Neighborhood Stability & Change:
Unbundling the Dynamics of Place and Race in Los Angeles 1940-2000*

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Abstract

Urban economics and sociology offer many narratives to explain the evolution of urban America since the Second World War. These stories include the rise and fall of segregation, the inexorable march of the middle class to the suburbs, the filtering of aging housing stock from one class to the next, deindustrialization and the accompanying loss of jobs for blue-collar workers, "tipping" models, and others. Where there may be empirical support for their existence in some aggregate sense, their ability to explain the evolution of urban areas appears to be greatly enhanced through their interaction along several of the dimensions by which neighborhoods are defined. We argue that the post-War metropolis is a highly dynamic environment in which waves of people move through places with their own dynamic. We ask: how do places and people interact? We work systematically with three dimensions of census tract data from Los Angeles County over a 60-year sample period – race/ethnicity, human capital, and ground rent. Our initial findings show the great importance of understanding neighborhood characteristics in the metropolitan and historical contexts. And while we use census tract data like most other urban social scientists, we argue that the true object of inquiry is the neighborhood. Neighborhoods, like census tracts, never change location. But neighborhood types do change locations in various times, and we have to make a clear distinction between the neighborhoods (unique, immobile) and the types (general, mobile). Using case studies of segregation and tipping, we find that the received wisdom about both can be significantly augmented by our approach.

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1   Introduction

Urban economics and sociology offer many narratives to explain the evolution of urban America since the Second World War. These stories include the rise and fall of segregation, the inexorable march of the middle class to the suburbs, the filtering of aging housing stock from one class to the next, deindustrialization and the accompanying loss of jobs for blue-collar workers, "tipping" models, and others. Across a wide range of empirical studies, these mechanisms have been examined in isolation. And where there may be empirical support for their existence in some aggregate sense, their ability to explain the evolution of urban areas appears to be greatly enhanced through their interaction along several of the dimensions by which neighborhoods are defined. That they are common narratives belies the fact that the extent to which they are manifest may be substantially determined by the interaction of local socioeconomic, race-ethnic, and neighborhood characteristics. For example, Schelling's (1969) "tipping" model is generally discussed in unconditioned terms of race though it may be more prevalent in poorer neighborhoods than in richer neighborhoods or more common in blue-collar neighborhoods than in white collar neighborhoods. Furthermore "tipping" may be an inapt phrase altogether in neighborhoods in which there is a succession of racial/ethnic majorities.

Indeed, the most confusing aspect of the received scholarship may be the relationship between the people and the places of urban areas. Some researchers use demographic characteristics to classify neighborhoods; others use neighborhoods as abstract spatial polygons that contain data about people residing in them. Some scholars are more interested in the people moving into and out of neighborhoods; others are more interested in the changes in housing stock and other fixed characteristics. The vast majority of scholarship does not attempt to locate the neighborhoods in geographic space. With the goal of sorting-out the basic dynamics at work in large, dynamic metropolises, we argue for a new approach to the study of neighborhood stability and change. First, we demonstrate the benefits of longer time series data. The processes at work in urban areas appear to run their course over decades not years. Moreover, there also appears to be shifts in relationships among the data

that can only been seen with the perspective of many decades – shorter data series could miss significant turning points. Second, the use of the longer time series has not come at the cost of keeping the entire County of Los Angeles the scope of the analysis. Where it has been common to see longer-run analysis focus on particular neighborhoods, we are able to keep in view the larger metropolitan context in which the processes of neighborhood change are manifest.

From this broad cross-sectional and temporal foundation, we are able to see, and make use of, a clear distinction between "place" and "space." This is no mere rhetorical flourish; space refers to the polygons that define the Census tracts. It is common – in the segregation literature, for example – to treat "space" (the tracts) as a set of independent cases from which aggregate statistics and inferences can be drawn. While perhaps not incorrect, it may provide a substantially incomplete accounting of the dynamics of segregation and, in particular, of the "places" in which races may or may not live among each other. We conceptualize the post-war metropolis as a highly dynamic environment in which waves of people move through places with their own dynamic and ask, how do these two elements (places and people) interact? We work systematically with three dimensions of census tract data: 1) race-ethnicity (Asian, Black, Latino, White); 2) human capital (High School Education, College Education); and 3) ground rent (Median House Value). Race-ethnicity represents fixed characteristics of people; human capital represents changeable characteristics of people; ground rent represents changeable characteristics of fixed places. To explore the utility of our approach, we re-examine two familiar narratives: "tipping points" and "segregation/desegregation." In both cases, this approach yields insights not found using traditional methods.

The paper is organized as follows. Section 2 introduces our time series data for Los Angeles County and presents several tables of summary statistics that describe both the raw data and the broad trends that are the focus of this paper. Section 3 reviews several deep literatures on racial segregation and demonstrates the usefulness of reconsidering the "common wisdoms" using a richer definition of neighborhood. In an application to a specific mechanism of urban evolution, Section 4 explores the phenomenon of racial "tipping" in Los Angeles County and demonstrates the richer set of inferences regarding not only its extent

but the neighborhood characteristics that act to attenuate local racial change. Preliminary conclusions and extensions are discussed in Section 5.

2 Los Angeles County 1940-2000

The Los Angeles County Union Census Tract Data Series, 1940-2000 (Ethington, et al 2006) was the basis for all analysis in this paper. It is organized with the goal of providing maximum uniformity and comparability across all census years and census geographies. It includes aggregate data describing the characteristics of U.S. Census Tracts for race-ethnicity, occupation, education, housing, age and median household income, house value, and rent. It was assembled from three principal sources: 1) the print-published US Census tables for the years 1940, 1950 and 1960, and 2) the digitally distributed "Correspondence" data files created by the California State Department of Finance for the years 1970, 1980, and 1990, and 3) the electronically-distributed Census 2000 data, recoded into matching variables by the Population Dynamics Laboratory of USC. All data have been proportionally aggregated by spatial area algorithms to fit the 2000 census tract geography. Please see Appendix for the methods used in the creation of this data set.

While the data – especially in the later years – include a rich set of descriptors of the tract residents and dwellings, we focus on three categories of variables that span the full sample period. In particular, we employ four race/ethnicity groups: Asian or Pacific Islander (referred to in this paper as "Asian"), Black, Hispanic, and Non-Hispanic White (referred to as "White"). We also use two measures of human capital, the percentage of high school and college graduates in a tract. Finally, we measure the relative position within the County's housing market by the rank of the median house value.

The sample period we study represents an era of unprecedented change in the County. Beginning with at the eve of World War II, Los Angeles goes through a period of rapid growth. During the twenty years from 1940 to 1960 the County becomes largely built-out – closing the agricultural gaps between distinct population and employment centers and becoming a continuous economic urbanization. Comprising this growth is rapid change in the racial and ethnic mix in the County's population. These dynamics are plotted over the

60-year sample period in Figure 1.

Figure 1: Racial/Ethnic Populations, Los Angeles County: 1940-2000
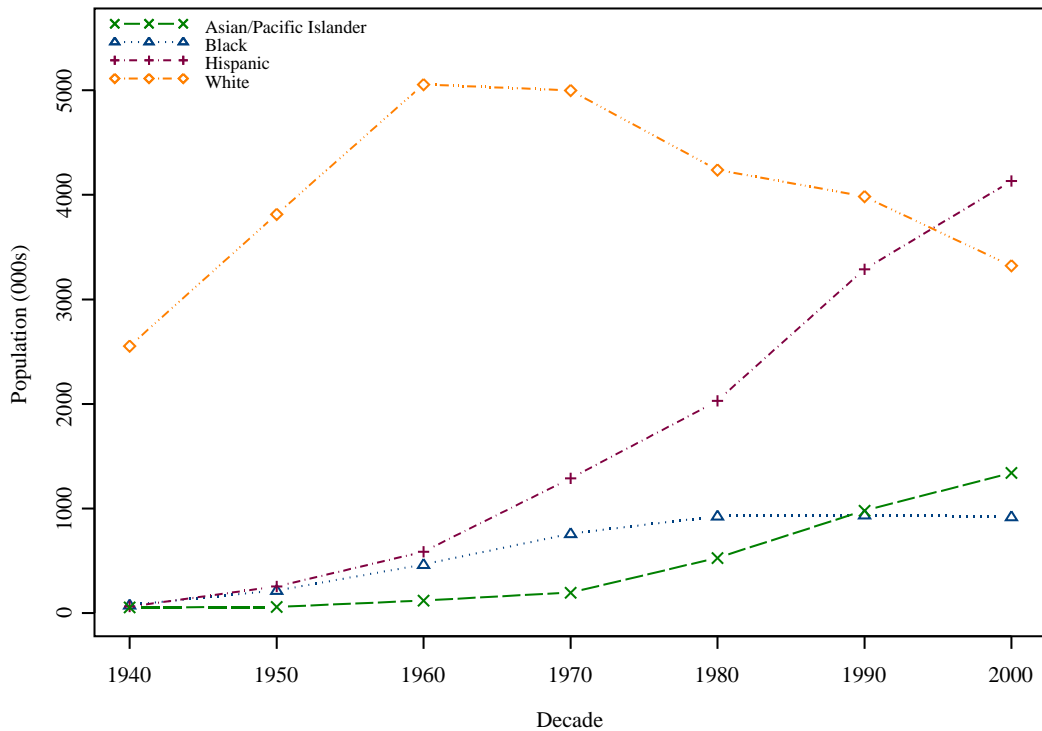
The County begins the period with a large white majority (93%) that falls throughout the sample, reaching a low 34% by 2000. The influx of minorities both explains this long running trend and provides some of the context for the approach we develop in this paper. It is the regularities and irregularities in the spatial distribution of these populations that have been the motivation for entire literatures in the social sciences. And while race and ethnicity play major roles in the evolution of Los Angeles County, they are decidedly incomplete measures of people and the neighborhoods they occupy.

The measures we add to the analysis are human capital and ground rent, which have their own dynamics in over the 1940-2000 period. House prices have risen rapidly over the last thirty years relative to the earlier years in which vacant land was readily available in Los Angeles County or adjacent counties. Human capital in the form of college graduates followed a very similar pattern – rising throughout but at a faster rate in the recent decades.

There is more, however, to the dynamics of these variables that motivates us. Consider the correlations presented in Table 1. These are correlations between the rank ordering of

Table 1: Univariate Measures of Stability & Change
(Correlations are based on tract *ranks* not levels)

| Variable | Periods of Tract Correlation | | |
	1940 & 1960	1960 & 2000	1940 & 2000
Asian	0.221	-0.048	0.277
Black	0.437	0.305	0.030
Hispanic	0.510	0.477	0.234
White	0.374	0.584	0.067
High School Graduate	0.569	0.226	-0.112
College Graduate	0.759	0.679	0.518
Median House Value	0.675	0.535	0.317

the tracts by the listed variable – correlations are high when the relative ordering of the variables is perserved, independent of trends in aggregate growth rates. The correlations are calculated this way to account for the fact that there is significant change in the variables from aggregate growth or decline that could misrepresent the stability of a tract from the perspective of a place within a hierarchy. Here stability (high correlation) can arise from persistence not in the percentage of Hispanics, say, but rather in the degress to which changes in the Hispanic population preserves the exposure relative to other tracts.

The table reveals marked differences in the persistence across variables and epochs. The racial/ethnic differences are substantial with the ranking of tracts by their Asian and Hispanic populations far more persistent than either their black or white populations. The rank orderings for these populations are essentially unrelated to their rank orderings in 1940.

This lack of persistence in the race and ethnicity of the people in the tracts stands in sharp contrast to the persistence shown by their human capital and the value of their homes. Both College Graduate and Median House Value show higher correlations than the racial and ethnic variables. This suggests that while races and ethnic groups move around the metropolitan area they do so within tracts by some degree of stratification either by human capital, housing values, or both. Indeed, this is one of the key insights developed in the

paper. Places are defined by more than just race and ethnicity and that the interaction of the set of descriptors offers a far richer framework for analysis than they do independently.

3 Residential Segregation

Studies of urban residential segregation have been a staple of sociological scholarship for several generations, motivated initially by the Civil Rights movement and by ongoing efforts to mitigate social inequalities. Since the 1950s, thousands of studies have approached the question of residential segregation within four major frameworks: 1) Attitudes, based on survey research; 2) Changes in or comparison of segregation indices; 3) Ethnic and SES succession; and 4) Places: enclaves, communities, ghettos.

Studies of attitudes rely on survey research to investigate the perceptions, values, and preferences of urban residents, in order to determine the conditions that either support or impede integration of neighborhoods by race-ethnic and other group characteristics. This line of research is decidedly about people, but it usually seeks to apprehend the attitudes of people toward places that either are or may hypothetically be inhabited by other types of people. And it asks, what factors (race, SES, proportions, speed of change, etc) are most important in shaping these attitudes? (Bobo et al. 1996; Emerson et al 2001). Although we do not directly address this genre of research, our approach and conclusions carry important implications for the interpretation of this scholarship.

Studies of quantitative "segregation indices" are by far the most voluminous type of research. Using a variety of indices, such as the Index of Dissimilarity, the Exposure Index, and the Entropy (Diversity) Index, scholars have investigated the extent of separation among urban social groups-most often, racial groups. Studies in this genre typically ask whether segregation has gotten worse or better in a single city from one census decade to the next, or they compare the extent of segregation across two or more cities. (Massey and Denton 1987; Massey et al 1994). This framework reached its most sophisticated level in the 1990s, when Douglas Massey and Nancy Denton began to combine several segregation indices in studies of racial groups across most American cities. Groups that were residentially separated, concentrated, clustered, etc, by five or more measures were deemed to be "hypersegregated."

Importantly, these lines of inquiry often fail to address the underlying dynamics that lead to the aggregate changes in the indexes; they ask not "who moved?" and "why?", but simply "what's the result of all the moving?" Moreover, though the necessity of continuing to identify landscapes of deprivation and inequity remains, we have, so to speak, outgrown the framework of these kinds of segregation studies. Back in 1965, segregation usually meant the same thing: unjust inequality. Today, there are entirely elective homogeneous communities of affluent African Americans (Baldwin Hills) Asians (Monterey Park, Gardena) and Latinos (Huntington Park) that are "segregated" but not unjustly so. "Segregation," as a term by itself, is simply too blunt today.

The third type of segregation study asks about the movement into and out of neighborhoods, most often called "ethnic succession" or "neighborhood transition." This type of research is almost as old as sociology itself, originating in the work of Park and Burgess at the University of Chicago before the First World War. Much more so than the studies of segregation indices, this framework typically investigates both race-ethnic and socioeconomic questions. Seeking to understand the overall processes of urban neighborhood change, researchers use a variety of data to understand the interaction of SES characteristics of neighborhoods, and the race-ethnic composition of those neighborhoods. (Wilson 1987; Quillian 1999; Hou and Milan 2003). William Julius Wilson (1987) influentially argued that a "spatial mismatch" between low-income households and blue-collar jobs condemned the "truly disadvantaged" to persistent poverty. Quillan (1999) shows that the outmigration of middle-income immigrants and minorities from poor neighborhoods explains much of the concentration of poverty. Hou and Milan (2003) is representative of this genre. Analyzing Montreal, Toronto, and Vancouver, they find that "Blacks tend both to live in, and move into, neighborhoods with low socio-economic status (SES). South Asians, although they also "tend to live in neighborhoods with low SES – do not become further concentrated in such neighborhoods," and that "the Chinese population increases more rapidly in neighborhoods with higher SES." (p387). While very useful and important, these studies share a peculiar and very significant similarity. They find a social process with great dynamism, but hold the metropolis constant. In their model, neighborhoods are static places as people purportedly

move between those places. But places have their own dynamism and that dynamism runs somewhat or largely independently of the dynamism of individual and group mobility.

Finally, the fourth type of segregation study is mostly concerned with understanding the qualities of neighborhoods, as sites that experience change and as places of opportunity or hardship for urban residents. These studies often focus on immigrant groups, or on the interaction of immigrant with native groups. (Alba and Logan 1993; ***). In a recent work Logan, Zhang and Alba (2002) distinguish among "immigrant enclaves," "ethnic communities," and "minority ghettos," each in different distinct geographic places of the metropolis. Immigrants enclaves are the rough landing-places for new working-class immigrants; ethnic communities are the destinations of upwardly-mobile and successful immigrants; and minority ghettos are Wilson's neighborhoods of those left behind by socio-spatial processes: the "truly disadvantaged." Logan, Zhang and Alba's 2002 article neatly synthesizes their own and many others' empirical studies, to identify categorically distinct types of neighborhoods, each with a different social dynamic. It is from this apogee of sociological analysis that we wish both to build and to differ. This genre convincingly portrays neighborhoods as distinct sites, but it subtly abstracts them from their metropolitan milieus by the superior term in the model: the populations themselves. Places in this framework are containers of processes, ultimately not interesting in themselves, but interesting only in what they represent. Thus Monterey Park marks a certain social achievement, but its contextual relationship to other places in Los Angeles County – which far outnumber Logan, Zhang, and Alba's typology – is not taken into consideration. This is the point where our analysis differs most sharply from the received traditions in segregation studies. We are interested in studying social processes interactively with geographic processes: the significance of a neighborhood goes far beyond its ability to tell us about the condition or trajectory of an individual or group.

3.1 Empirical Study of Metropolitan Places by Race, Human Capital, and Ground Rent

Our approach to residential segregation begins with the places of segregation: neighborhoods, as approximated by the standard unit of census tracts (average size about 4,000 persons).

Those neighborhoods are fixed in specific spatial locations, and they are inseparably linked to their larger spatial and temporal contexts. There two principles are worth emphasizing: 1) Los Angeles County census tracts will be considered together. There is no partability in the metropolis: all neighborhood places are contextually related to neighboring places, and to the municipalities in which they are located, and so on, out to the edges of the metropolis. In fact, there are global linkages, but these will not be considered directly here. 2) No place is ever static: change is a constant condition of all urban places, and all change is an observed moment within larger dynamics. In other words, each observation takes place in historical time, and so we also consider all the census tracts in Los Angeles County within a temporal context of 1940-2000.

Figure 2 shows four racial population groups by dots that represent the location of 100

**Figure 2:** Racial/Ethnic Populations, Los Angeles County: 1940
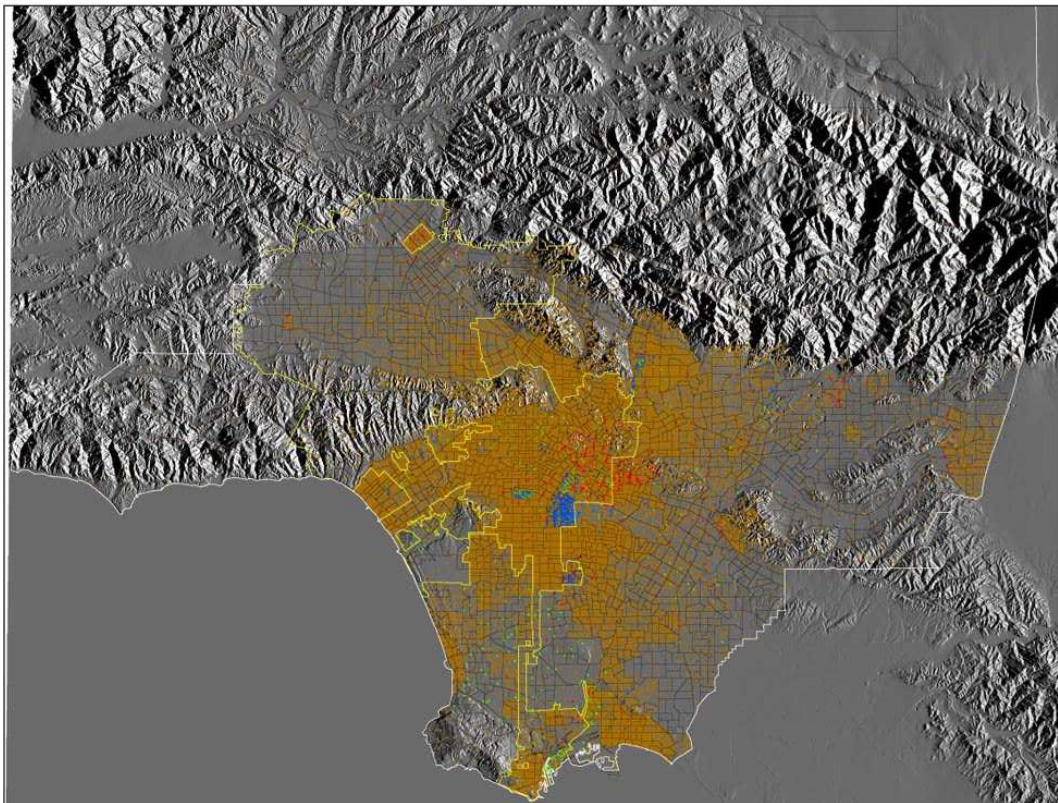
persons of each group. The simple growth and geographic spread of these four racial group populations across the metropolis, from 1940, 1960, and 2000 is clearly visible, sufficiently

Figure 3: Racial/Ethnic Populations, Los Angeles County: 1960
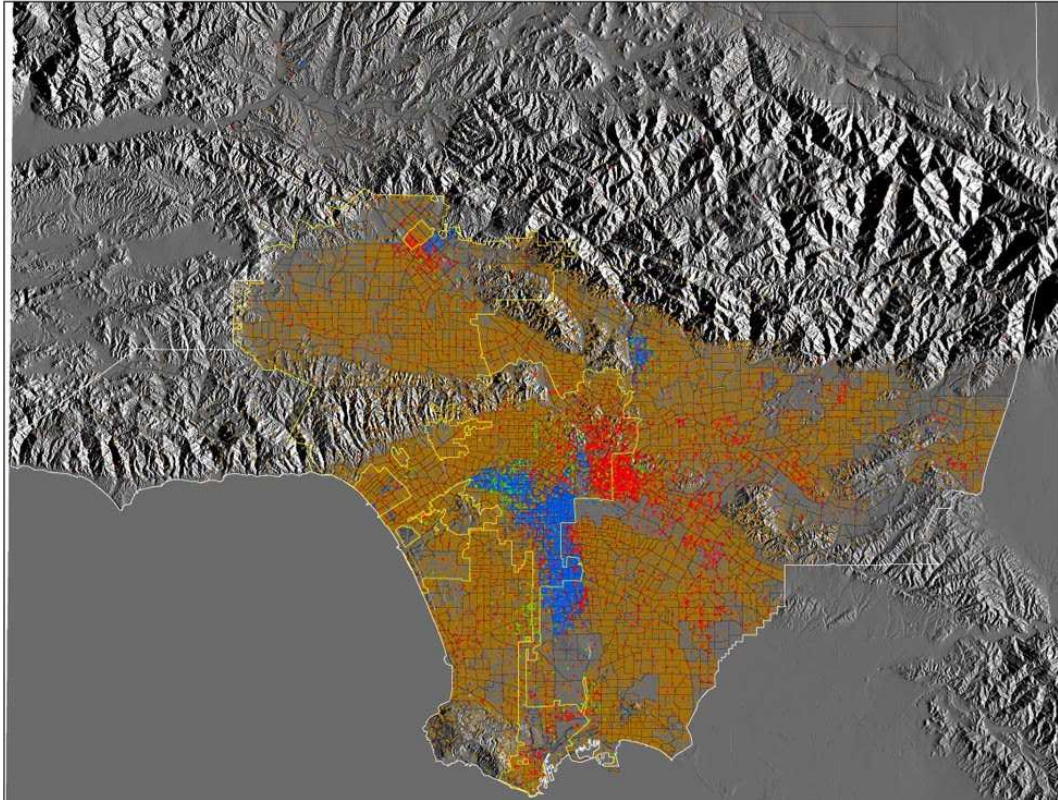
illustrate the enormous dynamism in the Los Angeles metropolis over these 60 years. The 1940 map not only shows the clustering of the largest minority group in that year, African Americans, but also shows that the buildable land area had not been filled-in on the eve of the Second World War. By 1960, most available space had been built-out, and the size of the four populations had increased dramatically as well. Quite visible already by 1960 are wildly divergent patterns of concentration or clustering among the four groups. African-Americans seem to be the most concentrated. Latinos are heavily clustered in East Los Angeles, just across the Los Angeles River from Downtown, but are also widely dispersed across the eastern half of the County (San Gabriel Valley). The same pattern holds in the San Fernando Valley. Asians are lightly sprinkled in both the Black and Latino areas, and also in the White-majority areas, which cover the county most evenly. By the year 2000, these patterns had been altered yet again, with a greatly diminished White population, vastly increased Latino and Asian populations, and a Black population that is still clustered, but no

Figure 4: Racial/Ethnic Populations, Los Angeles County: 2000
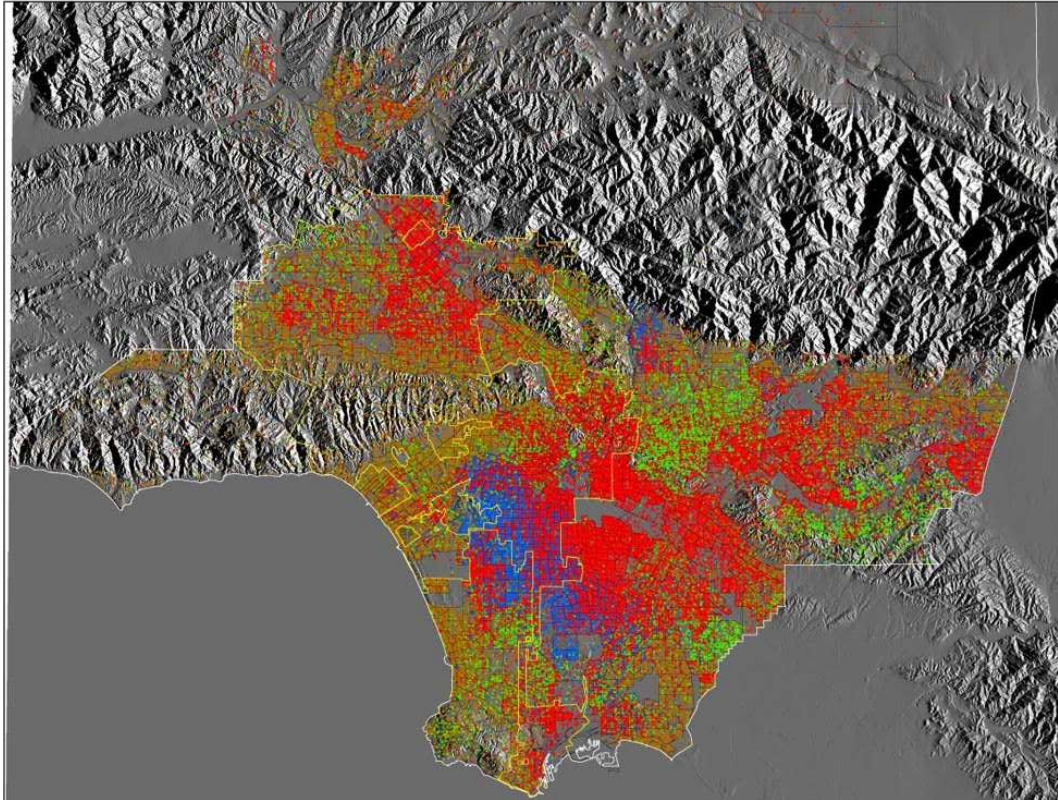
longer exhibits the tell-tale sharp edges of overtly discriminatory racial segregation. Viewed as 100-person dots, it is easy to see how mixed these populations had become. Asians seemingly live everywhere, in small clusters. Latinos also live in most areas, but are more clustered and concentrated. Whites seem to have retreated to the edges, but also live in many central areas and share spaces with the other three groups.

Now let us observe a different kind of map, showing the stability in rank of these four populations (among all Los Angeles County tracts), for the years 1960-2000. We begin in 1960 to avoid the complications of the un-built areas observable in the 1940 map in Figure 2. The panels of Figures 5 show the "rank stability" of tracts for the White, Black, and Hispanics. The dots on these maps do not represent group locations, but rather, places that have seen either stability or instability of these respective populations. The patterns are quite similar between Whites and Blacks in some broad areas, such as Baldwin Hills and South Central area: instability (yellow) for both groups in the former and stability

Figure 5: Rank Stability: Standard Deviation of Tract Rank of % Race/Ethnicity
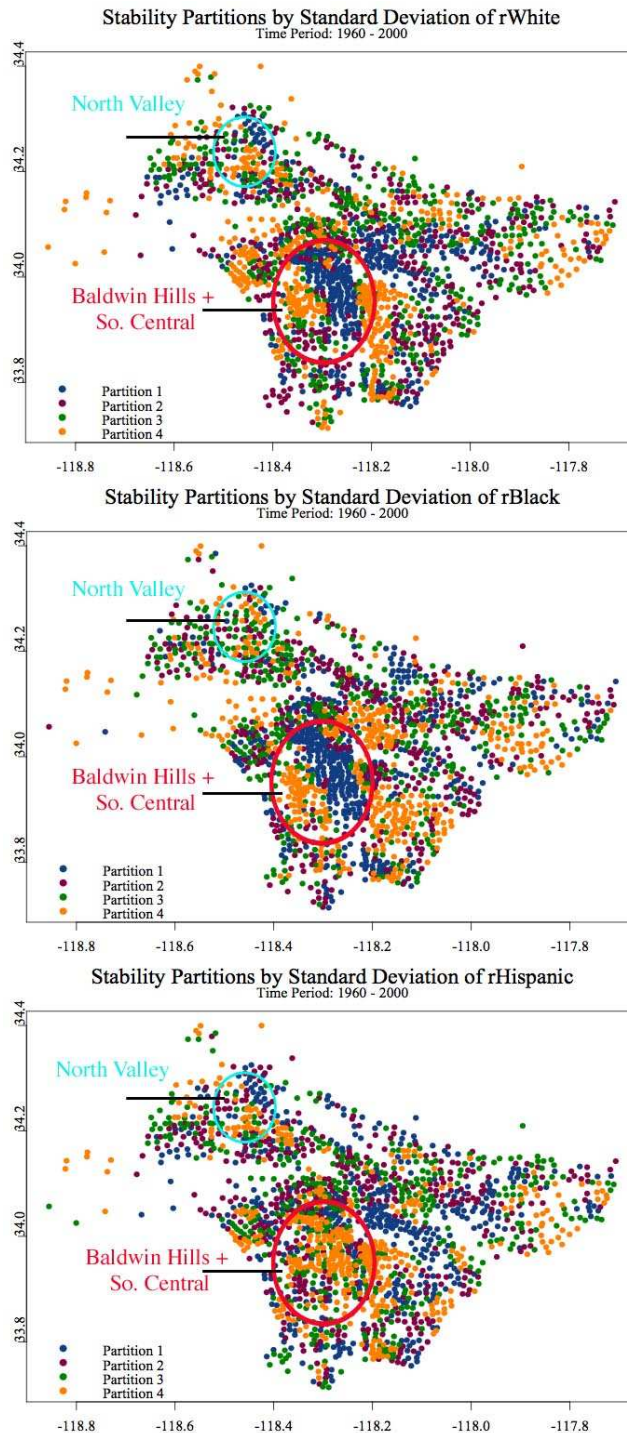

(blue) in the latter. In those same areas, however, Hispanics show different patterns. In many areas of the metropolis, however, such as the North Valley, we can see that places show every possible combination of difference between White, Black, and Hispanic stability.

Clearly, much more was going on than a simple story of "White Flight" from areas of Black or Hispanic population change. White flight may in fact have been taking place in some of these areas, but such a pattern would only tell a small part of the overall story. What is that overall story?

To get a better grasp of the various patterns at work, we need to compare the patterns in rank stability from decade to decade, for all four racial groups, and then to consider the other two dimensions of "place" that we have emphasized: human capital and ground rent. Figure 6 shows the simple patterns of correlation in census tract rank stability for all four

**Figure 6:** Decennial Correlations for Tract Rank by Race/Ethnicity
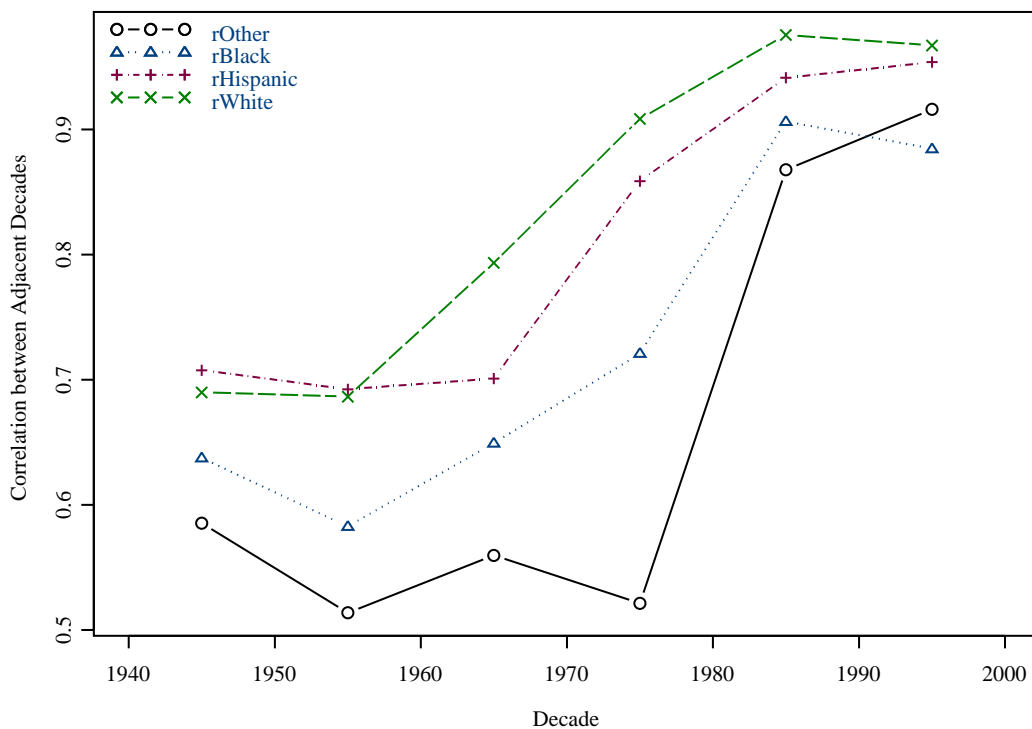
race groups. Looking at the correlation in rank from one decade to the next, tracts that were the most and least White in 1940 correlated at 69% with the same levels in 1950, and in general, for every 10 year comparison, the rank in "Whiteness" of tracts was more highly correlated than for the other three race groups. The least correlated (meaning the least stable) was the rank in "Asianness" of tracts, through 1980.

But something very important and striking happened after 1980: the rank stability for all four groups suddenly became much more stable. In other words, the "Whiteness," "Blackness," "Latinoness." "Asianness" across all the tracts in Los Angeles County in 1990 stayed mostly the same way it was in 1980, and again, the condition in 2000 was highly correlated (greater than 90%) for all four groups. We call this situation a "convergence" in the levels of stability among the tracts (as approximators of neighborhoods) by the last two decades of the 20th century.

Before we can start to explain these distinctive patterns, we need to consider non-racial factors. Figure 7 compares the same kind of decade-to-decade correlations in rank stability

Figure 7: Decennial Correlations for Tract Rank by Human Capital & Median House Value
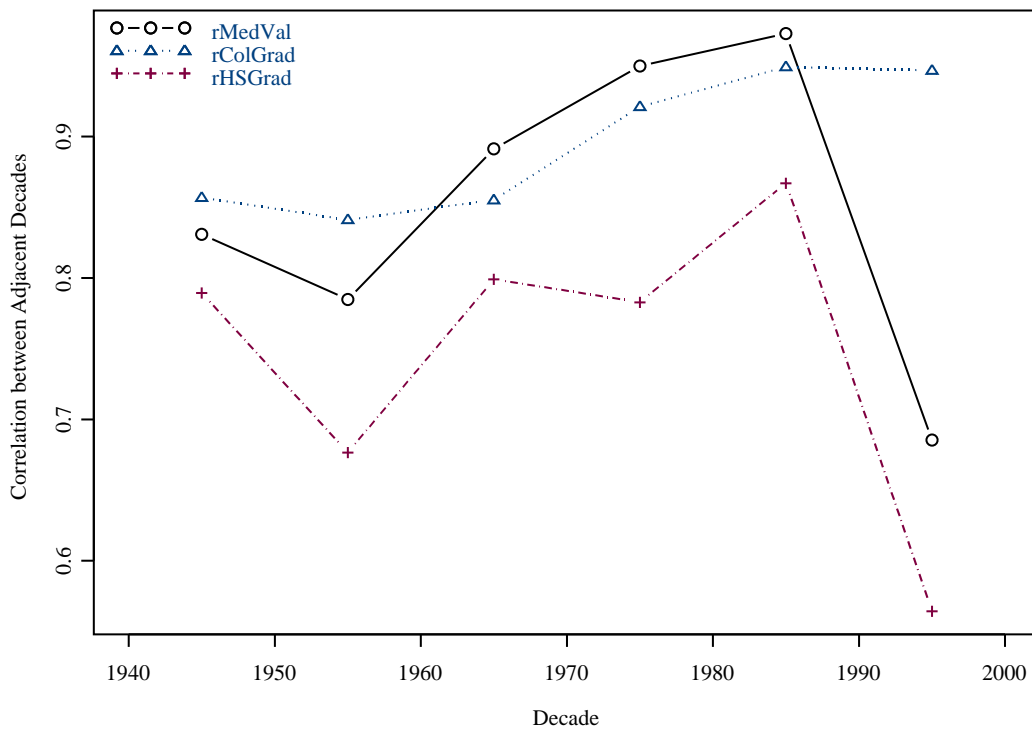
for "human capital," measured by education levels, and "ground rent," measured by median property values. Through the year 1990, all three of these variables show much higher overall levels of stability than we observed for the racial rank correlations. For the entire period, 1940-2000, the most stable variable was percentage of residents with a College Degree. Ranks

in numbers of persons with High School education was the least correlated from decade to decade (lease stable), and ranks in Median Values was nearly as high as that for College Degree overall (highest for the years 1960-1990), but plunged in parallel with High School for the 1990-2000 interval.

Clearly, these patterns are intriguing. Median value describes the quality of an entity that is fixed in place: the census tract (2000 geography throughout). Until 1990, the property values of the places metropolis stayed remarkably stable, changing very little from decade to decade. In fact, the correlation between the tract rankings of median house values 1960 and 1990 is over 85% – a stunningly high number in this era of such churning in population and employment. This might suggest that the persons flowing through the metropolis, classified by racial groups in Figure 7, were "filtered" by their socioeconomic status. The "human capital" held by these circulating populations, measured by College Degree education level, remained stable even when property values became very unstable during the 1990s, which again supports the idea of filtering by social class. That the ranking of tracts by these with only a High School Degree showed great instability, again suggests SES filtering.

But what kind of stability? Before attempting to "explain" these patterns with a narrative, we must remember that these are only univariate patterns. We need now to combine the racial dimension seen in Figure 6 with at least one of the SES dimensions in Figure 7. Figures 8 - 11 show the   same kind of rank-order correlations from decade to decade, as in the first two graphs, but in these, we have stratified each racial group into quintiles of the Median Value at year 1960 (the ranks of which are correlated at greater than 85% with the year 1990, before falling somewhat in 2000). In other words, we rank-ordered all Asians, Blacks, Latinos and Whites for the highest quintile of median property values (green lines), then did the same for the second quintile (blue lines), and so on to the lowest (red lines).

First, we may observe patterns common to all four racial groups. The most striking is the "convergence" of ranks among all five levels of Median Value, by the end of the 1940-2000 period. While the various levels showed great variation in stability within each racial group until about 1970 and 1980 (depending on which racial group), these differences started to disappear from 1980-2000. In simple terms, class trumped race in predicting stability of

Figure 8: Correlations for Tract Rank by % Asian, Stratified by Median House Value
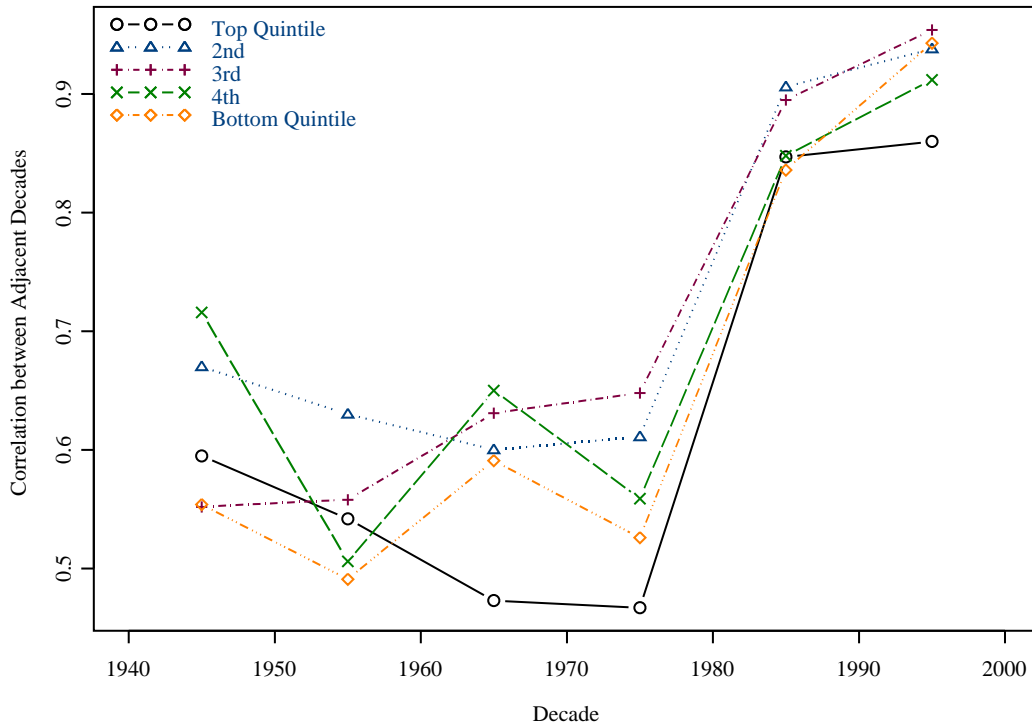

tracts for the earlier period, and the reverse obtained for the later years.

Another common pattern is more subtle but clearly significant. For each racial group, the most stable tract ranking was for the second (blue) and third (yellow) quintiles of property values. Indeed, the highest quintile, for each group, was usually the least stable, and paralleled most closely the stability patterns for the lowest quintile of Median Values. We are too early in our analytic program to give a convincing explanation of this seeming anomaly, but we suspect that the close parallels in stability for the highest (green) and lowest (red) quintiles indicates the inherent vulnerability of those two ends of the property value spectrum to price cycles. We might also hypothesize that the middle property values have an inherent stability because of the phenomenon of "regression toward the mean" in property value variability through time.

So far, we have been most successful at demonstrating two things: 1) that the story of residential segregation is clearly in need of "unbundling" by the three dimensions we have

Figure 9: Correlations for Tract Rank by % Black, Stratified by Median House Value
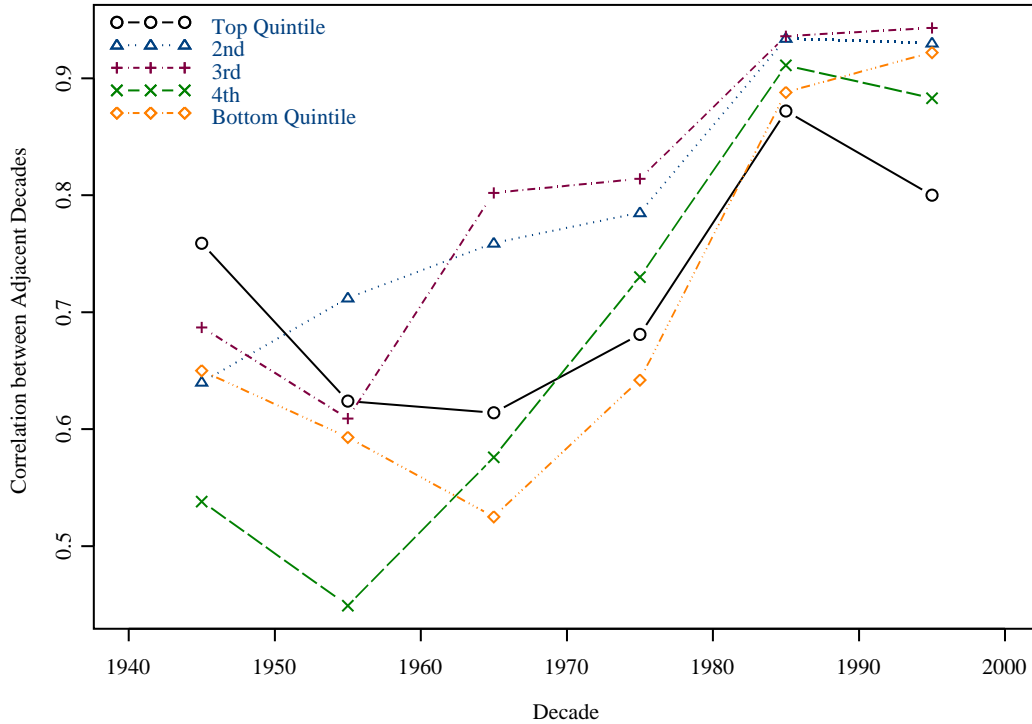

identified: race, human capital, and ground rent; and 2) that there are strong interactions between these three dimensions. We have not carried-out these findings yet into forms of analysis that allow us to explain just what those interactions are, but we can say a few things.

First, it is clear that the interactions will have a different explanation for the earlier, more unstable period of 1940-1960, characterized by population increases among Blacks and Whites and the build-out of the metropolis, than for the later period, from about 1970 to 2000, which saw the massive influx of new immigrants – Asians and Latinos, the fall of overt racial segregation, and important changes in the regional economy-namely "restructuring."

Second, we need to take these findings based on rank-order stability back to the geography and ask, where were the various kinds of three-dimensional interaction "taking place?" We close this section with a glimpse at the geography of these place-experiences, in Maps 12, 13, and 14. In these maps, the Median Value for 1960, 1980, and 2000 are classified by

Figure 10: Correlations for Tract Rank by % Hispanic, Stratified by Median House Value
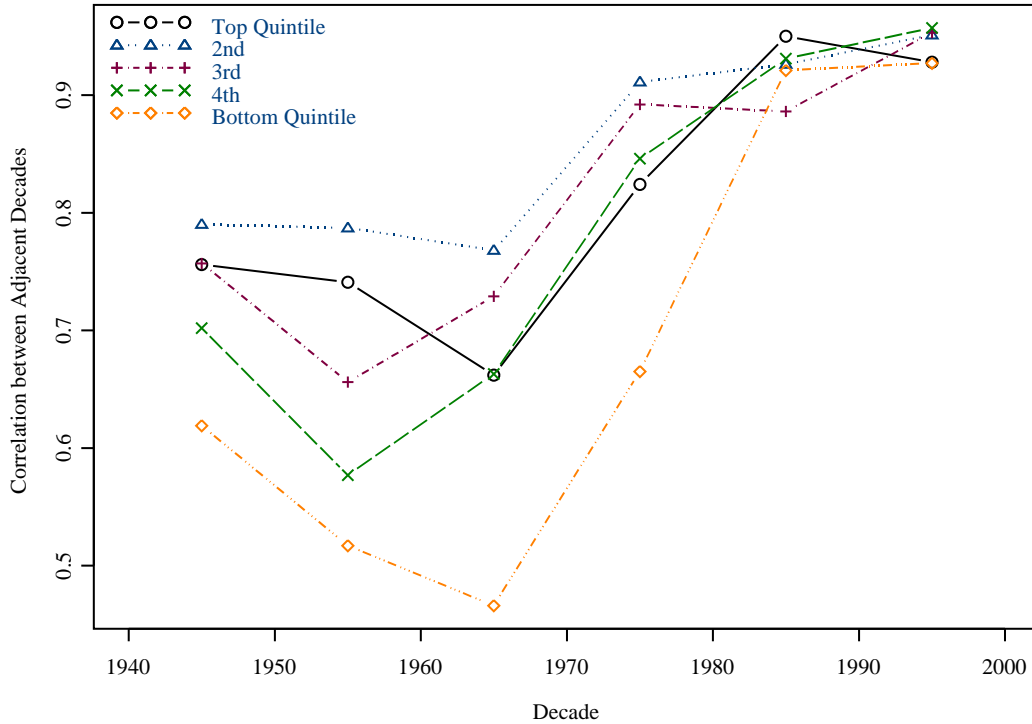

Standard Deviations from the mean for the County, with Dark Green as highest, and Dark Pink as lowest, and Yellow always showing the middle or mean value.

Property values seem to stay the lowest around the industrial corridors of the metropolis. These are the Alameda Corridor, the path of Interstate 5 in the San Fernando Valley, and the "City of Industry" corridor in the San Gabriel Valley. Highest values seem to remain consistent, overall, at the fringes of these three regions, toward the higher elevations and toward the ocean (except for the harbor, which is the southern end of the Alameda Corridor).

But there is also a significant amount of relative property value change in the transitional areas between these two poles for each of the mapped years: 1960, 1980, and 2000. What drives those changes is not yet known. However, observing the overlays of the racial populations, represented by colored dots: Asian= green; Black = blue; Latino = red, and White = grey), we can see something very significant. While one broad observable pattern is the clustering of Black and Latino residential location in the lower-property value areas,

Figure 11: Correlations for Tract Rank by % White, Stratified by Median House Value
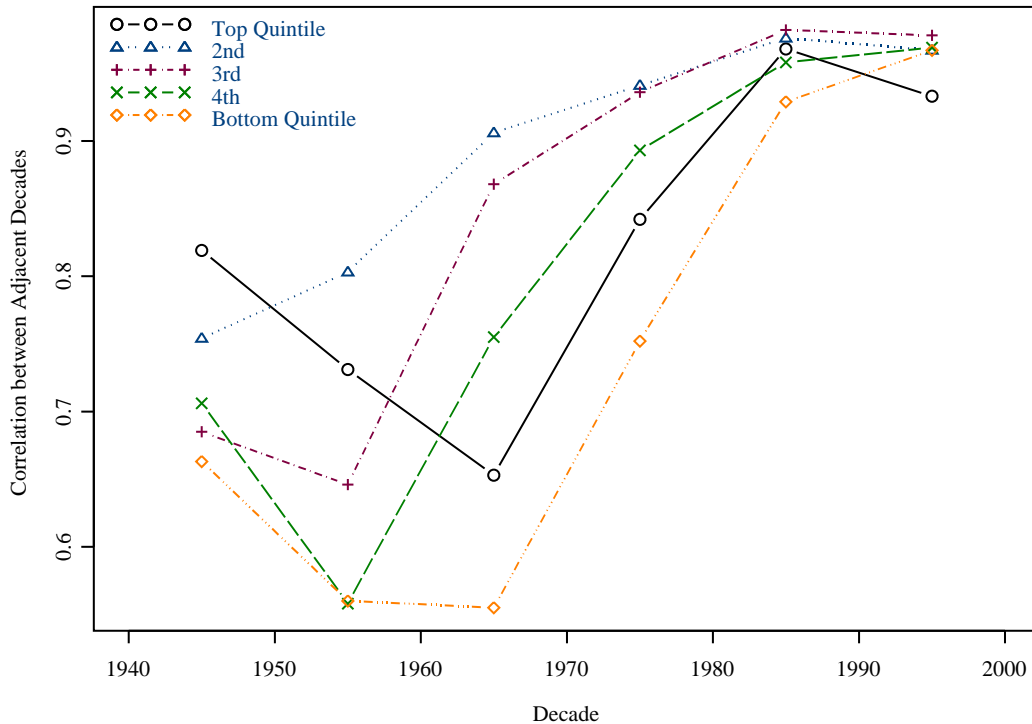

it is also easy to observe clusters of Black and Latino residence in middle and even in high property value areas. Asian residential clustering tends toward higher-value areas by the year 2000 (difficult to see because both are coded green).

We have no causal explanation at this point, for the interaction of the three dimensions of race, human capital, and ground rent, but we believe we have demonstrated already, that the various modes of modeling residential segregation, reviewed at the beginning of this section, need to be combined in a way that will take very seriously the interaction of race, human capital, and place. In our next section, we take the first step toward that goal, by reconsidering the familiar story of racial "tipping points."

4 The Empirics of "Tipping"

Of the mechanisms commonly used to describe urban evolution outlined above, "tipping" offers an excellent opportunity to demonstrate the nuances that appear once a multidi-

Figure 12: Stability of Median House Values: 1960
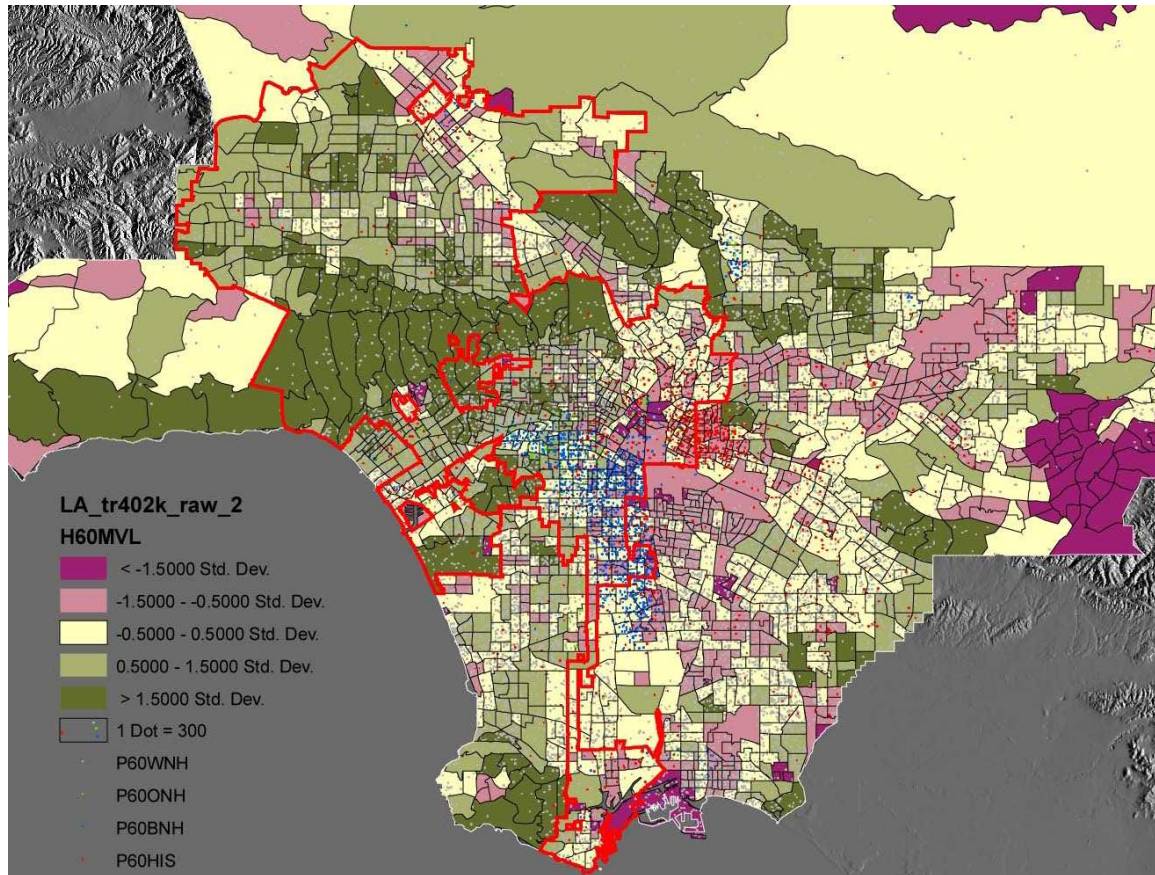
mensional approach is used to describe neighborhoods rather than the simple racial/ethnic framework that is typically employed. A common tipping narrative attempts to explain rapid change in the racial/ethnic make up a neighborhood. While Schelling makes clear in his 1969 paper that a tipping dynamic can manifest itself in any population that can be split into two mutually exclusive groups, the general application of the tipping model has been to the rise of urban segregation in the 1950s and 1960s, in which the arrival of even small numbers of blacks to a neighborhood resulted in the mass dislocation of whites. In this section, we examine the extent of this "standard" kind of tipping in Los Angeles County, and contrast the simple black-and-white story with a number of regularities that appear once factors beyond race are considered.

The basic tipping mechanism begins when a neighborhood that is largely white experiences a slight increase in minority population. The minority population does not see their

Figure 13: Stability of Median House Values: 1980
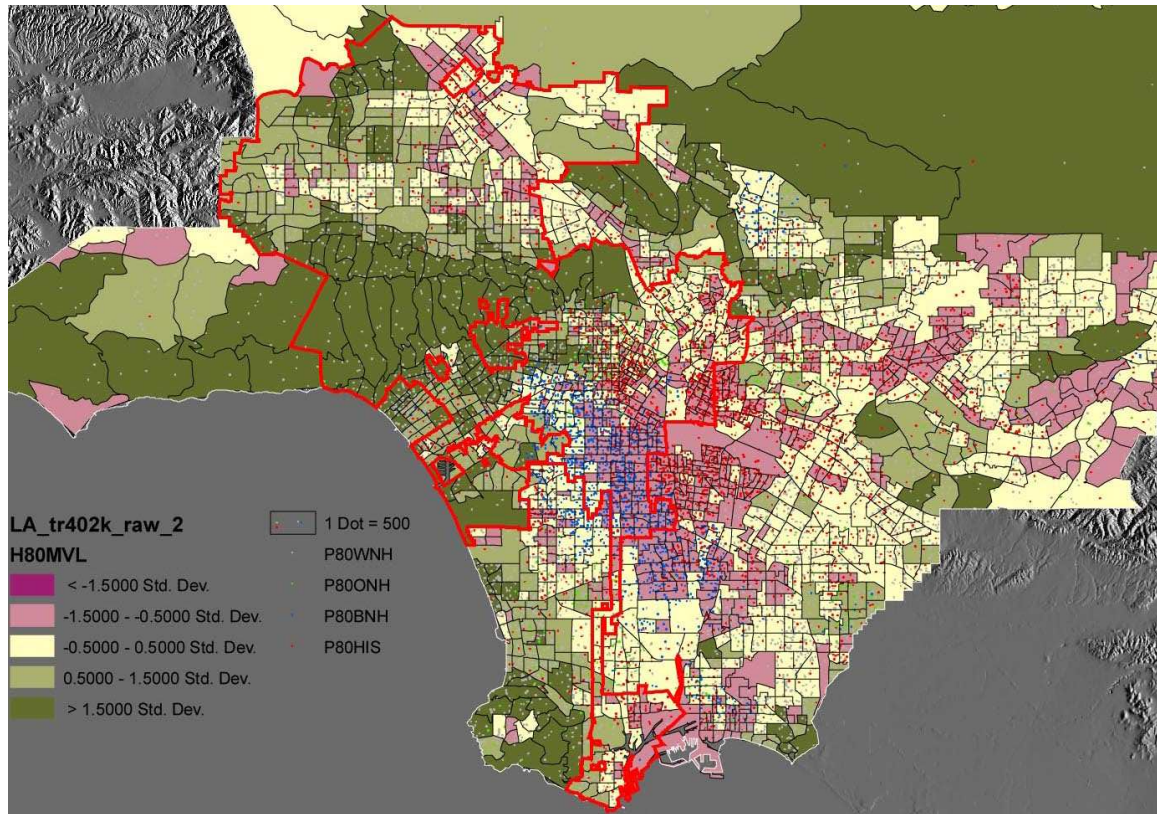
in-migration as destabilizing, because their view of what constitutes a stable level of integration (minority share) is above that which results from their moving to the new neighborhood. The local white population, on other hand, sees the new arrivals as a destabilizing force — crossing their view of some threshold of stable integration and foretelling fundamental neighborhood change. Fearing this, the white population fulfills its own prophecy and begins to leave the neighborhood *en masse*. The neighborhood then tips from being largely white to, in our example, being largely black. Tipping, then, is a situation where small changes in a neighborhood's racial or ethnic composition lead to dramatic changes because of different perceptions about what constitutes a stably integrated neighborhood.

To explore this "standard" version of a tipping model, we should look for census tracts which are majority white in one decade and majority black in the following decade. A tighter restriction on the definition of tipping would involve tracts that evolve rapidly from large majority white to large majority black. Recall from Figure 1 that the county-wide

Figure 14: Stability of Median House Values: 2000
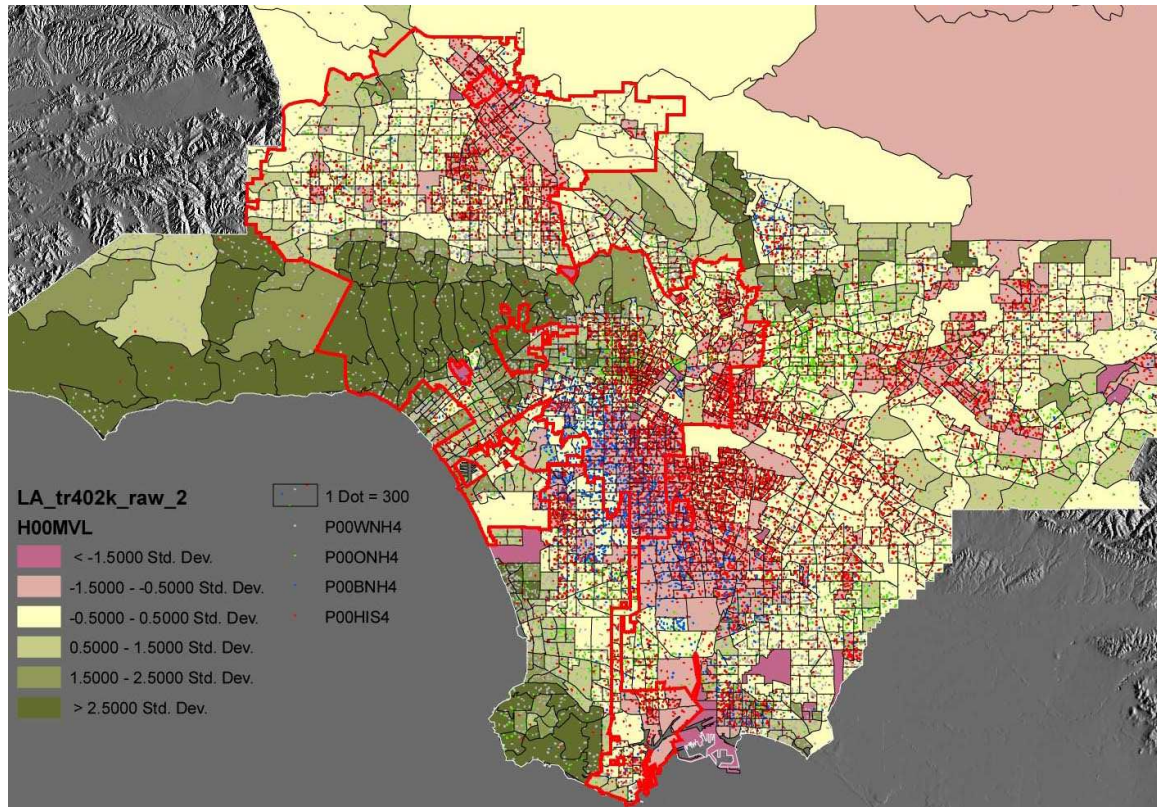
population dynamics suggest that some spatial reorganization of where different racial/ethic groups live is highly likely. During the period from 1940 to 1960, both the white and black populations of Los Angeles County grew rapidly: the white population doubled from 2.5 million to 5 million, while the black population rose from only 75,000 in 1940 to 214,000 in 1950 to 463,000 in 1960. While the 1940s and 1950s were a period of rapid build-out in the County's undeveloped land, by 1960 the arrival of new ethnic and racial minorities was in no small part accommodated by the outflow of the white population. By 1980, the white population was not much different than it had been in 1950, despite an aggregate growth in County population from 4.3 million to 7.7 million. In other words, it is natural – given these aggregate dynamics – to observe changes in the racial and ethic composition of Los Angeles County's neighborhoods. At issue is the speed and size of the changes and the role of neighborhood characteristics in attenuating or accelerating these changes.

The purpose of this case study of tipping in Los Angeles is to illustrate differences in

the inferences that can be drawn from two distinct types of analysis. The first is a traditional accounting of black and white populations and the relative importance of the rapid turnover of neighborhood populations in explaining the spatial distribution of the two populations. The second approach examines the spatial distribution of the two populations less by neighborhood than by *type of neighborhood*. That is, "black" and "white" categories aggregate important subsamples from within each. In particular, we examine neighborhoods by defining them by not only their racial/ethnic composition, but also by their human capital composition (college and high school graduates) and their relative position in the hierarchy of local land markets (rank of median house price). Not surprisingly, this richer, multi-dimensional analysis suggests a variety of additional nuances not found by looking solely at race and ethnicity.

4.1 Tipping Is In the Eye of the Beholder

The first step is to examine the traditional model of tipping and ask: given the dramatic rise in the black population, is there any evidence of tipping at work in Los Angeles County? Is there evidence of extreme change in the racial/ethnic composition of Census tracts from decade to decade? What is the frequency of change from majority white to majority black? And, importantly, is tipping a significant phenomenon and relevant mechanism in the evolution of Los Angeles County?

Tables 2, 3 and 4 report a number of statistics from a basic analysis of the County's tracts regarding their black and white population histories. Did tracts tip from whites to blacks? Table 2 reports the number of times tracts with a large majority of whites (80% or more) and small minority of blacks (15% or less) "tipped" according to a variety of thresholds for what constitutes tipping. For example, from all of the 80%-15% tracts observed from 1940 to 1990, only two tracts end up with at most 10% whites and at least 90% blacks.

Using a simple definition of tipping — moving from an 80%/15% tract to any black majority/white minority — only 79 tracts "tipped". This is a very small number given the 2068 tracts and seven decades for which we have data. During the 1940 to 2000 sample period, Los Angeles County's Census tracts offered over 12,000 observations of decennial

Table 2: Tipping Counts by Definition of Tipping

		Percent Black in After "Tip" (Tract contains no less than...)					
		50%	60%	70%	80%	90%	Total
	50%	0	0	0	0	0	0
	40%	9	1	0	0	0	10
Percent White	30%	13	21	3	0	0	37
After "Tip"	20%	3	1	14	3	0	21
(no more than...)	10%	0	1	1	7	2	11
	Total	25	24	18	10	2	79

transitions, implying that tipping was rare as a general phenomenon with only 0.64% of all possible changes across decades yielded a situation that could broadly be defined as "tipped." Of course, white/black tipping is generally considered an artifact of the Civil Rights era, so its frequency over the period from 1970 forward may understate its relevance. Moreover, the number of tracts is likely to be small and, perhaps, a poor indicator of the relevance of tipping. Though the black population grew quickly from 1940 to 1970, it started with a population in 1940 of only 75,000. From this small base, it would be mathematically impossible for a large number of tracts to have tipped.

A better metric of the importance of tipping would be the fraction of the black population in any decade that arrived into a tipped neighborhood. Statistics that speak to this point are reported in Table 3. Using the set of 80%/15% tracts as the candidates for tipping, the 79 tracts that "tip" are, in fact, largely confined to the first half of the sample period – with 66 of the 79 occurrences of tipping taking place in the 1950s and 1960s. The table also reports that while the number of tracts is small, the magnitude of the population flows in and out of them is not. During the 1950s, for example, fully 42 percent of the net black migration to Los Angeles County arrived in tracts that tipped during the same period. Over the twenty-year period most closely associated with discrimination in housing markets and "block busting," over a third of the net migration to the County arrives in tracts tipped by

Table 3: Decennial Tipping Statistics: Majority-to-Majority

Tract Statistic	1950	1960	1970	1980	1990	2000	Total
Number "Tipped"	6	38	28	7	0	0	79
Blacks to "Tipped"	13,936	105,140	88,910	17,119	0	0	225,105
Blacks to All Tracts	139,785	248,908	294,165	169,677	8,799	-16,282	845,052
Percent	10	42	30	10	0	0	–
Whites to "Tipped"	-5,102	-97,958	-73,723	-18,324	0	0	-195,107
Whites to All Tracts	1,260,932	1,241,026	-56,205	-760,851	-254,453	-661,675	768,774
Percent	0	-8	131	2	0	0	–

the new arrivals. It's worth noting that not only did blacks arrive in large numbers to these tracts, but whites left in approximately the same large numbers. This is not a deterministic result from the definition of tipping: a large number of black arrivals to a tract occupied by a small number of whites would result in a tipped tract, but this outcome would result in sharp differences in black and white flows to and from the tract. Consistent with the common tipping story, the aggregate flows suggest the displacement of whites, not simply the addition of blacks.

It may be that these rather dramatic numbers are a function of the relatively loose standard of what constitutes a "tipped" tract. Rather than shifts from majority to majority, some higher threshold combination may provide a better description of the standard tipping narrative. In fact, under more restrictive definitions of "tipping," its occurrence drops rapidly. Table 4 reports that the standard narrative of racial/ethnic reversal – from *large*

Table 4: Decennial Tipping Statistics: Racial/Ethnic Reversal

Tract Statistic	1950	1960	1970	1980	1990	2000	Total
Number "Tipped"	1	4	6	0	0	0	11
Blacks to "Tipped"	2,488	15,475	24,078	0	0	0	42,041
Blacks to All Tracts	139,785	248,908	294,165	169,677	8,799	-16,282	845,052
Percent	2	6	8	0	0	0	16
Whites to "Tipped"	-417	-12,614	-18,783	0	0	0	-31,814
Whites to All Tracts	1,260,932	1,241,026	-56,205	-760,851	-254,453	-661,675	768,774
Percent	0	-1	33	0	0	0	32

majority white to *large* majority black – is much less common and of significantly less import to the aggregate spatial distribution of blacks. Tracts are included in this table of statistics if they experience a transition from the 80%/%15 white/black thresholds used above to a reversed maximum 15% white/minimum 80% black composition. It shows, for instance, that the incidence of tracts tipping drops from 79 under the earlier, more permissive definition of tipping, to only 11 tracts – just four in between 1950 and 1960 and six between 1960 and 1970. Moreover, with this definition of tipping, only six- to eight-percent of net black in-migration is accounted for within these tipped tracts.

These statistics make clear the role of definitions in judging the importance of tipping: clearly, the relative importance of tipping is in the eye of the beholder. For those who would define it more freely, tipping appears to be a highly significant mechanism in explaining the spatial distribution of blacks, especially during the period of the rapid rise of the black population in Los Angeles County from 1940 to 1970. However, even with a more restrictive definition, tipping appears relevant, though far more limited in its explanatory power of aggregate trends.

The larger point among the statistics in Tables 2, 3, and 4 is what is not shown. Using either definition of tipping, the majority of blacks arrived to tracts in which tipping had not occurred. In other words, while somewhere between 11 and 79 tracts experienced tipping, 5380 tracts were "at risk" for tipping during the period for which tipping was potentially relevant, 1940-1970.[1] Of these tracts, 4788 received positive net in-migration of blacks. In other words, the vast majority of tracts which were comprised of a large white majority and received at least some positive inflow of blacks, failed to tip. Among the "at risk" tracts that actually received positive net in-migration, the *median* white majority at the beginning the decade was 93 percent; by the end of the decade the median majority had fallen to only 85 percent. In these same tracts, a median net arrival of 464 blacks resulted in the median minority position of blacks rising from one percent to less than two percent. (Note that the mean number of blacks arriving, conditional on positive net in-migration of blacks, is 0.73

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[1]These are defined as tracts that started a decade with at least an 80 percent majority of whites and no more than 15 percent representation by blacks. These tracts are more numerous earlier in the subsample, running from 1,953 in 1940 to 1,582 at the beginning of the 1960s.

and suggests a highly skewed distribution of outcomes given a positive change in the black population.)

This raises the issue that we aim to bring into sharper focus. The traditional unidimensional approach to tipping has undertaken an analysis similar to that executed here. While interesting – and validating the presence of tipping in Los Angeles County – it fails to explain why tipping did not occur where it otherwise might have. Moreover, as reported in Table 2, tipping appears to take many different forms. Indeed, where tipping is often discussed as a dichotomous outcome, there is a continuum of racial and ethnic change in tract compositions. The argument presented in this paper is that by revisiting the mechanisms of urban evolution with a keener eye to other dimensions that define neighborhoods, more can be learned about the nuances of these mechanisms. The next section provides examples of the subtler nature of tipping and of additional dimensions that influenced both the extensive and intensive margins.

4.2   Explaining The Incidence & Extent of Tipping

In some sense, the examination of tipping is an exercise in looking at the tail of a distribution: tipped tracts are outliers. As shown in Figure 15, the large majority of tracts "at risk" for tipping remained stable despite the arrival of small but significant numbers of blacks. Clearly, the right-tail of the distribution of outcomes is long. But even here it is not possible to demarcate convincingly those that have "tipped" from those that have remained somewhat stable in the presence of large changes in the share of the black population. Nor are the factors that led to these wide range of outcomes analyzed. Figure 16 reports the analogous histogram for the white populations in the same tracts. Again, while the tail of extreme outcomes is long, the large majority of tracts experienced only moderate declines in their white majorities.

The two additional dimensions of neighborhoods we add to the analysis are human capital – in the form of high school and college graduates – and relative position within a hierarchy of land markets – proxied by the tract's median house value. There are several reasons that one might expect that both of the dimensions may have an influence on outcomes in tracts

Figure 15: Percentage Change in "At Risk"Tracts
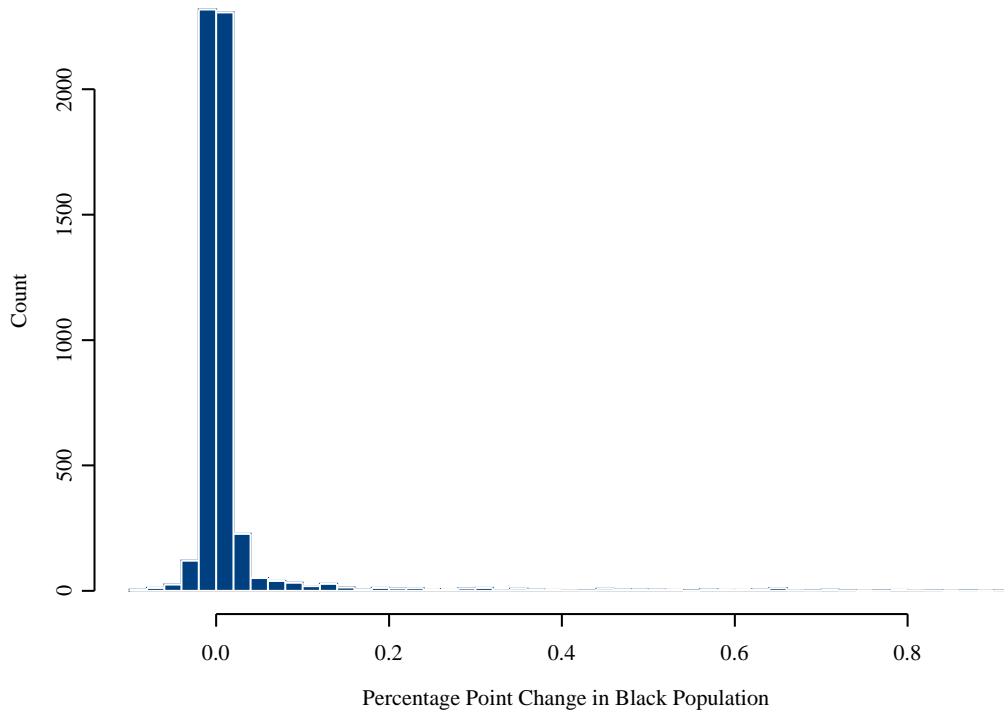
"at risk" for tipping. First, racial and ethnic tolerance may increase with education, which would lead tracts with above average representation in college graduates to be less reactive to the arrival of blacks. Second, tracts where college graduates are high are more likely to be destinations for educated blacks, who may be viewed as consistent with a neighborhood defined by education rather than race. The same two results may occur with tracts containing higher valued homes. These are conjectures that can be explored using our data.

Because the issue of defining tipping is inherently problematic – and produces a dichotomous summary of a continuous outcome – this section examines the percent change in the black population of tracts "at risk" for tipping. That is, it examines the range of outcomes and the contributing factors for tracts with a large white majority (at least 80 percent) and small black minority (no more than 15 percent) *and* that received a positive flow of blacks between decades.

Figure 17 plots the percentage point change in black population in the "at risk" tracts.

Figure 16: Percentage Change in "At Risk" Tracts
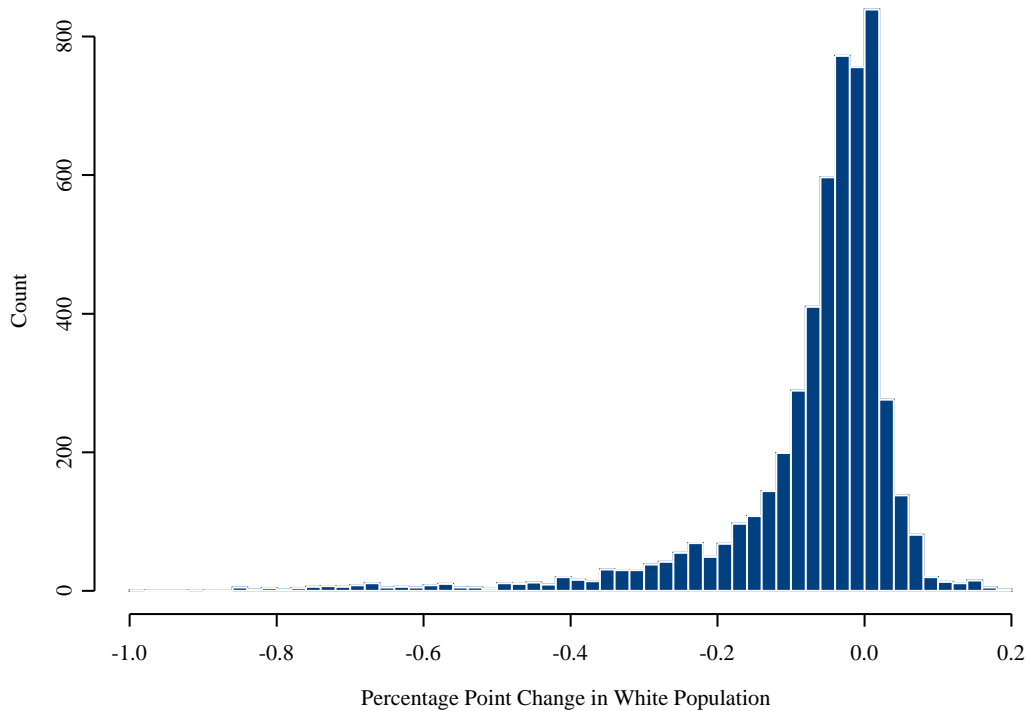
Along the y-axis, it is clear that this set of tracts experienced a wide variety of outcomes, from almost no change to almost complete reversal of racial composition. The x-axis reveals that graduating from college was far less common in the immediate post World War II era than it is today, with the shares of college graduates ranging from zero to 26 percent. The figure also reveals two broad trends regarding the incidence of tipping (or at least large changes in the black population) and its relationship to human capital.

The first clear regularity in the data is the massing of points near the zero percentage point change in the black population. Along the spectrum of college graduate shares, there appears to be a distribution of outcomes heavily skewed to the right — that is, at any point along the x-axis, the cross section of outcomes regarding large changes in the black population is massed around zero, with a long tail upward. This suggests that there are two types of tracts. The first is a tract in which little happens. These could be tracts in which active discrimination prevents the arrival of any blacks. Alternatively, these could be tracts

Figure 17: Change in Black Populations by College Graduates
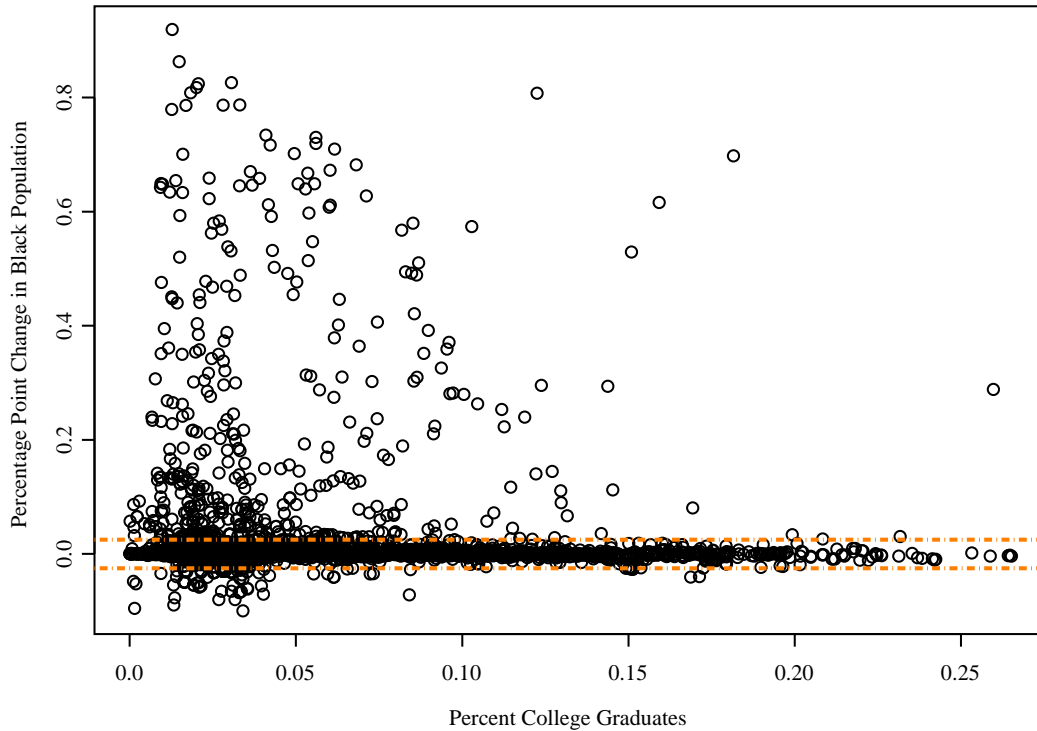
for which the arrival of small numbers of blacks is not destabilizing. These tracts are located in Figure 17 between the dashed lines.[2] The second type of tract can be found outside the dashed lines. In these tracts, the arrival of blacks has occurred in relative (to the existing population) terms that are large. Two empirical questions arise from these observations. The first is: what factors lead to stability? That is, are there other characteristics of a neighborhood that significantly determine whether or not the arrival of blacks is large? The second question is: given that changes occurred, are there characteristics of the neighborhood that attenuate the size of the change? Figure 17 suggests that tracts of higher human capital – in the form of a greater share of college graduates – contributes both to a lower probability of significant change and, conditional on change occurring, to a change smaller than would have occurred in lower human capital tracts.

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[2]The lines are located at +/- two-and-a-half percent changes in the percentage of blacks in tracts. Various other thresholds between two percent and 20 percent were tested in all the results reported below remain qualitatively the same.

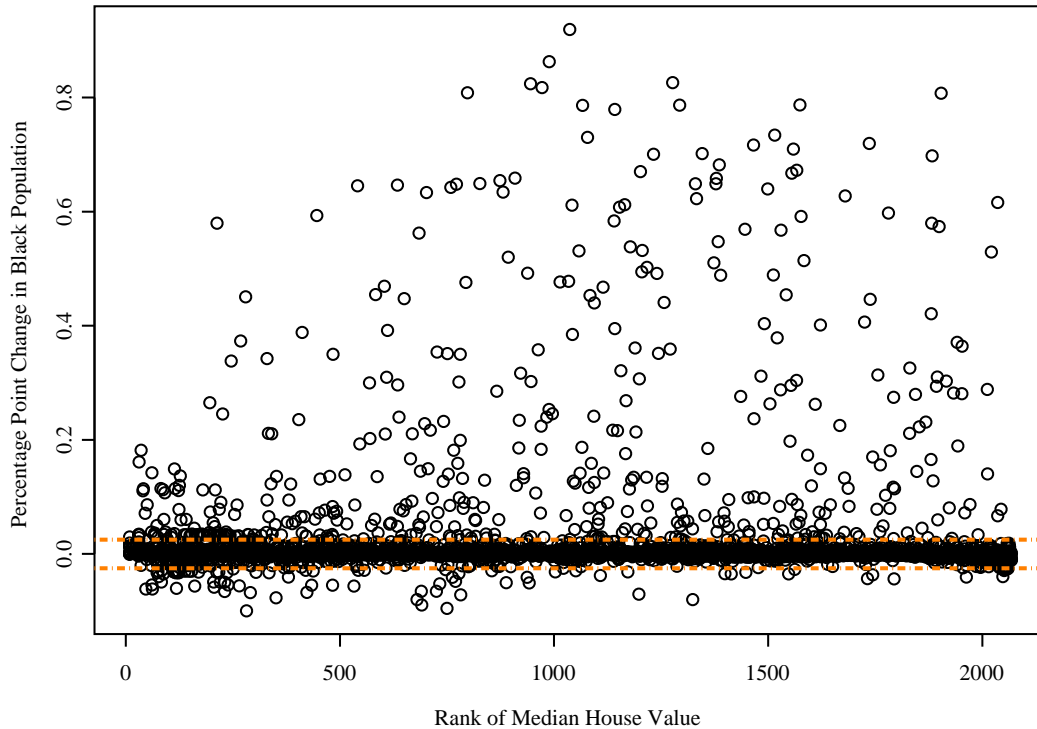**Figure 18:** Change in Black Populations by Median House Values

Figure 18 broadly echoes the trends in Figure 17. Here, tract rank with regard to median house value is plotted against the same percentage point change in the black population of the "at-risk" tracks. As in Figure 17, there is a clear band of tracts in which no change occurs. This is true across the entire spectrum of house values, though the band appears to be denser among the higher ranked tracts. Given that change does occur, there appears to be (at least in the upper half of the tracts) a relationship between the size of a change in black population and the rank of the tract. The noticeably vacant "trinagle" above the highest ranked tracts suggests that relatively expensive housing markets acted to dampen large changes.

Fortunately, these apparently broad trends can be tested formally. Tables 5 and 6 report regression statistics for two types of regressions. The first set of regressions seeks to examine the relationship between the likelihood of a significant change in a tract's black population and its human capital and relative position in the local land market. The second set of

Table 5: Likelihood of Significant Change in Black Population
(Dependent Variable: Occurrence of Significant Change, Yes or No)

Variable	Model I	Model II	Model III
Degrees of Freedom	5378	5378	5377
Intercept	-3.813	-0.247	-2.231
	(15.86)	(0.97)	(5.28)
log(% College Graduates)	-0.597		-0.487
	(7.80)		(6.06)
log(Rank Median House Value)		-0.268	-0.190
		(6.96)	(4.51)
ρ(actual, fitted values)	0.111	0.086	0.123

Note: t-statistics reported in parentheses

regressions uses the same explanatory variables to examine the relationship between track characteristics and the size of the change of the black population given that one occurs. The dependent variable in the first of regressions is an indicator variable taking the value one if a significant change occurs between adjacent decades. For these regressions, a significant change is deemed to be plus or minus two-and-a-half percentage points. The second set of regressions samples from the "at risk" tracts in which this threshold is crossed, and uses the percentage point change in the black population as a dependent variable. In both regressions, the independent variables are the log of a tracts share of college graduates and the log of tracts rank in terms of median house value.

The regression tables bear out the broad trends visible in Figures 17 and 18. The first set of regressions indicates that – independently and together – the percentage of college graduates and the rank of the median house value are significant predictors of the likelihood of a significant change in the the black population. The higher the human capital in a tract the less likely the tract changed significantly in this regard. Similarly, the higher the rank of the median house value, the lower the probability of significant change. Note that there is no way to discern whether these variables derive their influence from a higher or lower degree of tolerance among tract residents – whether racist whites largely thwarted the arrival of large numbers of blacks or tolerant whites saw small numbers blacks as no immediate threat to the stability of the neighborhood. Rather, they simply indicate a statistical relationship.

Given a tract does experience significant change in the black population, do either human capital or median house value influence the size of the change? Table 6 suggests that only

Table 6: Size of Significant Change in Black Population
(Dependent Variable: Percentage Point Change, given Significant Change)

Variable	Model I	Model II	Model III
Degrees of Freedom	634	634	633
Intercept	0.156	-0.230	-0.261
	(5.48)	(5.66)	(4.81)
log(% College Graduates)	-0.009		-0.007
	(1.11)		(0.88)
log(Rank Median House Value)		0.055	0.056
		(8.85)	(8.81)
r^2	0.002	0.110	0.111

Note: t-statistics reported in parentheses

median house value does. Where the explanatory power of the regressions is fairly low, what power they do have results from the inclusion of the log of the rank of median house value. The regressions suggest that the lower the rank (rank increases as median house value drops) the higher the likely change will be.

5   Conclusion

This paper presents only the first results of a larger project the two authors have entered into, but we believe that these preliminary results strongly support the general framework we have proposed at the outset of the paper. First, our initial findings show the great importance of understanding neighborhood characteristics in the metropolitan and historical contexts. By ranking all of the county's census tracts, and treating them as locations that will always undergo some kind of change, we have even able to draw very significant comparative inferences about rates of instability, both between race-ethnic groups, and between the three major dimensions we have emphasized: race-ethnicity, human capital, and ground rent. In each of our two empirical sections, we were able to sharply separate the influences of each of these three dimensions. This seems to support our contention that each dimension has a

partially autonomous dimension. Fixed places, then, and a metropolitan context: with short and long-term historical cycles, patterns, rhythms, disequilibria, and crises. A great deal of work is ahead to sift through these various patterns.

Second, we think that our analysis in this paper supports an important distinction between "space" and "place," which is now very well established in the fields of geography, sociology, and anthropology, but not well understood in either economics, history, or political science (Feld and Basso 1997; Gieryn 2000; Low and Laurence-Ziga 2003; Cresswell 2004; Ethington and McDaniel 2007). Spaces are objective, abstract, measurable, "scientific" and universal. They can be objectively described as points, lines and polygons, and all can be fitted to the grid of latitude and longitude. Census tracts are spaces: they are identified with numbers, such as 301657. Place, however, "is an organized world of meaning," in the words of geographer Yi-Fu Tuan, one of the early exponents of the place-space distinction. (1977: 179). Places are experiential, memorial, subjective, and even poetic. Places, in other words, are qualitative, and social scientific methods can only estimate those qualities, as we do to study social status, quality of life, social power, and so on. Neighborhoods are places, identified with names, like Oakwood, or Little Tokyo. One has a childhood and memories in a neighborhood, not in a census tract. The kinds of amenities that people seek in a place to live are neighborhood qualities: including all the factors that urban economists, sociologists, and urban historians study. But they are usually only systematically studied through data acquired at the census tract level. By distinguishing between the dynamics of phenomena that change location and those that do not, we are essentially using statistical spaces to illuminate urban places. Third, then, while we use census tract data like most other urban social scientists, we believe that the true object of inquiry is the neighborhood. Neighborhoods, like census tracts, never change location. But neighborhood types do change locations in various times, and we have to make a clear distinction between the neighborhoods (unique, immobile) and the types (general, mobile). One neighborhood can be an affluent redoubt in one generation, an immigrant working-class enclave in another generation, and an underclass ghetto in yet another. In each of these phases, the meaning of that neighborhood to its residents and to outside observers will be very different. Our point is

that what makes it a neighborhood in each era is the intersection, on that specific site, of the three dimensions of race-ethnicity, human capital, and ground rent. Our largest point here is that "neighborhood" is the intersection of (dynamic) race-ethnicity, human capital, and ground rent. Neighborhood change is a confluence of flows in these three dimensions. Are there other dimensions? Yes of course: psychological, life-cycle, and so on. But the kinds of urban change described in the models we review all hinge on these three dimensions, so they have to be considered together, within an institutionally inscribed geographic context, and within time. The implications of these findings, we believe, will be profound for the future conduct of studies of urban change, because such studies will need to take the overall dynamism along all three dimensions of the metropolis into account when situating their specific studies. And, increasingly, we shall need to recognize that urban change does not just happen as a process, it takes place.

6   Bibliography

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7 Appendix – Methodological Notes on the Los Angeles County Union Census Tract Data Series, 1940-2000.

Methods:

The unique feature of the Los Angeles County Union Census Tract Data Series, 1940-2000 is that all data can be studied according to a common geography for every year, from 1940 through 2000. In order to achieve this uniformity, all data were fitted to the geography of the 2000 census tracts. Census data or the years 1940, 1950, and 1960 were originally collected and stored in GIS shapefiles according to the census tract boundaries of those years. The 1970 1980 and 1990 data had already been fitted to the 1990 tracts by the California State Department of Finance (see specific methods below). We initially (in 1998) performed the fitting operation on the 1940, 1950, and 1960 data by imposing the 1990 tract boundaries on top of the boundaries for each of those years, and, using the "Union" function in ArcInfo , calculated a proportional distribution of data into the 1990 tracts. Obviously, certain assumptions and drawbacks are involved in this method. For the most part, census tracts in earlier years were geographically larger than those in following years. Thus, a 1940 tract with 1000 persons might have been split the Census Bureau into two or more tracts in 1950, to reflect growing population, again in 1960, and so on through 1990. Those original 1000 persons are assumed by our method to be spread uniformly across the space of the 1940 tract, and to land proportionally, by area, in the 1990 tracts that overlay that 1940 tract. Thus, assume that hypothetical 1940 Tract A was split over the years into five 1990 tracts, called Tract V, W, X, Y, and Z. Tract A was 100 square kilometers. 1990 Tract V lies completely within 1940 Tract A, and is 25 square kilometers. 1990 Tract W also lies completely within 1940 Tract A, and is 30 square kilometers. 1990 Tract X, Y, and Z lie both inside and outside of 1940 Tract A, however. Only 2% 1990 Tract X lies within 1940 Tract A (call that 2 square kilometers), 50% of Tract Y lies within 1940 Tract A (call that 30 square kilometers), and 80% of 1990 Tract Z lies within 1940 Tract A. The following person counts would have been assigned to the 1990 tracts: V=250; W=300; X=20; Y=300; Z=130. Note that 1990 Tracts X, Y, and Z will also pick up data assigned from the other 1940 tracts they overlap.

The 1970 and 1980 data were fitted to the 1990 census tracts by a different method. Below we have reproduced verbatim the State Department of Finance's description of its method:

The 1970 - 80 - 90 database was created to simplify thematic mapping of historical California data for the years 1970, 1980 & 1990. The data for all three years are assigned to 1990 census tracts. Census geography has changed since 1970 making the process of relating 1970/1980 data to 1990 census tracts more difficult. The result of this effort, however, eliminates much of the difficulty and allows the user to easily compare census tract data between 1970 and 1990. The data, as assigned to 1990 census tracts, will accurately depict the demographic and economic changes for this period.

To help the user of this file better understand the relationship of 1990 census tracts and the 1970/1980 geography, a correspondence file is available that indicates how the 1970-1980 data were assigned to 1990 census tracts. If the user wanted to produce a tabular report of the data for 1970 or 1980, beware of the fact that the data cannot be considered OFFICIAL U.S. Census Bureau data or California Department of Finance data.

There are seven possible types of geographical changes between 1970 and 1990:

1. A census tract existed in 1970 and has not been subdivided:

1970	1980	1990
0001	0001	0001

The actual data appears for this tract in each year.

2. A census tract existed in 1970 and was subdivided in 1980:

1970	1980	1990
0001	0001.01	0001.01
0001	0001.02	0001.02

3. A census tract existed in 1970 and was subdivided in 1980 and 1990:

1970	1980	1990
0001	0001.01	0001.11
0001	0001.01	0001.12
0001	0001.02	0001.21
0001	0001.02	0001.22

The actual data appears for these tracts in 1990 only. The 1980 data were assigned to the 1990 tracts based upon the population split of the 1990 tracts. The 1970 data was assigned to the four 1990 census tracts based upon the population split of the two subdivided 1980 tracts. The 1982 and 1970 medians are assigned without change.

4. A census tract existed in 1970 and was subdivided in 1990:

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1970   1980      1990
0001   0001    0001.01
0001   0001    0001.02
0001   0001    0001.03
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The actual data appears for this tract in1990 only. The 1980 and 1970 data were assigned to the three 1990 tracts based upon the population split of the three 1990 tracts. The 1980 and 1970 medians are assigned without change.

5. A census tract existed in 1970 and was merged with another tract in 1990:

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  1970       1980      1990
0001.01   0001.01    0001
0001.02   0001.02    0001
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In this situation the 1970 and 1980 data are aggregated and the medians are re-calculated.

6. Actual adjustments (other than subdivision) were made to a census tract boundary in 1980 and/or 1990. In these situations the boundary adjustments have been ignored. The assumption is that these changes are insignificant in respect to thematic mapping purposes and do not distract from interpreting change between 1970 and 1990 in a particular geographic area. Users must be cautioned that the boundaries in this file accurately describe 1990 census tract areas BUT may not accurately describe 1980 or 1970 census tract areas.

7. Census tracts did not exist in 1970 and/or 1980. In this situation Enumeration districts (Eds) or Census County Divisions (CCDs) were matched to 1990 tracts according to the following steps:

- Step one. Determine all census county divisions (CCDs) that match directly with 1990 tracts. For the remaining areas go to step two.

- Step two. Determine enumeration districts (one or more) that match directly with 1990 tracts. For the remaining areas go to step three.

- Step three. Determine enumeration districts (one or more) that closely match with 1990 tracts. For the remaining areas go to step four.

- Step four. Using CCDs as a geographical control, match 1970/1980 enumeration districts to 1990 census tracts based upon median family income and the percent non-white population.

Finally, all of these 1940-1990 data were re-fitted to the 2000 geography after the release of Census 2000 for California in 2001. The method used was the same proportional-area method described above, used for 1940-1960. We then added all comparable 2000 data directly from the STF3 tract-level census data, and recombined the Census Bureau's race and ethnic variables to create variables on race that matched those in the 1940-1990 series.