (e.g., students nested within schools), the robust standard error estimates provided by the HLM software assume some kind of probability sample. In this article, however, we analyzed repeated measures from a census of MAs that were defined in each census from 1970 to 2000. Thus, the standard errors from models in Tables 2 and 3 (available from the authors upon request) should be interpreted as “estimates of parameter dispersion contaminated by measurement error” (Grodsky and Pager 2001, p. 552). In other words, smaller standard errors indicate more consistent effects of the independent variables on minority suburbanization. Accordingly, instead of using the conventional alpha levels of .01 or .05, we denote relatively consistently measured effects with an asterisk, to indicate that the coefficient is at least twice its standard error.

Spatial assimilation models. Model 1 in Tables 2 and 3 present estimates of the effects of the four variables suggested by spatial assimilation theory on minority suburbanization. In Table 2, we found that income and homeownership were relatively strong predictors of minority suburbanization for all three groups. The coefficients indicate that a one thousand dollar increase in average minority group income is associated with one-half of a percentage point increase in Asian and Hispanic suburbanization, and seven-tenths of a percentage point increase for African

Americans. One percentage point increases in homeownership are associated with four-tenths to one-half of one percentage point increase in minority suburbanization. Acculturation and education had relatively large effects only for Hispanics, however the acculturation coefficient was in the opposite direction as that predicted. Our data indicate that MAs with more good English-speaking Hispanics tend to be less suburbanized. It is possible that this effect derives from the increasing rates of immigration directly to suburbs by Hispanic immigrants seeking jobs in suburban service and construction industries, and perhaps in agricultural concerns on the outskirts of metropolitan areas such as Ventura and Fresno, CA, Fayetteville, AR, and parts of North Carolina. However, this hypothesis cannot be tested with our data.

In Table 3, we found few effects of change in the spatial assimilation variables on change in minority suburbanization, except a small negative effect of change in English speakers and a small positive effect of change in homeownership for Hispanics.

(Table 2 about here)

(Table 3 about here)

Models with housing supply. In Model 2 of Tables 2 and 3 we include our measures of housing supply: the ratio of suburban to central city housing in 2000 in Table 2 and percent per decade change in that ratio in Table 3. The inclusion of this variable enables us to assess whether our measures of spatial assimilation exerted independent effects, or whether MAs with large and increasing suburban rings were also the MAs in which minorities exhibited the highest levels of SES and acculturation. In addition we are able to assess the independent effects of housing supply, controlling for measures of spatial assimilation.

The coefficients on the housing supply variable in Table 2 indicate that a one-unit change in the suburban:central city housing stock ratio is associated with a 7 to 10 point increase in minority suburbanization. Using the standard deviation estimate from Table 1, this indicates

that, controlling for socioeconomic characteristics of the minority population, MAs that are one standard deviation higher on suburban housing supply would feature suburbanization rates that are 17 percent higher for Asians, and about 12 percent higher for blacks and Hispanics. The coefficients in Table 3 indicate that a one percent per decade increase in the ratio of suburban to central city housing stock is associated with suburbanization rate increases of 0.16 percent for Asians and Hispanics and 0.11 percent for blacks. Put differently, for a MA that experienced the average per-decade increase in suburban housing stock (21.6 percent per decade, from Table 1), that MA would have experienced increases of 3.5 percent suburban Asians and Hispanics, and 2.3 percent African Americans. Clearly, therefore, 2000 levels of and 1970 to 2000 change in minority suburbanization are strongly related to the supply of suburban housing in metropolitan areas.

More importantly, however, controlling for suburban housing supply enables us to assess whether the apparent effects of the spatial assimilation variables shown in Model 1 were substantially related to housing supply. In other words, if the SES of minorities is higher in MAs with more housing supply, then including measures of housing supply ought to attenuate the effects of the spatial assimilation variables. This turns out largely to be the case in terms of minority average income. Relative to the effect sizes in Model 1, in Model 2 these effects declined by 46 percent (0.47 to 0.25) for Asians, 77 percent (0.70 to 0.16) for blacks, and 66 percent (0.50 to 0.17) for Hispanics. Thus, our data suggest that minority incomes tend to be higher in MAs with larger suburban rings, yielding small independent effects of income.

A similar story emerges for Asian homeownership, in that the effect in Model 1 of Table 2 (0.41) declines to 0.15 in Model 2. Thus, Asian homeownership tended to be higher in 2000 in MAs with larger suburban housing supply. This same relationship did not hold for blacks and Hispanics, however. The homeownership coefficients in Model 2 remained consistent (even

increasing slightly), suggesting that higher rates of black and Hispanic homeownership are associated with higher rates of suburbanization, independent of the relative size of the suburban ring. Similarly, the negative effect of English ability and the positive effect of education for Hispanics held firm from Model 1 to Model 2. We also found a strong suppressor effect for education for blacks. Whereas the effect of a one-percent change in the percentage of blacks with greater than a high school education was only 0.01 in Model 1, it increased to 0.34 in Model 2. This suggests that education and suburban housing supply are negatively correlated, and that controlling for housing supply revealed a positive effect of education on suburbanization for blacks.

In Table 3, controlling for housing supply did little to change our interpretations of the effects of increasing levels of acculturation and SES among minorities. We found that controlling for housing supply growth intensified (relative to Model 1 of Table 3) the small negative effect of growth in the percentage of good English speakers and the small positive effect of growth in homeownership for Hispanics.

Models with ecological context variables. In Model 3 of Tables 2 and 3 we include measures of population size and growth, minority representation, and region and age of MAs. We found no relationship between population size or growth on minority suburbanization, and an effect of minority representation only on the suburbanization rate of blacks in 2000. Specifically, a one percent increase in the MA percent black was associated with a 0.28 point increase in the percentage of blacks in the suburbs.

In Table 2 we found large regional effects for all three groups. All groups were substantially less suburbanized in the Northeast and Midwest, relative to the West. For example, on average in 2000, Hispanics in the Northeast were about 16 percent less suburbanized than their western peers. African Americans in the Northeast and Midwest were about 11 to 12

percent less suburbanized than blacks in the West. These findings likely reflect historical migration patterns of blacks to central cities in the Northeast and Midwest, and the clustering of Puerto Rican and Dominican immigrants in the central cities of Northeastern and Midwestern metropolitan areas such as New York, Boston, Milwaukee, and Chicago. Controlling for other variables in Model 3, we found that Asians were less suburbanized in MAs whose central city passed 50,000 in population after the turn of the 20th century. We also found that blacks were more suburbanized in the newest MAs, echoing findings from past research on residential segregation (e.g., Farley and Frey 1994).

Controlling for measures of ecological context yielded few changes to our interpretation of the spatial assimilation or housing supply effects, relative to Model 2. Specifically, controlling for the ecological context variables enabled us to detect an effect of percent English speakers for Asians, which is in the direction predicted by spatial assimilation theory. All other effects of spatial assimilation and housing supply were essentially unchanged from Model 2.

In Table 3, we found few appreciable effects of ecological context, with the exception of region for Hispanics and MA age for Asians and blacks. We found that growth in Hispanic suburbanization in the South grew an average of 3 percent per decade, relative to the West. This likely reflects rapidly growing direct settlement and relocation of internal Hispanic migrants to southern MAs in such states as North Carolina, Arkansas, and Alabama (Kochkar, Suro, and Tafoya 2005). We also found that newer MAs were experiencing slower rates of Asian and African American suburban growth than the oldest MAs. It is tempting to interpret this finding as simply reflecting the lower levels of suburbanization at the beginning of the period of observation (1970) for these groups. As we shall see in the next section, however, controlling for levels of minority suburbanization provides little support for this interpretation.

Models with minority suburbanization in 1970. In Model 4 of Tables 2 and 3 we include the percentage of each minority group in the suburbs in 1970 to control for the possibility that relationships between spatial assimilation, housing supply, and ecological context on 2000 levels of and 1970 to 2000 change in minority suburbanization are spurious owing to the degree of minority suburbanization in 1970. That is, it is conceivable that, for example, MAs with many high-status minorities in 2000, or those with rapidly growing suburban rings, are the same MAs in which minorities had already established a substantial suburban foothold in 1970.

The coefficients in the bottom row of the top panel of Table 2 show that one-percent increases in the percentage of minorities in 1970 are associated with one-half to three-quarters of a percentage increases in minority suburbanization rates in 2000. Clearly, and not surprisingly, minority suburbanization in 2000 depends largely on minority suburbanization in 1970.

In addition, however, we found that virtually all of the relationship between spatial assimilation and minority suburbanization in 2000 is accounted for by the inclusion of the 1970 rates. Only two spatial assimilation coefficients remain at least twice as large as their standard errors—household income for Asians and percent homeowners for Hispanics—and each of these effects was reduced by about 70 percent relative to Model 3. Similarly, between 80 and 95 percent of the associations between suburban:central city housing stock in Model 3 were explained by the inclusion of 1970 minority suburbanization rates in Model 4.

There are at least two possible interpretations of these findings. First, suburban residence may be both effect and cause of minority socioeconomic status. Thus, those MAs that had high proportions of suburban minorities in 1970 produced more high-SES minorities from 1970 to 2000, who and these high-SES minorities were able to attain or retain suburban residence by 2000. Second, our findings may simply indicate the persistence of a synchronic relationship between minority SES and suburbanization, and a diachronic relationship between MA-level

SES on the one hand, and minority suburbanization on the other. That is, it is possible that MAs with many high-SES minorities were more suburbanized in both 1970 and 2000 (the synchronic relationship), and that minority SES and suburbanization in 1970 are related to minority SES and suburbanization in 2000 (the diachronic relationship).

In Table 3 we assess the extent to which minority suburbanization in 1970 is related to the growth in percent minority in suburbs from 1970 to 2000. To begin with, note that the coefficients on the 1970 rate variables are negative, indicating that MAs with higher levels of minority suburbanization in 1970 experienced flatter (not necessarily negative) growth in minority suburbanization from 1970 to 2000, relative to MAs with lower minority suburbanization rates in 1970. This is not surprising, given that there is more room for growth in MAs with lower levels of minority suburbanization at the beginning of the period. Note also that the strong positive effects of relative growth in suburban housing observed in Models 2 and 3 are completely wiped away in Model 4. This suggests that MAs with the most rapid growth in suburban housing stock were the ones in which minorities were most present in 1970. Finally, we observe small positive effects of growth in good English speakers and homeownership for Asians, small negative effects of growth in good English speakers and mean household income for Hispanics, and a small positive effect of growth in homeownership for Hispanics. We found no persistent effects of the spatial assimilation variables for African Americans.

Conclusions

In this paper we tested two hypotheses about the causes of increases in minority suburbanization from 1970 to 2000. First, we examined the role of variation in levels of and changes in measures of minority acculturation and socioeconomic status, commonly grouped under the "spatial assimilation" theoretical framework. If, as proposed by Massey and Mullan (1984) and others,

rising levels of income, education, and homeownership are keys to the attainment of suburban residence, then it stands to reason that, in metropolitan areas in which minorities were achieving gains on these measures, rates of minority suburbanization ought to have increased during the last three decades. In addition, however, these decades also saw massive growth in the supply of suburban housing, relative to the housing available in central cities. Therefore, we reasoned that in MAs where suburban housing supply was generally increasing, members of all groups ought to have increased in their representation in the suburbs, in addition to or apart from changes in those groups' characteristics. In order to control for possible confounding effects, we also included several measures of the ecological context of MAs, as well as the rates of minority suburbanization in 1970.

In general, we found scattered support for the spatial assimilation framework. While income and homeownership were associated with higher rates of suburbanization in 2000, these effects were largely attenuated after controlling for the supply of suburban housing and other MA-level characteristics. We also found that the supply of suburban housing was strongly associated with the level of suburbanization in 2000, however, this affect too was dramatically reduced after controlling for the level of minority suburbanization in 1970. We conclude that the MAs in which minorities had established a substantial suburban foothold by 1970 tended to be the ones with the largest supply of suburban housing by 2000.

In examining change from 1970 to 2000, we found little support for the spatial assimilation perspective, in that virtually all of the effects of increasing minority acculturation and SES were small, and in the case of Hispanic English proficiency, in the opposite direction to that proposed by spatial assimilation theory. We found that MAs with more rapidly growing suburban rings featured higher rates of growth in minority suburbanization; however, these effects also disappeared after introducing controls for minority suburbanization in 1970.

Among the most robust effects observed were those relating to the age of metropolitan areas, at least for Asians and African Americans. In both Models 3 and 4, MAs whose central cities passed 50,000 in population prior to 1900 had higher rates of Asian and black suburbanization, and more rapidly increasing rates from 1970 to 2000, than any of the comparison age categories. It is a little difficult to make sense of these effects, given that we controlled for minority proportion, minority suburbanization in 1970, and suburban housing supply in one or both of these models. The explanation, which is more a restatement of the model specification than a theoretical observation, must be that characteristics of older cities not correlated with suburban ring size, minority proportion, or preexisting minority suburbanization, led to higher rates of minority suburbanization in 2000 and faster growth from 1970 to 2000.

In conclusion, we believe that this paper improves upon prior analyses of minority suburbanization in at least three ways. First, rather than focusing on a single decade or change between two decades, our analyses estimate growth trajectories over time, yielding a longer view of trends than captured in prior research. Second, our paper is the first to our knowledge to operationalize suburban housing supply as the supply relative to that in the central city. We believe this measure better captures the extent to which the suburbs of a metropolitan area are the dominant living arrangement for residents of that metropolitan area. Finally, our research demonstrates the profound path dependency of minority suburbanization by including controls for minority suburbanization in 1970. Indeed, we found that with few exceptions, the levels of minority suburbanization in 1970 accounted for much of the variation in 2000 rates of suburbanization, and rates of change over time.

Appendix: Construction of Race/Ethnicity Categories

Several of our variables rely on counts of the race or ethnicity of individuals. Using the procedures described below, we constructed five mutually exclusive and exhaustive categories (non-Hispanic White, Black, Asian, and other race, and Hispanics of all races) that were maximally comparable from 1970 to 2000. Data from the 1970 census raised the largest challenges, for the three reasons described below.

1970

Coding Asians and other race individuals. First, members of all non-White or Black racial groups were collapsed into an “other race” category in 1970. We estimated Asian and other race counts in 1970 by first multiplying the 1970 tract population of other race individuals by the proportion of 1980 other race individuals who were Asian, shown in the formula below:

$$\hat{A}_{i(1970)} = O_{i(1970)} \left(\frac{A_{i(1980)}}{A_{i(1980)} + O_{i(1980)}} \right), \quad (\text{A1})$$

where $\hat{A}_{i(1970)}$ is the estimated count of Asians in tract i in 1970, $O_{i(1970)}$ is the observed count of other race individuals (including Asian, American Indian, and other race) in tract i in 1970, and $A_{i(1980)}$ and $O_{i(1980)}$ are, respectively, the observed counts of Asian and other race (American Indian plus other race) individuals in tract i in 1980. We then subtracted the estimated count of Asians from the observed other race count in 1970 ($O_{i(1970)} - \hat{A}_{i(1970)}$) to derive an estimate of the 1970 tract population of other race (i.e., non-Asian) individuals.

This procedure undoubtedly resulted in some degree of measurement error in the true proportion of Asian and other race individuals in 1970 tracts. That is, if the proportion of other race individuals who were Asian was different within a given tract in 1980 than in 1970, then our estimates of the Asian population in 1970 would be incorrect.³ If, however, those errors tend to

³ Here it is important to recall that the NCDB matched tract boundaries across decades; thus, we are using the same geographic area to estimate 1970 counts based on 1980 proportions.

cancel each other out; that is, if in some tracts we overestimated the proportion Asian and in others we underestimated it, then there would be no bias in our estimates. Random measurement error would not contribute bias to our dependent variables, only larger variance components and lower percentages of variance explained at level 2. Measurement error in our independent variables would tend to bias coefficients downwardly (such as on the effect of change in percent Asian from 1970 to 2000), and thus these coefficients represent somewhat, though likely not dramatically, conservative estimates.⁴

Coding Hispanics. In 1970, the 5-percent sample asked respondents directly whether they were “of Spanish origin or descent,” including categories for Mexican, Puerto Rican, Cuban, Central or South American, and other Spanish. In the 15-percent sample, the Census Bureau defined Hispanics on the basis of a set of post-enumeration criteria, depending on the state in which respondents lived. These procedures are detailed in Tatian (2003, pp. 4-13 to 4-14).

Apportioning Hispanics to racial groups. Hispanics on the NCDB were not apportioned to racial groups in 1970, thereby making it impossible to tell precisely who were non-Hispanic Whites, Blacks, Asians, and members of other racial groups. We imputed tract-level counts of non-Hispanics in 1970 by multiplying the Hispanic tract count in 1970 by the proportion of non-Hispanics of racial group X in 1980, as shown in the following formula:

$$\hat{X}_{i(1970)}^{NL} = X_{i(1970)} \left(\frac{X_{i(1980)}^{NL}}{X_{i(1980)}} \right), \quad (\text{A2})$$

where $\hat{X}_{i(1970)}^{NL}$ is the estimated count of non-Hispanic members of racial group X in tract i in 1970, and $X_{i(1980)}^{NL}$, $X_{i(1970)}$, and $X_{i(1980)}$ are, respectively, the observed counts of non-Hispanic members of racial group X in tract i in 1980, and all members of racial group X (Hispanic plus

⁴ In 1970, the average tract percentage of other race individuals was 1.31%, with fully 95% of 1970 tracts having fewer than 4.27% of members of other racial groups. Our imputation procedures led us to calculate average tract percentages of 0.99% for Asians and 0.32% for other race individuals. Thus, the absolute impact of even substantial bias in our estimates is likely to be quite small.

non-Hispanic) in tract i in 1970 and 1980. As with our estimates of Asians and other race individuals in 1970, these measures also have some degree of measurement error in them, though the errors would be small if the tract-level proportions of Hispanic and non-Hispanic members of each racial group X were fairly stable in 1970 and 1980. Furthermore, the errors would tend to cancel each other out if the share of Hispanic members of each racial group X increased or decreased from 1970 to 1980 in a non-systematic fashion.

1980 and 1990

In these decades, Hispanics were apportioned to each of the four racial categories (White, Black, Asian, and Other [including American Indian and other race]) and respondents were not allowed to choose more than one racial category, which changed in Census 2000 (see below). Thus, for 1980 and 1990 we simply relied on the observed counts of the five racial/ethnic categories.

2000

In Census 2000, respondents were, for the first time, allowed to choose more than one racial group. We dealt with multiracial reporting in the following way: all Hispanics were coded as Hispanics, whether or not they chose one or more racial categories. Non-Hispanics who identified themselves as being of two or more races were coded as “non-Hispanics of other races.” Such individuals (about 1.9 percent of non-Hispanics and 1.6 percent of the total population [Grieco and Cassidy 2001, Table 10]) were not included in the calculations of Dissimilarity, Isolation, and Net Difference, and were included in the “other” category in the calculations of the Entropy index. See the “Measures” section above for details on these calculations.

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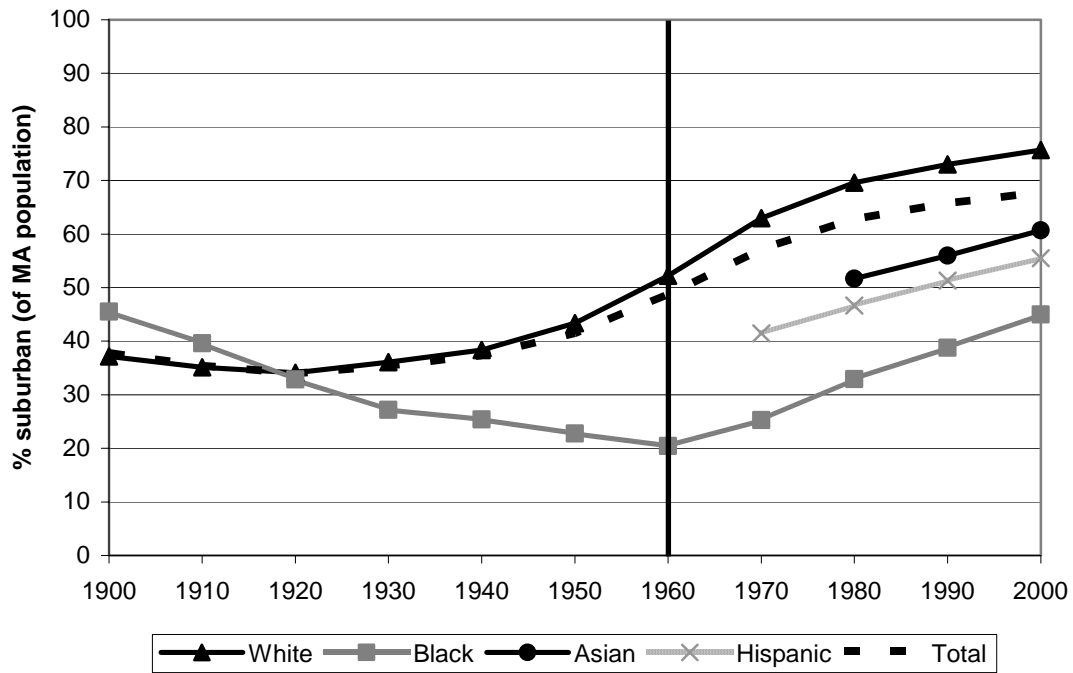


Figure 1. Percent of U.S. Metropolitan Area Population in Suburbs, 1900 to 2000, by Racial/Ethnic Group

Notes: Data prior to 1970 from U.S. Census Bureau (2008). Whites and blacks include Hispanics, and "Total" line only refers to white and black population. Data from 1970 to 2000 from authors' calculations from data from National Change Database. White, black, and Asian lines do not include Hispanics, Hispanics are of all races, and "Total" line includes 3 groups in 1970 and all four groups from 1980 to 2000.

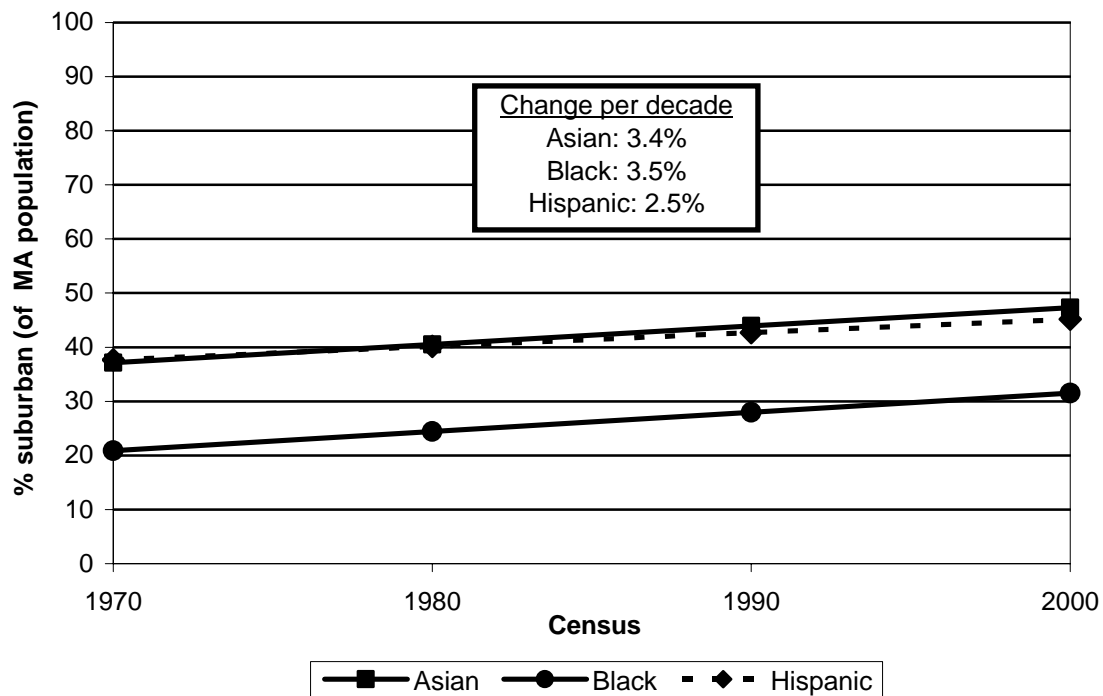


Figure 2. HLM Estimates of MA-Level Minority Suburbanization, 1970 to 2000

Notes : N is 1,007 at level 1 and 256 at level 2. Figures derived from random-coefficient models estimated in HLM6 (see Raudenbush and Bryk 2001:75-80). For each group, data for 2000 based on the γ_{00} (the MA-average intercepts), and data for 1970 to 1990 estimated from the γ_{10} (the MA-average

Table 1. Descriptive Statistics of the Independent Variables, 2000 and 1970 to 2000

Variables	2000				1970 to 2000 change ^a			
	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
Spatial assimilation								
Percent good English speakers								
Asian	86.9	5.3	62.5	97.6	13.4	18.3	-15.9	129.6
Hispanic	76.3	9.4	49.0	98.4	-7.7	7.7	-32.6	5.7
Percent > high school								
Asian	63.7	12.6	23.9	94.4	7.6	14.7	-30.8	84.9
Black	37.3	14.3	8.4	75.3	72.9	46.7	-14.1	265.6
Hispanic	31.2	11.2	11.1	76.0	48.0	39.3	-51.0	254.4
Mean household income (in \$000)								
Asian	58.4	14.6	20.2	122.4	9.0	18.3	-50.9	99.6
Black	35.9	7.1	20.9	68.6	3.6	9.9	-33.6	54.8
Hispanic	40.0	7.1	21.7	64.2	3.6	10.6	-61.9	49.2
Percent homeowners								
Asian	50.8	11.1	13.5	77.9	-15.5	14.0	-68.1	40.2
Black	41.7	9.1	10.7	65.4	-12.5	15.4	-109.3	29.5
Hispanic	44.1	11.6	14.7	74.0	-12.7	15.2	-60.8	28.4
Housing supply								
Suburban:central city housing stock	1.8	1.6	0.1	9.1	21.6	15.9	-12.1	131.7
Ecological context								
MA population (in 000)	820.7	1,526.6	57.8	15,643.5	14.4	13.0	-7.6	110.5
Percent minority ^b								
Asian	2.9	5.2	0.3	69.3	73.7	23.1	7.1	173.7
Black	11.3	10.7	0.2	51.1	17.2	24.4	-21.9	143.6
Hispanic	10.4	15.3	0.4	94.4	39.1	22.8	-5.6	120.3
Region								
Northeast	0.18	0.38	0	1	—	—	—	—
Midwest	0.26	0.44	0	1	—	—	—	—
South	0.39	0.49	0	1	—	—	—	—
West	0.18	0.38	0	1	—	—	—	—
Age of MA								
Earlier than 1900	0.19	0.39	0	1	—	—	—	—
1900 to 1939	0.34	0.48	0	1	—	—	—	—
1940 to 1969	0.30	0.46	0	1	—	—	—	—
1970 or later	0.17	0.38	0	1	—	—	—	—
Minority percent suburban, 1970								
Asian	35.5	25.6	0.0	94.4	—	—	—	—
Black	20.3	19.1	0.0	91.0	—	—	—	—
Hispanic	35.8	21.0	0.0	88.9	—	—	—	—

Notes: N (MAs) is 256.

^a These are person-year weighted rates of change (in % per decade) from 1980 to 2000, except for Black and Hispanic percent homeowners, housing stock, MA population, and percent minority, which are from 1970 to 2000.

^b Refers to the percentage of the minority group in the column heading.

Table 2. Fixed Effects from HLM Regressions of 2000 Levels of Minority Suburbanization on Measures of Spatial Assimilation, Housing Supply, Ecological Context, and Minority Suburbanization in 1970

Parameter	Model											
	1			2			3			4		
	Asian	Black	Hispanic	Asian	Black	Hispanic	Asian	Black	Hispanic	Asian	Black	Hispanic
Intercept	47.32 *	31.50 *	45.19 *	47.34 *	31.51 *	45.21 *	47.33 *	31.51 *	45.21 *	47.37 *	31.52 *	45.30 *
Spatial assimilation												
Percent English speakers	-0.07	—	-0.66 *	0.09	—	-0.57 *	0.48 *	—	-0.44 *	0.10	—	-0.08
Percent > high school	0.05	0.01	0.29 *	0.06	0.34 *	0.34 *	-0.07	0.17	0.30 *	-0.03	0.06	0.03
Mean household income (in \$000)	0.47 *	0.70 *	0.50 *	0.25 *	0.16	0.17	0.28 *	0.31	0.08	0.08 *	0.04	0.03
Percent homeowners	0.41 *	0.51 *	0.44 *	0.15	0.56 *	0.48 *	0.07	-0.04	0.43 *	0.00	0.02	0.13 *
Housing supply												
Suburban:central city housing stock	—	—	—	10.44 *	7.39 *	7.78 *	10.25 *	7.90 *	7.93 *	2.06 *	0.47 *	0.34
Ecological context												
Log MA population	—	—	—	—	—	—	1.21	0.80	1.05	0.80 *	-0.15	0.52
Percent minority ^a	—	—	—	—	—	—	-0.15	0.28 *	-0.10	-0.02	0.00	-0.06
Northeast	—	—	—	—	—	—	-7.74 *	-11.99 *	-16.12 *	-1.01	-3.15	-7.02 *
Midwest	—	—	—	—	—	—	-5.23	-11.01 *	-13.34 *	-2.57	-8.33 *	-1.86
South	—	—	—	—	—	—	-3.64	-1.26	-4.57	4.99	-0.10	9.84 *
1900 to 1939	—	—	—	—	—	—	-7.39 *	0.08	-2.30	-8.75 *	-5.72 *	-1.02
1940 to 1969	—	—	—	—	—	—	-14.63 *	4.37	0.98	-16.49 *	-7.45 *	-0.96
1970 or later	—	—	—	—	—	—	-12.74 *	9.06 *	2.38	-14.25 *	-4.22	0.42
Minority suburbanization, 1970	—	—	—	—	—	—	—	—	—	0.52 *	0.65 *	0.72 *

Notes: All covariates have been grand-mean centered. Level-2 N is 256. * indicates coefficient is at least twice the size of its standard error.

^a Refers to the percentage of the minority group in the column heading.

Table 3. Fixed Effects from HLM Regressions of 1970 to 2000 Change in Levels of Minority Suburbanization on Measures of Spatial Assimilation, Housing Supply, Ecological Context, and Minority Suburbanization in 1970

Parameter	Model											
	1			2			3			4		
	Asian	Black	Hispanic	Asian	Black	Hispanic	Asian	Black	Hispanic	Asian	Black	Hispanic
Intercept	3.40 *	3.54 *	3.40 *	3.42 *	3.56 *	2.54 *	3.41 *	3.55 *	2.54 *	3.48 *	3.57 *	2.69 *
Spatial assimilation												
<i>Percent English speakers</i>	-0.02	—	-0.02 *	-0.01	—	-0.19 *	0.00	—	-0.15 *	0.01 *	—	-0.07 *
<i>Percent > high school</i>	0.03	-0.01	0.03	0.01	-0.01 *	0.01	0.02	-0.01	0.00	0.01	0.00	0.00
<i>Mean household income</i>	0.04	-0.05	0.04	0.03	-0.04	-0.02	0.03	-0.05	-0.01	0.00	-0.01	-0.02 *
<i>Percent homeowners</i>	0.04	0.03	0.04 *	0.03	0.02	0.12 *	0.03	0.01	0.12 *	0.02 *	0.01	0.07 *
Housing supply												
<i>Suburban:central city housing stock</i>	—	—	—	0.16 *	0.11 *	0.16 *	0.15 *	0.08 *	0.14 *	0.00	-0.01	0.00
Ecological context												
<i>Log MA population</i>	—	—	—	—	—	—	0.00	0.06	0.00	0.01	0.00	-0.02
<i>Percent minority^a</i>	—	—	—	—	—	—	-0.01	0.01	-0.03	-0.01	0.01	-0.01
Northeast	—	—	—	—	—	—	-1.46	-0.24	-0.24	0.09	-1.27	-1.78
Midwest	—	—	—	—	—	—	0.01	-1.49	1.34	-0.38	-2.71 *	0.16
South	—	—	—	—	—	—	1.38	-0.98	3.16 *	2.50 *	-0.18	3.88 *
1900 to 1939	—	—	—	—	—	—	-1.86 *	-1.88 *	0.25	-2.42 *	-1.75 *	-0.39
1940 to 1969	—	—	—	—	—	—	-3.96 *	-3.30 *	0.23	-4.96 *	-2.54 *	-0.64
1970 or later	—	—	—	—	—	—	-4.45 *	-2.97 *	-0.07	-4.72 *	-1.45	-0.32
Minority suburbanization, 1970	—	—	—	—	—	—	—	—	—	-0.11 *	-0.10 *	-0.06 *

Notes: All covariates have been grand-mean centered. Covariates in italics are person-year-adjusted decadal rates of change. Level-2 N is 256. * indicates coefficient is at least twice the size of its standard error.

^a Refers to the percentage of the minority group in the column heading.