Title: Sprawl and Neighborhood Change: Patterns of ‘White Flight’ Amid Growing Neighborhood-level Racial Diversity, 1990 to 2010

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Abstract: Over the last half century, the literatures on racial segregation and sprawl have largely been kept separate. This paper aims to rectify this deficit by conducting an analysis of the sprawl of populations in four race/ethnicity categories (white, black, Asian and Latino) in 52 large US metropolitan areas, 1990 to 2010. Findings indicate that white flight remains a dominate feature of the residential landscape despite increasing neighborhood diversity in inner ring suburbs. These results provide a framework for assessing the future trajectories of neighborhood change, urban spatial development and segregation as the relative share of the white population continues to fall into the next decade and beyond.
According to Census Bureau projections released in 2015, the U.S. population is expected to be majority non-white by the year 2044 (Census, 2015). The fertility rate among native-born whites is predicted to fall further below replacement level, and with a small rate of white in-migration from abroad, the total U.S. white population will decline in both a relative and an absolute sense. While the Census’s projection of a ‘minority-majority’ U.S. by 2044 can be critiqued on a number of methodological and conceptual grounds—from the utility of rigid racial categories in demographic projections to the epistemological violence of ‘majority’/‘minority’ terminology—it is a productive starting point for an analysis of neighborhood racial change in the U.S. because it situates processes of race within a broader framework of demographic growth and transformation.

While the number of whites is expected to decline between 2014 and 2060, the total U.S. population is projected to rise by over 98 million (Census, 2015). Where additional population will live and how population growth will transform the current residential landscape are both open questions. Since the mid-19th century, U.S. growth has increasingly occurred in urban areas, and since the early 20th century growth within urban areas has often occurred in suburbs on the urban fringe. While the process of suburbanization predates the first and second Great Migrations and the rise of concentrated black residence in urban areas in the North (Mieszkowski and Mills, 1993), the peripheral, sprawling pattern of urban growth has historically played a significant role in the creation and maintenance of black-white residential segregation. The so-called phenomenon of ‘white flight’ required the construction of many millions of houses in the “crab grass frontier” in suburbs on the urban fringe (Jackson, 1987) and as such, constituted a significant shift in the residential distribution of the whites relative to the residential distribution of other groups. To this day, the preeminent theories of racial residential segregation, spatial
assimilation and place stratification, presuppose a racial geography of white suburb, black inner city.

As urban areas continue to push outwards from their centers and as the population becomes less and less white, it is unclear to what extent sprawl and new growth will remain a mostly white spatial process. The purpose of this paper is to bring scholarship on racial residential segregation together with scholarship on sprawl, two literatures that have largely been kept separate. My analysis connects patterns of neighborhood racial change observed between 1990 and 2010 with the shift in the distribution of whites towards the periphery that occurred over the same period. Using a measure of relative centrality, I first investigate the relationship between metropolitan area growth and sprawl across large U.S. metropolitan areas and then demonstrate the large extent to which population growth on the urban periphery has been driven by a shift in the white population. From there, I conduct a simple counterfactual analysis of what neighborhood racial compositions would have looked like in 2010 had the distribution of whites in 1990 held constant. Results indicate that while fixing the distribution of whites only slightly increases the absolute level of neighborhood diversity observed in 2010, the patterns of neighborhood change are considerably altered. These findings suggest that there remains a current of ‘white flight’ within large U.S. metropolitan areas and that the continued shift in the distribution of whites to the suburban periphery has played a significant role in kinds neighborhood racial change observed between 1990 and 2010.

**Background**

*Diversity, population growth and sprawl*
Throughout U.S. history, “white” has been the largest racialized population category; however, beginning in the 1970s the relative share of the population constituted by whites began to fall (Frey, 2015). Higher fertility rates among blacks and Latinos combined with heightened levels of immigration from Asia and Latin America led to a steady increase in the size of black, Latino and Asian populations. As the fertility rates of whites declined after the baby boom and the number of white immigrants remained low, the relative growth rate of the white population dropped below the growth rate of other groups thus giving way to increasing diversity at the national level.

While this demographic transformation is often discussed in terms of how it will impact the future racial and ethnic composition of the U.S. population, it is already apparent in the current racial and ethnic composition of U.S. population growth. Between 2000 and 2010, the white population grew a mere 1.1 percent, accounting for less than 2 million of the over 26.5 million in total population gain on the period (Census 2000 and 2010). It is projected that in the next decade the white population will begin to decline in number, at which point all U.S. population growth will be non-white (Frey, 2015).

Growing diversity in the United States has happened alongside an ongoing trend of urbanization and suburban development. Beginning in the early 20th century, U.S. population growth has been heavily concentrated in urban areas. According to an analysis of Census data conducted by the EPA, between 1910 and 2010 the urban population grew by nearly 500 percent while the rural population grew by only 19 percent (EPA, 2013). While disparity between urban and rural growth rates has narrowed in recent decades, population growth remains disproportionately urban; as of 2010, 81 percent of the U.S. population lived in urban areas, up from 79 percent in 2000 (U.S. Census Bureau, 2012). Throughout much of the 20th and 21st
centuries, the dominant pattern of development within urban areas has been one of suburbanization and the decentralization of households and jobs (Nechyba and Walsh, 2004). Since the 1950s, the population living in central cities has stayed flat while the population in suburbs has grown steadily, and since the early 1980s, the rate of increase in the amount of developed land has outpaced the rate of population growth (EPA, 2013). While population growth has been concentrated in urban areas, growth within urban areas has most often occurred in less dense suburbs outside of the urban core, resulting in sprawl.

Despite happening simultaneously, it is difficult to draw a straight line between the rising share of population growth among non-white populations and the disproportionate distribution of urban development in suburban areas peripheral to the urban core. While there has been some evidence of growing immigrant settlement in suburbs (Li, 1998; Hanlon, 2009) and an increased presence of non-white groups outside central cities (Fischer, 2008), it is questionable the extent to which these trends have abated the overwhelming whiteness of sprawl. Recent work by Ehrenhalt (2012) uses evidence of increasing white gentrification of neighborhoods in central cities to argue that U.S. metropolitan areas are undergoing an inversion of the historic white suburb/non-white inner city pattern of segregation; however, notwithstanding the growth of racial and ethnic diversity in inner-ring suburbs, diversity in most metropolitan areas still declines as one traverses out past these suburbs into new developments on the fringe that are more rural in character (Walker, 2016).

**Sprawl and racial residential segregation**

The peripheral pattern of development is often attributed to the proliferation of the automobile (Glaeser and Kahn, 2003), but this technological explanation fails to address larger social and economic processes of housing development and demand as they relate to micro-level
residential mobility decisions. In particular, scholars interested in the causes and impacts of sprawl often overlook the role of race in determining who has access to new developments on the urban periphery and how these new housing developments impact other dimensions of the market for housing. As noted by Galster and Cutsinger (2007) the literature on sprawl and the literature on segregation have developed largely independent of each other. This is an unfortunate detriment to both. On the one hand, the causes and consequences of sprawl are inextricably bound up in issues of differential access to housing across racial groups; while on the other hand, decentralized development of the built environment has played a major role in the maintenance of racial-residential segregation throughout much of the 20th century.

Contemporary theories of segregation have their roots in the urban ecology school of Park et al. (1925) who in providing a model for neighborhood succession in inner city neighborhoods implied residential development on the periphery. Writing during a time of rapid urbanization and development driven in part by high rates of immigration, Park et al. theorized that the settlement of new immigrant groups in the metropolitan core would have cascading effects on the residential landscape as urban growth expanded outward in concentric zones. Central to Park et al.’s model was the handing down of less desirable housing from more established groups to less established groups, resulting in gradient of increasing wealth and assimilation as one traversed the city outward from the center. New immigrant settlement to the central city was thus theorized as instigating development on the periphery as competition for resources led to a building out rather than building up of the urban environment.

The contemporary theories of segregation that draw on Park et al.’s model, the spatial assimilation model (Logan and Alba, 1993; Massey, 1985; Iceland and Nelson, 2008) and the place stratification model (Massey and Denton, 1993), however, tend to be less dynamic in their
conceptualization of the residential landscape. Developed in the late 1980s and early 1990s after several decades of low immigration and persistently high black-white segregation in most U.S. metropolitan areas, both theories presuppose a distribution of whites in desirable suburban areas and the distribution of blacks in undesirable inner city areas. The spatial assimilation model posits that groups are constrained in their mobility due to different levels of income. As the socio-economic status of a group’s household grows, some will relocate out of the less well-off areas in which other members of the group are concentrated. The place stratification model theorizes that black-white segregation is maintained by systematic discrimination between groups, in particular the aversion of whites to live in close proximity to blacks. When black persons move into a neighborhood, place stratification model predicts rapid neighborhood turnover.

The conceptual boundaries of the spatial assimilation model and the place stratification model begin to blur when one attempts to use them to explain the racial dynamics of sprawl. The spatial assimilation model assumes the preexistence of locations (i.e. white locations) which non-whites strive to obtain (Logan, 1996). Yet, if continuous urban growth requires the continuous development of new housing on the periphery and this new housing is more accessible to whites than to non-whites then what constitutes the “space of assimilation” is actually a moving target. If rents fall with increased distance from the center as a monocentric model of urban areas would suggest (Glaeser and Kahn, 2003), then the spatial assimilation model would predict highest levels of diversity in peripheral areas where housing rents are lowest; yet, this pattern does not exist in most large US metropolitan areas. Instead, new housing in peri-urban areas tends to be first occupied by whites. Proponents of the spatial assimilation model often use increasing racial diversity in inner ring suburbs as evidence in support of the model, but by failing to consider the
racial dynamics of new housing on the periphery they ignore the larger residential system of which inner ring suburbs are just one part.

The spatial assimilation model could be used to explain the historically white nature of sprawl if one assumes that new houses in new subdivisions on the periphery are unaffordable to non-white families stuck in undesirable central city neighborhoods. While this certainly may be true, it makes it difficult to separate white mobility to a (new) place that only whites can afford from white mobility to a (new) place to avoid non-whites. In other words, it makes it difficult to distinguish the differential mobility of whites and non-whites from the phenomenon of ‘white flight’. The ambiguity is elevated in situations where white population growth is zero. That is, if the size of the white population is fixed, then white occupation of new housing on the periphery is inherently linked to white exit of older housing in more central locations and racial succession in older neighborhoods.

_Sprawl and neighborhood change_

When sprawl is conceptualized as condition, it is often associated with lower levels of segregation. As the findings of Huie and Frisbie (2000) and Galster et al (2007) demonstrate, less dense metropolitan areas in the West and South tend to have lower levels of black-white segregation than denser cities in the Midwest and Northeast, and thus, in analyses of data from a single period of time, metropolitan-level attributes associated with sprawl tend to be negatively correlated with metropolitan levels of segregation. There are theoretical arguments for why sprawl be associated with higher levels of diversity. Glaeser et al. (2008) argue that in metropolitan areas in which the residential landscape is more homogeneous in terms of density and transportation options (e.g. all low density, all automobile), there is less opportunity for spatial differentiation by income or race. Moreover, in rapidly growing metropolitan areas, new
housing development may provide an opportunity for non-white groups to leave highly segregated central cities (Nechyba and Walsh, 2004).

When sprawl is conceptualized as a process, however, it can be associated with mechanisms that maintain or drive segregation. The phenomenon of “white flight”, which occurred throughout much of the mid-20th century, was a type of sprawl in the sense that it motivated the development of suburbs outside the central city. Limited resources to new housing or exclusionary suburban policies might relegate non-white groups to less desirable neighborhoods within central cities or in segregated suburbs while whites move outward into newly developed areas (Nechyba and Walsh, 2004). Thus, while new housing might be associated with lower levels of metropolitan-level segregation in an analysis of data from a single period of time, how new housing affects neighborhood-level segregation depends on where particular neighborhoods exist with respect to an outwardly moving periphery. Patterns of neighborhood change within any given metropolitan area are linked to the kinds of growth and change happening on their peripheries.

Since 1990 there is evidence of both increasing diversity at the neighborhood level and persistent segregation (Logan and Zhang, 2010; Wright et al. 2014). To investigate this complex dynamic, this research situates neighborhood change within a framework of group-specific patterns of sprawl. I attempt to answer the following questions:

**Research Questions**

1. To what extent are U.S. metropolitan areas sprawling? How much variation is there across metropolitan areas? *I expect to find that all U.S. metros are experiencing sprawl and that those that are growing the fastest are experiencing the highest rates of sprawl.*
2. How rates of sprawl vary by race and ethnicity? Given the increasing share of population growth made up by non-white groups, I expect all groups are undergoing sprawl but that due to a lasting legacy of white flight, whites are undergoing the most sprawl.

3. What role does the sprawl of whites play in patterns of neighborhood change throughout cities? I expect to find that the shift of whites towards the urban periphery has played a prominent role in the consolidation of non-white neighborhoods and the persistence of all kinds of segregated neighborhoods.

Data and methodology

To investigate the relationship between growing diversity, sprawl and neighborhood change, I use a dataset of 1990, 2000 and 2010 race and ethnicity counts. Because the Census Bureau redraws tract boundaries each Census, all counts are harmonized to 2000 Census tract boundaries. Each tract in the data set contains the count of six race and ethnicity categories for each of the three censuses: non-Hispanic white, non-Hispanic black, non-Hispanic Native American, non-Hispanic Asian, non-Hispanic other and Hispanic (or Latino). Because the 1990 Census did not allow respondents to select multiple races, multi-racial respondents from the 2000 and 2010 Censuses were placed into a single race category based on the largest non-white group (e.g. a white-black respondent becomes black, a black-Asian respondent becomes black, an Asian-Native American respondent becomes Asian, and so on). Also, because I am interested in the processes governing large metro areas, I use the county-based 1999 OMB metropolitan statistical area (MSA) designations to subset my file to contain only tracts that were within a metropolitan areas that had population one million or greater as of 2010. This means my primary dataset consists of 36,769 tracts spread across 52 metropolitan areas. The vast majority of the
population in large urban areas (98.9 percent in 2010) is comprised of four categories – white, black, Asian and Latino—so I will focus only on those.

Measuring sprawl

While Galster et al (2001) outline eight distinct dimensions for measuring sprawl based on land-use patterns, I focus on just one: centrality. I do this to simplify my analysis with respect to time. Each observation in my dataset is a 2000 Census tract, and thus does not move in relation to the metropolitan center. While the distribution of different groups across these tracts will shift over time, the spatial distribution of the tracts remains the same. Other conventional measures of sprawl such as density, continuity or concentration do not have this nice feature (Galster, 2001). The distribution of a particular group with respect to density, for example, can change due modifications in the distribution of another group, but the distribution of a particular group with respect to centrality will only change if the distribution of that group changes. Given that racial and residential segregation can be conceptualized as the outcomes of patterns of residential mobility, focusing on centrality allows me to isolate a dimension of change in the spatial dispersion of a particular group (e.g. a group becomes less or more central) that can only happen as the result of aggregate mobility of that group.

To quantify centrality, I calculate the relative distance of each tract to the most central tract in its metropolitan area. I do this using the following approach. First, I calculate the population density of each tract by dividing its Census 2000 population count by its land area in square miles. Because MSAs can have multiple centers I group tracts by primary MSA or PMSA (e.g. Dallas-Fort Worth is one MSA made up of two PMSAs, Dallas and Fort Worth). Within each PMSA I determine the center by identifying the tract for which the vector of distances to all other tracts is most negatively correlated with the vector of tract population density. In general,
this method will select a very dense tract (relative to the PMSA) but more critically, it will select a dense tract located near other dense tracts and far from less dense tracts on the periphery.

While imperfect, this method is much more accurate that a population weighted centroid because it can handle edge effects. For example, because of Lake Michigan, the population weighted centroid of Chicago is located some fifteen miles due west of the CBD. Using this method, the center of Chicago is placed just north of the CBD in the residentially dense Gold Coast neighborhood.

Knowing the center of each PMSA, I then calculate the median tract distance to the center for each PMSA and use this to create a standardized measure of \textit{relative distance to center} for each tract. The relative distance to center of a tract is equal to its distance to the center divided by the median distance to the center of all tracts in its PMSA. This standardization allows for analysis across all metropolitan areas. If a tract’s relative distance to center is less than one, this means that the tract is located closer to the center than the median for the metropolitan area. If its relative distance to center is two, for example, this means that the tract is located two times farther from the center than the median tract.

The primary focus of my analysis will be to examine the distribution of the four race and ethnicity categories (white, black, Latino and Asian) by relative distance to center. I will do this in a number of ways. The first will be to calculate the population weighted median distance to center for each group. If whites score a median distance to center of 1.1 in 1990, for example, this means that the median white person in 1990 lived in a tract that was 1.1 times farther from the center than the median tract in its metro. Relatedly, to visualize the distribution of different groups or of the overall population, I will plot population weighted density distributions by distance to center. These will be effective in showing variations in distributions by distance to
center while also taking into account quantitative differences in population across time or across
group. For example, if one plot shows that, at a relative distance to center of 2, the line
representing the total population in 1990 is above the line representing the total population in
2010 this means that there were, in absolute terms, fewer people living at this distance to center
in 2010 than in 1990.

Finally, to focus on change in the distribution of different groups, I will use density plots
to visualize population loss and population gain by relative distance to center. To do this, I
separate tracts that experienced net population gain from tracts that experienced net population
loss, and plot the population (gain) weighted density distribution by relative distance to center on
the positive side of the y axis and the population (loss) weighted density distribution on the
negative side of y axis. Once again, these plots are effective in showing changes in population
distributions relative to distance to center in an absolute sense. If at a relative distance to center
of four, for example, the line representing white population gain is much higher than the line
representing Latino population gain, this means that tracts located four times the median distance
to the center experienced more white population gain than Latino population gain. It should be
noted that a group can experience population gain and population loss at the same distance to
center. This is possible for two reasons. First, though it is represented as one dimension, relative
distance to center represents a circle around the metropolitan center that exists in two
dimensions. In a hypothetical metropolitan area, it is possible that two suburbs equidistant from
the center might experience disparate trends in their Latino populations: one might gain while the
other might lose. Second, in the case where I plot all tracts from all metropolitan areas together,
it is possible that one metro might gain a particular group at a particular distance to center while
another might lose that group at that distance to center.
Conceptually, studying tract level population gain and population loss by race and ethnicity is similar to research that examines net migration and brings with it the advantages and disadvantages entailed. There are limits to what can be said about a tract that gained white population between 1990 and 2010. Without longitudinal data, there is no way of knowing how much white mobility occurred in and out of the tract over the time period; we only know that by 2010 there was net in migration (or fertility) and that the tract gained white population. That being said, in aggregate, these numbers become powerful. If for a particular group the amount of population loss exceeds population gain at one distance to center while the reverse is true at another distance to center, then I can say that the population of the group shifted relative to the center. While non-white groups have experienced strong growth over my period of analysis, this does not mean that there are not places at certain distances from the urban center where these groups have declined in number. The crux of my analysis will be to show how different groups have changed in relative distance to center compared to other groups.

*Measuring neighborhood change*

As mentioned above, a limitation with this measure of relative distance to center is that it collapses a two dimensional phenomenon into one dimension by pooling all tracts at each distance to center. Thus, it is possible for all four race and ethnicity groups to gain population at a particular relative distance to center and still be completely segregated (i.e. in a situation that approximates the Hoyt (1939) sector model of urban development). To link findings from my analysis of relative distance to center to an analysis of neighborhood change, I calculate an entropy score for each tract based on counts of the six racial and ethnic categories in my data set: white, black, Asian, Native American, other and Latino. This measure is common to the diversity literature (Wright et al., 2014; Walker, 2016) and can be calculated using the following equation:
\[ E = \sum_{i=1}^{n} G_i \ln \left( \frac{1}{G_i} \right) \]

where \( G_i \) is share of the tract population constituted by group \( i \). For ease of interpretation, I scale the indices generated from this formula so that they range between zero and one, where zero represents racial homogeneity (segregation) and one represents an even representation of all six groups.

There are two reasons for using an entropy index on six groups as opposed to an entropy index on the four groups in my analysis. First, because the relative sizes of the Native American population and the ‘other population’ are so small, the four group and six group entropy indices will be highly similar in most cases. Second, and more importantly, the six group entropy index provides the basis of a useful neighborhood typology developed by Holloway et al. (2011) that I will apply to study the nuances of neighborhood change. This typology, referred to as MixedMetro, is powerful in the way it conceptualizes different kinds of segregation and diversity. Under the MixedMetro typology, each tract is first classified as low diversity, moderate diversity or high diversity using the six group scaled entropy index, and then low and moderate diversity tracts are assigned a designation based on their most populous group. With six groups, there are thirteen categories: low diversity white, black, Asian, Native American and other; moderate diversity white, black, Asian, Native American and other; and high diversity. High diversity tracts are those for which no group constitutes a proportion larger than 45 percent and entropy is higher than 0.7414.

With entropy scores and MixedMetro classification by tract, I will conduct an analysis of the impact of white sprawl on neighborhood level diversity. To do this, I will determine the distribution of tracts by entropy and MixedMetro classification under a hypothetical scenario of
zero white sprawl (but equal white growth across all tracts) between 1990 and 2010 and compare this distribution of entropy and Mixed Metro category with the distribution of what was observed in 2010. My analysis will be descriptive in nature but will offer a unique window into the role of white sprawl in neighborhood change.

Results

Identifying sprawl

My first research question is a simple one – to what extent are U.S. metropolitan areas sprawling? – but one that must be addressed before I can begin investigating the relationship between sprawl and neighborhood change. To answer this question, I first calculate the population weighted median tract distance to center for all tracts 1990, 2000 and 2010 and determine that the distribution of all people in large US metropolitan areas have indeed shifted towards the periphery. Median relative distance to center steadily increased from 1.01 in 1990 to 1.07 in 2000 to 1.13 in 2010. Though small, these changes reflect the disproportionate growth that has occurred in less central neighborhoods and suburbs of metropolitan areas. A population weighted density plot (Figure 1) demonstrates this trend more clearly. While some growth has occurred in tracts closer than the median (relative distance to center < 1), growth has disproportionately occurred in less central tracts (relative distance to center > 1).

By and large, this pattern of sprawl holds across large US metropolitan areas. Of the 52 MSAs in my dataset, 48 experienced a shift in their population towards the periphery. The four exceptions were Charlotte, NC; Greensboro, NC; Greenville, SC; and Providence, RI. Figure 2 plots changes in median relative distance to center by metropolitan area against metropolitan

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1 For visual clarity and ease of interpretation the x axis (relative distance to center) on this density plot and all other density plots presented is limited to the range of 0 to 5. This means that tracts located five or more times farther from the center than their metro median or more are not visualized. This excludes 325 of the 36,796 tracts.
area growth. Counter to my expectations, growth is not a strong estimator of the degree of sprawl. Though the coefficient estimating the slope of the regression line (influence of growth) in Figure 2 is positive and significant (p<0.05), growth explains less than 10 percent in the variation in sprawl by metropolitan area. Notably, there are handful of metropolitan areas for which population has markedly shifted toward the periphery but population growth has been small.

*Figure 1: Weighted density distributions of population by tract distance to center by year*

*Figure 2: Sprawl vs. metropolitan area growth rate*
To understand this counterintuitive finding, I calculated a series of simple descriptive statistics on tract-level population change. Given that tract boundaries are fixed and population in large metropolitan areas grew by 25.8 percent, it follows that the median tract population across all large metropolitan areas increases from 3,750 in 1990 to 4,323 in 2010; yet, it appears that this growth was concentrated in some tracts and not others. In fact, 33.7 percent of tracts in my dataset experienced population loss over the period. While metropolitan areas with less growth or negative growth contained larger numbers of depopulating tracts, all metropolitan areas contained at least some. For example, 12.5 percent of census tracts in Las Vegas, the fastest growing metropolitan area on the period, had smaller population in 2010 than 1990.

Within metropolitan areas, population gain between 1990 and 2010 tended to occur in more peripheral tracts than where population loss occurred. Figure 3 plots the density
Figure 3: Weighted density distribution of tract population change (1990 to 2010) by distance to center

distribution of tract population gain (black) and tract population loss (grey) by relative distance to center along with vertical lines representing the median distance to center of these two types of tracts. Judging from the much larger arch of the black line representing population gain, there has been strong population growth over the period across all distances from the center. Yet, as illustrated in Figure 1, the distribution of population gain by tract is shifted towards the periphery. In contrast, the bulk of population loss is in central tracts. This finding goes against the narrative of gentrification and a return to the city. While there has been considerable population growth in central areas, it has happened alongside population loss in central areas and a greater trend towards population growth in less central areas. Counter to my expectations, the
overall trend towards sprawl is not strictly a function of population growth on the periphery but also population loss in the center.

Sprawl by race and ethnicity

The next step is to investigate differences in sprawl by race and ethnicity. My expectation is that the distribution of all groups (white, black, Latino, Asian) is shifting away from the center but that whites are the most sprawled and are shifting to the periphery at a higher rate than other groups. Before assessing sprawl by group, it is helpful to place the population trajectories of these four racial and ethnic categories in a larger demographic context. Between 1990 and 2010, the total population living in one of the 52 largest US metropolitan areas increased by 37 million, but this growth was distributed highly unevenly across the four largest racial and ethnic groups: the Latino population grew by 19.8 million; the Asian population grew by 8.2 million; the black population grew by 7 million; and the white population grew by only 773,000. Moreover, 23,791 tracts (64.7 percent) lost a total 18.5 million whites. While there were gains in white population in the other 35.3 percent of tracts to offset the white population loss, these numbers indicate that there was a fairly significant spatial redistribution of the white population amid very slight overall white population growth over the period.

The black population, which grew by 7 million, stands in considerable contrast to the pattern observed among the white population. Though 8,630 tracts lost black population between 1990 and 2010, the rate of loss in tracts that shed black population was greater than the rate of gain in tracts that accrued black population. Given the high relative concentration of the black population in 1990, this pattern of loss and gain suggests that there was a considerable diffusion of the black population over the two decades. The population trends of Asians and Latinos are largely what one would expect given the amount immigration from Asia and Latin America over
this period. Both populations grew strongly between 1990 and 2010, and the number of tracts that lost population and total population loss in these tracts was relatively small for both groups.

The population weighted median distance to center for each of the four race and ethnicity categories in each year 1990, 2000 and 2010 is presented in Table 1. As anticipated, whites were the least central group in 1990 followed in order by Asians, Latinos and blacks. In 2010, this ordering remains the same. For all four groups, the median distance to center increased by somewhere between 0.17 and 0.21. Though population distribution of whites did not experience the largest increase in median relative distance to center, their shift towards the periphery maintained their position relative other groups. The black population experienced the largest outward movement but remained the most centrally located of any group. In fact, the median relative distance to center observed for the black population in 2010 was still well below the median relative distance to center observed for the population overall in 1990. Because the black, Asian and Latino populations are growing at a higher rate than the white population and because these three groups remain distributed more centrally than whites, it follows that shift in the relative distance to center for the population overall (0.12) is less than the shift observed for each group individually.

Table 1: Population weighted median tract distance to center by race and ethnicity by year

<table>
<thead>
<tr>
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<th>1990</th>
<th>2000</th>
<th>2010</th>
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<td>1.24</td>
<td>1.32</td>
<td>0.18</td>
</tr>
<tr>
<td>black</td>
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<td>0.76</td>
<td>0.87</td>
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<td>1.07</td>
<td>1.13</td>
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Similar to Figure 2 for the overall population, Figure 4 shows the population weighted density distribution of each group by year by distance to center. Clearly, the white population
was the largest group in 1990 and remained the largest in 2010. While strong growth of the black, Asian and Latino populations are apparent, the bulk of the population of these three groups tended to be distributed between 0 and 2 in relative distance to center. The one exception to this pattern is the distribution of Latinos in 2010 (red) which appears to feature a considerable tail out past a relative distance to center of 2. Latinos and Asians have experienced growth at all levels of relative distance to center while for blacks and especially for whites, there has been population loss in more central areas. The white plot shows less population in 2010 compared to 1990 (red below blue) at all centralities from 0 to about 1.3 and population gain between 1990 and 2010 the rest of the way out (red above blue).

*Figure 4: Weighted density distributions of population by tract distance to center by race/ethnicity by year*
Results presented in Figure 4 are roughly consistent with the narrative of non-white central city/white suburb, but there is considerable nuance. All populations including white have experienced population gain between 1 and 2 in terms of relative distance to center. It is tracts at this distance from center that are most likely to have undergone increases in diversity over the period between 1990 and 2010. Indeed, research has demonstrated that inner-ring suburbs are often the most diverse places within US metropolitan areas (Walker, 2016); yet, while the black, Asian and Latino populations have experienced modest growth beyond a relative distance to center of 2, tracts beyond this relative distance remain overwhelmingly white and have experienced disproportionately high gains in white population.

Figure 5 plots the population weighted density distribution of gain and loss from 1990 to 2010 by racial and ethnic category. More than any other figure so far, this plot suggests that white sprawl is likely an expression of white flight. The spatial distribution of white population loss almost exactly mirrors the distribution of Latino population gain, and while the Latino population gain plot has a sizeable tail, white population gain exceeds the population gain of all other groups combined starting between a relative distance to center of 2 and 2.5. To some extent the distribution of black population gain and loss mimics the distribution of white population gain and loss but at a much smaller scale: loss in central areas gains in more peripheral areas. Though the Asian population experienced a slightly higher increase in absolute population than the black population, because there was black population loss in some areas, the total black population gain appears higher than the population gain for the Asian population at most distances from the center.
The analysis of sprawl by race and ethnicity presented so far has ignored variation across metropolitan areas. It is likely that some of the shifts documented in Figure 5 are the result of interurban rather than intraurban mobility. To get around this issue, I repeat Figure 5 but for nine metropolitan areas, selected for their representativeness of different patterns by region, growth and size (plots for all metropolitan areas can be seen in Appendix A). The Bay Area and Seattle represent the west, but differ in their size and historical levels of diversity. Chicago and Cleveland represent the Midwest but also differ in size and trajectory. Las Vegas and Charlotte were the two fastest growing metropolitan areas between 1990 and 2010 and represent other fast growing metropolitan areas in the Sunbelt and Southeast. Houston represents the patterns
Figure 6: Weighted density distribution of tract population change (1990 to 2010) by race/ethnicity by distance to center for 9 Large Metro Areas
observed in metropolitan areas in Texas, and Philadelphia represents the general trends in observed in large dense metropolitan areas in the Northeast.

Figure 6 shows both consistency and variation across metropolitan areas. In general, the distribution of whites appears to have sprawled: white population loss was concentrated in central areas while white growth was more peripheral. Growth of the black, Asian and Latino populations occurred in areas more central than white population growth. Of these nine metropolitan areas, the prominent exception to this pattern was the Bay Area which experienced white population loss in relatively central areas but virtually no white population growth across any distance to center. As observed in the pooled dataset, the black population generally experienced loss in very central areas and growth in tracts between 0 and 2 in terms of relative distance to center. This pattern holds across areas with high black population growth like Atlanta and areas with relatively low black population growth like Chicago.

Growth of the Latino population was the strongest of any of the four groups over the two decades and this is reflected in the patterns observed across these nine metropolitan areas. Possibly indicating neighborhood succession, the distribution of Latino population gain across most metropolitan areas roughly mirrors the distribution of white population loss. Two metropolitan areas, Houston and –surprisingly– Atlanta, however, feature small but sustained Latino population gain outwards towards the periphery. Corresponding to growth of the Latino population in large edge cities such as Waukegan, Aurora and Joliet (Walker, 2016), the Chicago plot features a prominent rise in Latino population gain at a relative distance from the center of 2.5.

Fast growing metros like Las Vegas, Charlotte and Seattle still exhibit the general trend of group specific sprawl albeit in different forms: Seattle and Las Vegas underwent sizeable
white population loss in central areas and white population gain in peripheral areas, while Charlotte experienced very little population loss of any kind but featured a pattern of white population gain that was less central compared to the pattern of population gain of other groups. The plot for Cleveland demonstrates the population dynamics in low growth metropolitan areas in the Midwest – very little Latino and Asian population growth, deep population loss among whites and blacks central areas, and prominent sprawl of whites relative to blacks. Though there are clear differences across metropolitan areas, this analysis has mostly confirmed my expectations. The white population exhibited the most peripheral distribution in 1990 and shifted outward further to maintain this peripheral status over the two decades. That being said, there is evidence within specific metros but also across all metros that the periphery of metropolitan areas is not as white as it was in 1990. The Latino population, and also to a lesser extent the Asian and black populations, have experience modest growth in more peripheral areas. That being said, the majority of non-white growth has occurred in around the median distance to center (1). In addition to growing by 7 million, the black population underwent went a shift out of very central areas over the decade but still remains the most centrally distributed of any of the four groups.

*White sprawl and neighborhood change*

My final research question addresses the relationship between white sprawl and neighborhood change. My expectation is that the overall shift in the white population toward more peripheral areas is part of a residential dynamic that results in higher levels of neighborhood-level segregation: the consolidation of whites in predominantly white neighborhoods and the succession of previously white neighborhoods to non-white groups. To investigate this claim, I conduct two simple analyses: a model and a counterfactual. Both
approaches use the MixedMetro neighborhood typology to assess patterns of neighborhood racial and ethnic change that can be linked to white sprawl.

In the modeling analysis, I run a linear regression on the set of 52 metropolitan areas to test for the relationship between white sprawl, as measured by a change in the median relative distance to center of the white population, and white concentration in low diversity (segregated) white neighborhoods as classified by the MixedMetro typology. Controlling for the percentage of whites living in low diversity white neighborhoods in 1990 and the change in the metropolitan level entropy between 1990 and 2010, this model tests the hypothesis that metropolitan areas with greater amounts of white sprawl between 1990 and 2010 exhibited larger degrees of white concentration in 2010. Results of this model are in Table 2.

*Table 2: Linear regression model predicting the percentage of whites living in low diversity white tracts in 2010*

<table>
<thead>
<tr>
<th></th>
<th>beta</th>
<th>se</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.441</td>
<td>0.023</td>
<td>***</td>
</tr>
<tr>
<td>Percentage of whites in LDW tracts in 1990 (mean centered)</td>
<td>1.535</td>
<td>0.079</td>
<td>***</td>
</tr>
<tr>
<td>Change in metropolitan entropy 1990 to 2010 (mean centered)</td>
<td>-2.176</td>
<td>0.27</td>
<td>***</td>
</tr>
<tr>
<td>Change in the median distance to center of whites</td>
<td>0.169</td>
<td>0.09</td>
<td>'</td>
</tr>
</tbody>
</table>

Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

Residual standard error: 0.08422 on 48 degrees of freedom
Multiple R-squared: 0.8937, Adjusted R-squared: 0.887
F-statistic: 134.5 on 3 and 48 DF, p-value: < 2.2e-16

Findings are somewhat inconclusive. The dependent variable is the percentage of whites within a metropolitan area that lived in a low diversity white tract (neighborhood) in 2010. As one would expect, the coefficient estimating the effect of the percentage of whites in a metropolitan area in low diversity white tracts in 1990 is positive and highly significant. Metropolitan areas with higher levels of white concentration in white neighborhoods in 1990
exhibited higher concentration of whites in white neighborhoods in 2010. On the other hand, the coefficient estimating the effect of the change in metropolitan level entropy is negative and strongly significant. Metropolitan areas that experienced greater increases in metropolitan level diversity exhibited lower concentration of whites in white neighborhoods. These two variables explain a substantial portion of the variation in 2010 white concentration, and net of these two variables, the measure of white sprawl has a limited effect. That being said, the model suggests that there is marginal evidence that increase in the level of white sprawl, as measured by an increase in the relative distance to center of the white population between 1990 and 2010, is positively associated with higher levels of 2010 white concentration. The coefficient for this variable is significant at the $p < 0.1$ level and suggests that a change in the median distance to center of whites by 0.5 (a large but reasonable shift to the periphery) between 1990 and 2010 would predict an 8.5 percent increase in the percentage of whites living in low diversity white tracts. Metropolitan areas that have experienced more white sprawl tend to exhibit slightly higher rates of white concentration, but as the model suggests, the effect of white sprawl on white concentration is marginal.

The second analysis is a counterfactual in which I explore the neighborhood compositions under a condition of zero white sprawl since 1990 and compare with the neighborhood compositions observed in 2010. To do this, I take the white population counts observed at the tract level in 1990 and increase them all by a uniform rate of 0.7 percent, the growth rate of the overall white population in large metropolitan areas observed between 1990 and 2010. I then combine the counterfactual tract-level white counts with the observed tract-level black, Asian, Native American, other and Latino counts from 2010 and recalculate tract entropy and MixedMetro classification. By comparing the distribution of tracts by counterfactual and
observed entropy and MixedMetro classification, I can answer questions about the role of white sprawl in specific patterns of neighborhood change. It should be noted that this approach relies on an unrealistic assumption with respect to housing availability. By holding the distribution of the white population across tracts fixed, any increase in non-white population across tracts must occur in housing that may or may not in reality exist. For example, if a hypothetical tract was observed as containing 4,000 whites (population total 4,000) in 1990 and 1,000 whites and 3,000 Latinos (population total 4,000) in 2010, then the counterfactual population count for this tract would be 4,028 whites and 3,000 Latinos (population total 7,028). In this scenario, at least some new housing would likely need to be built to house the additional 3,028 people in this tract. Though the assumption is unrealistic, it highlights the residential housing dynamics central to continued sprawl over the period: if most metropolitan areas grew in population size, where did new housing for additional population go? Based on the analysis conducted in the first section, new housing by and large was built in less central areas on the periphery. Thus, the following analysis explores a counterfactual in which new housing was not built on the periphery but instead was built in places to accommodate the tract-level growth of the non-white population that was observed between 1990 and 2010.

The effect of white sprawl on diversity change – measured by tract entropy – can be seen in Figure 7. The shape of the population weighted density distribution of tract entropy for the counterfactual scenario is in grey while the observed distribution for 1990, 2000 and 2010 are in blue, green and red respectively. From this plot, it is clear that there has been a tremendous shift in neighborhood level racial and ethnic compositions towards those compositions that are more diverse. A majority share of tracts in large metropolitan areas had low entropy in 1990 (blue) and by 2010 (red) a majority had medium to high diversity. The plot generated from the
counterfactual scenario suggests that white sprawl lessened the trend towards neighborhood level diversity. Had whites not sprawled, there would be considerably more people living in tracts of medium to high entropy and fewer living in tracts of low entropy.

Table 3 shows the precise kinds of low entropy tracts that would not exist in the counterfactual scenario, and the results are somewhat surprising. While the counterfactual scenario generates 206 (1.8 percent) fewer low diversity white tracts than were observed in 2010, it also generates 409 (16.5 percent) fewer low diversity black tracts, 17 (54.8 percent) fewer low diversity Asian tracts, and 389 (33.1 percent) fewer low diversity Latino tracts. Counter to the hypothesis tested in the model above, the largest outcome of white sprawl is not be on the concentration of whites in white neighborhoods but the consolidation of blacks, Asians and 

Figure 7: population weighted density distribution of tract entropy in 1990, 2000, 2010 and 2010 counterfactual
Latinos in their own neighborhoods. The counterfactual scenario indicates a similar dynamic among moderate diversity black, Asian or Latino tracts: there would be fewer of them if there had been zero white sprawl. The largest positive difference between the counterfactual and observed MixedMetro counts is among the moderate diversity white tracts. The counterfactual scenario generates 1,533 (11.6 percent) more moderate diversity white tracts than were observed in 2010. Overall the counterfactual scenario suggests that there would be more white dominated tracts had there been no white sprawl. Though this result may seem counterintuitive at first, it bears emphasis that despite strong growth of the black, Asian and Latino populations between 1990 and 2010, the population living in the 52 largest metropolitan areas in 2010 was still predominantly white. If the population of all four groups in 2010 were spread evenly across tracts, all tracts would be moderate diversity white. Thus, the counterfactual scenario generates a distribution of whites, blacks, Latinos and Asians across tracts that would more closely resemble an even distribution.

Table 3: Distribution of tracts by Mixed Metro category for 1990, 2010 and 2010 counterfactual

<table>
<thead>
<tr>
<th>Category</th>
<th>1990</th>
<th>2010</th>
<th>2010 counterfactual</th>
<th>difference between 2010 observed and 2010 counterfact.</th>
<th>total</th>
<th>pct</th>
</tr>
</thead>
<tbody>
<tr>
<td>low diversity white</td>
<td>21,546</td>
<td>11,295</td>
<td>11,089</td>
<td>-206</td>
<td>-1.8%</td>
<td></td>
</tr>
<tr>
<td>low diversity black</td>
<td>2,697</td>
<td>2,480</td>
<td>2,071</td>
<td>-409</td>
<td>-16.5%</td>
<td></td>
</tr>
<tr>
<td>low diversity Asian</td>
<td>9</td>
<td>31</td>
<td>14</td>
<td>-17</td>
<td>-54.8%</td>
<td></td>
</tr>
<tr>
<td>low diversity Native American</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>low diversity Latino</td>
<td>672</td>
<td>1,175</td>
<td>786</td>
<td>-389</td>
<td>-33.1%</td>
<td></td>
</tr>
<tr>
<td>moderate diversity white</td>
<td>7,849</td>
<td>13,204</td>
<td>14,737</td>
<td>1,533</td>
<td>11.6%</td>
<td></td>
</tr>
<tr>
<td>moderate diversity black</td>
<td>1,737</td>
<td>2,704</td>
<td>2,476</td>
<td>-228</td>
<td>-8.4%</td>
<td></td>
</tr>
<tr>
<td>moderate diversity Asian</td>
<td>240</td>
<td>746</td>
<td>701</td>
<td>-45</td>
<td>-6.0%</td>
<td></td>
</tr>
<tr>
<td>moderate diversity Native American</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>moderate diversity Latino</td>
<td>1,816</td>
<td>4,218</td>
<td>3,801</td>
<td>-417</td>
<td>-9.9%</td>
<td></td>
</tr>
<tr>
<td>high diversity</td>
<td>190</td>
<td>906</td>
<td>1,083</td>
<td>177</td>
<td>19.5%</td>
<td></td>
</tr>
</tbody>
</table>
To take the counterfactual analysis one step further, I examine the discrepancies between the counterfactual and observed counts using a transition matrix. This analysis, seen in Table 4, provides a window into the patterns of neighborhood change that produced the 2010 counts. For example, while the count of low diversity white tracts observed in the counterfactual scenario is only 1.8 percent less than the number of such tracts observed in 2010 (Table 3), this underestimates the discrepancy. Of the 11,295 low diversity tracts in 2010, only 9,920 (87.8 percent) would be low diversity in the counterfactual scenario – 1,277 (11.3 percent) would have become moderate diversity white and 98 (0.9%) would have become some other non-white category. This finding suggests that there is a substantial portion of low diversity white tracts observed in 2010 that have lower levels of diversity because white population gain outpaced the population gain of other non-white groups. On the other hand, there are 1,156 moderate diversity tracts observed in 2010 that would have remained low diversity white had they not experienced white population loss. Obviously, these two types of tracts differ markedly with respect to their distance to the center. The 2010 low diversity white tracts that would have been moderate diversity had they not experienced significant white population gain had a median relative distance to center of 1.71 while the 2010 moderate diversity white tracts that would have been low diversity had they not experienced significant white population loss had a median relative distance to center of 0.89. This finding demonstrates the role of white mobility in shifting the distribution of segregated white space toward the urban periphery.

Similar patterns exist for other neighborhood types. Among non-white low diversity tracts, the observed and counterfactual only agree on 79 percent of low diversity black, 38.7 percent of low diversity Asian and 63.5 percent of low diversity Latino. Had there not been white sprawl, substantial numbers of tracts observed in these categories would have been classified as
Table 4. 2010 observed and 2010 counterfactual transition matrix

<table>
<thead>
<tr>
<th>2010 Counterfactual Mixed Metro Category</th>
<th>2010 Observed Mixed Metro Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD white</td>
<td>MD white</td>
</tr>
<tr>
<td>9,920</td>
<td>1,156</td>
</tr>
<tr>
<td>87.8%</td>
<td>8.8%</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>1.959</td>
<td>111</td>
</tr>
<tr>
<td>0.1%</td>
<td>0.2%</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>38.7%</td>
<td>0.3%</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>746</td>
<td>38</td>
</tr>
<tr>
<td>63.5%</td>
<td>0.9%</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

| LD black                                | MD black                           |
| 2                                       | 5                                  |
| 0.1%                                    | 0.2%                               |
| 1,959                                   | 111                                |
| 79.0%                                   | 4.1%                               |
| 12                                      | 2                                  |
| 38.7%                                   | 0.3%                               |
| 2                                       | 426                                |
| 63.5%                                   | 36.3%                              |
| 0                                        | 0                                  |
| 100.0%                                  | 100.0%                             |

| LD Asian                                | MD Asian                           |
| 1                                       | 4                                  |
| 0.1%                                    | 0.1%                               |
| 746                                     | 38                                 |
| 63.5%                                   | 0.9%                               |
| 9                                       | 0                                  |
| 100.0%                                  | 100.0%                             |

| LD Latino                               | MD Latino                          |
| 1                                       | 4                                  |
| 0.1%                                    | 0.1%                               |
| 746                                     | 38                                 |
| 63.5%                                   | 0.9%                               |
| 9                                       | 0                                  |
| 100.0%                                  | 100.0%                             |

| LD NA                                    | MD NA                              |
| 9                                        | 0                                  |
| 100.0%                                   | 100.0%                             |

| HD                                       |                                    |
| 1                                        | 1                                  |
| 0.1%                                     | 0.0%                               |
| 1                                        | 1                                  |
| 100.0%                                   | 100.0%                             |
moderately diverse. Similarly, there is agreement on only 64.3 percent of moderate diversity black, 68.6 moderate diversity Asian and 71.9 percent moderate diversity Latino. In the counterfactual scenario significant numbers of tracts in these categories would have been classified as moderate diversity white. The findings from the model and the counterfactual analysis indicate that white sprawl has a demonstrable effect on the kinds of neighborhood compositions observed in 2010. While there is evidence that white sprawl has maintained the low overall diversity of some white space, this effect is overshadowed by the impact of white sprawl on lowering the diversity in predominantly black, Asian or Latino neighborhoods.

**Conclusion**

This analysis demonstrates the need to place the study of residential segregation in a broader context of metropolitan level population growth and sprawl. Regardless of the precise mechanism of neighborhood change, any model of segregation that does not take into account the nearly universal pattern of sprawl that accompanies US metropolitan population growth will be incomplete. The rise of diverse inner ring suburbs alone is not sufficient evidence to declare the end to patterns of mobility that maintained the white suburb/non-white inner city pattern of segregation throughout much of the 20th century or to claim that one model of segregation works better than another. Instead, more work should be done to understand how the ongoing demographic transformation of the US population is linked to transformations in the patterns of residential mobility and the market for housing. This paper demonstrates that though the white population in large metropolitan areas hardly grew between 1990 and 2010, there remained a discernable pattern of white mobility that resembled ‘white flight’.

The analysis undertaken above provides answers to three broad research questions about sprawl and its relationship to neighborhood change. First, there is ample evidence that the
distribution of the population living in large metropolitan areas has shifted away from the metropolitan center over the period between 1990 and 2010. This shift was marked by both population loss in central areas and population gain in more peripheral areas. While nearly all metropolitan areas experienced a shift in their populations away from their centers, however, the degree of sprawl was only partially explained by rate of population growth. Further work should be done to determine the correlates of metropolitan level sprawl.

Second, the population distribution of whites in 1990 was more peripheral than the distribution of blacks, Latinos or Asians, and it remained that way in 2010. All groups experienced an outward shift of their population between 1990 and 2010. For whites this shift was due to significant population loss in more central areas and population gain in less central areas. Though patterns in the distributions of population gain and population loss by group vary across metropolitan areas, the general pattern was one that maintained the peripheral distribution of the white population. Relative to black and Asian populations, the Latino population exhibited the most growth in areas outside of the center.

Third, the continued pattern of white sprawl played a prominent role in the types of neighborhood racial change observed between 1990 and 2010. Though the degree of white sprawl appears to have only a marginal effect on the concentration of whites in white neighborhoods, the analysis using a counterfactual scenario of zero white sprawl demonstrates that a considerable number of neighborhoods became low diversity white or maintained a low level of diversity because of a shift in the white population towards the periphery. By far the largest effect of this shift appears to be the way it leads to the consolidation of low diversity non-white neighborhoods. This finding fits well within the neighborhood succession model but brings to light the need to tie together neighborhoods experiencing white flight with the neighborhoods
to which whites flee and to rectify the lack of conceptual framework for understanding the
different ways in which white flight might look like in aggregate, in different metropolitan areas
or in different scenarios of growth.

For all the stress placed on housing, this analysis has only examined changes in the
distribution of people. Further research should be done to link the geography of new housing
construction to the patterns detailed in this paper specifically looking at what kinds of families
occupy new housing, where this new housing is located and, if possible, where these families
moved from. Moreover, work should be done to incorporate the potential socio-economic
correlates and outcomes of sprawl. Even if most tracts far from their metropolitan center are
predominantly white, by no means does this suggest that they are alike with respect to income,
class, occupation or other socio-economic characteristics.

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